# Indiana Harbor and Canal
# Ambient Air Monitoring Program:
# Construction/Pre-Dredging Phase Annual Report
# 2012

U.S. Army Corps of Engineers
Chicago District
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# Executive Summary

Ambient air monitoring data, including polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), volatile organic compounds (VOC), metals, and Total Suspended Particulates (TSP) are currently being collected as part of the Indiana Harbor and Canal Confined Disposal Facility (IHC CDF) project. The IHC CDF project is located on the former Energy Cooperative, Inc., refinery site. Construction of the CDF initiated in 2004 and continued through 2011. Dredging of the IHC and disposal of dredged material into the CDF started in November 2012. Air monitoring was conducted from November 2001 to the present time. Two monitoring locations are used: the south site (adjacent to the Indiana Harbor Canal just south of the ECI property), and the East Chicago High School.

This report presents a summary of the mean concentrations for both monitoring sites, for a number of compounds during the period from 2001 up to the start of dredging and disposal of dredged material into the CDF in Fall 2012. Data are analyzed based on the location of the monitoring station, the season (corresponding to the average temperature), and whether construction activities are occurring on site. Air monitoring data collected during the dredging event are not discussed in this report since too few data are available for a statistical evaluation.

Based on a statistical analysis of the data, there is no indication that construction activities at the ECI site were causing degradation of the ambient air at either the south monitoring site or at the high school. As construction activities were substantially complete as of the end of calendar year 2011 and dredging started in November 2012, this report will serve as a compilation of all data collected prior to the start of dredging in the IHC which documents conditions prior to dredging start. At this time, it is recommended that an adequate level of monitoring continue during the start of dredging activities at the ECI site, and that the data be re-evaluated on an annual basis to determine whether dredging activities are having an adverse impact on the ambient air conditions near the CDF.

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## Introduction

In November 2001, the U.S. Army Corps of Engineers (USACE) implemented an ambient air monitoring program at the property known as the Energy Cooperative, Inc. (ECI) site, located in East Chicago, Indiana. The ECI site is the location of a confined disposal facility (CDF), which is constructed to hold sediment dredged from the Indiana Harbor and Canal (CDF). In May 2004, the construction phase of the ambient air monitoring program was implemented. The ambient air monitoring program results, including the background phase (reference 1 below) and construction phase monitoring through 2011 (references 1 through 9) are presented in the following reports:

1. Indiana Harbor and Canal Air Monitoring: Background Phase Ambient Summary & Construction Phase Ambient Air Monitoring Program, USACE Chicago District, November 2003.

2. Indiana Harbor and Canal Ambient Air Monitoring Program: Construction Phase Annual Report 2004, USACE Chicago District, June 2005.

3. Indiana Harbor and Canal Ambient Air Monitoring Program: Construction Phase Annual Report 2005, USACE Chicago District, June 2006.

4. Indiana Harbor and Canal Ambient Air Monitoring Program: Construction Phase Annual Report 2006, USACE Chicago District, July 2007.

5. Indiana Harbor and Canal Ambient Air Monitoring Program: Construction Phase Annual Report 2007, USACE Chicago District, July 2008.

6. Indiana Harbor and Canal Ambient Air Monitoring Program: Construction Phase Annual Report 2008, USACE Chicago District, September 2009.

7. Indiana Harbor and Canal Ambient Air Monitoring Program: Construction Phase Annual Report 2009, USACE Chicago District, June 2010.

8. Indiana Harbor and Canal Ambient Air Monitoring Program: Construction Phase Annual Report 2010, USACE Chicago District, July 2011.

9. Indiana Harbor and Canal Ambient Air Monitoring Program: Construction Phase Annual Report 2011, USACE Chicago District, July 2012.

These reports include detailed information on the selection of the monitoring sites, the handling of non-detectable data, an evaluation of meteorological data, and statistical analyses of the previous air monitoring data. Because the monitoring locations, physical conditions, and data handling have not changed, that information will not be repeated in this report. Interested readers are referred to the above referenced documents for details.

CDF construction activities were substantially complete in 2011, and dredging of the IHC started in November 2012. Air monitoring continued during the post-construction, pre-dredging period in 2012 (January to October 2012). The purpose of this report is to present an updated statistical analysis of the ambient air monitoring data with the pre-dredging data from 2012. This report will also serve as a compilation of all data collected prior to the start of dredging in the IHC and therefore documents conditions prior to dredging start. Air monitoring data will be compared by location, season, and parameter. The entire ambient air monitoring dataset is used for this analysis, including data from 2001 through October 2012. Air monitoring data collected in 2012 after dredging started (November and December 2012) are not discussed in this report since too few data are available for a statistical evaluation. This data will be presented in a future air monitoring report.

## Air Monitoring Data

Locations and Parameters

The air monitoring data used for the statistical analysis were collected at two locations, referred to as the "south" site and as the "high school" site. These two locations are shown in Figure 1. The south site is located adjacent to the Lake George Branch of the Indiana Harbor Canal. The high school (HS) site is located approximately 1700 feet south of the south sampler, on the East Chicago High School property. The rationale for these monitoring locations is discussed in previous reports.

The air sampling stations operate in tandem, on a 12-day rotational schedule. Each sample is a 24 hour sample. Parameters measured and used in the statistical analysis include the analytes listed in Table 1. The parameters fall into several chemical groups: polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), metals, and Total Suspended Particulates (TSP).

In October 2012, the ambient air monitoring program was changed to five monitors to monitor the dredging activities. The five monitors include 4 new monitors (in the four cardinal directions) on top of the earthen dikes that form CDF disposal cells and the existing monitor at East Chicago High School. The monitoring frequency was changed to a six-day rotational schedule at the same time. The rationale for the additional monitors and higher sampling frequency is to observe the effects (if any) of the dredging and dredged material disposal activities on the ambient air. This current report includes evaluation of the data collected prior to the change to the dredging air monitoring regime. Data collected after dredging starts will be included in the next ambient air monitoring report.

**Figure 1:** Location of Ambient Air Sampling Stations and the ECI site in East Chicago, Indiana.

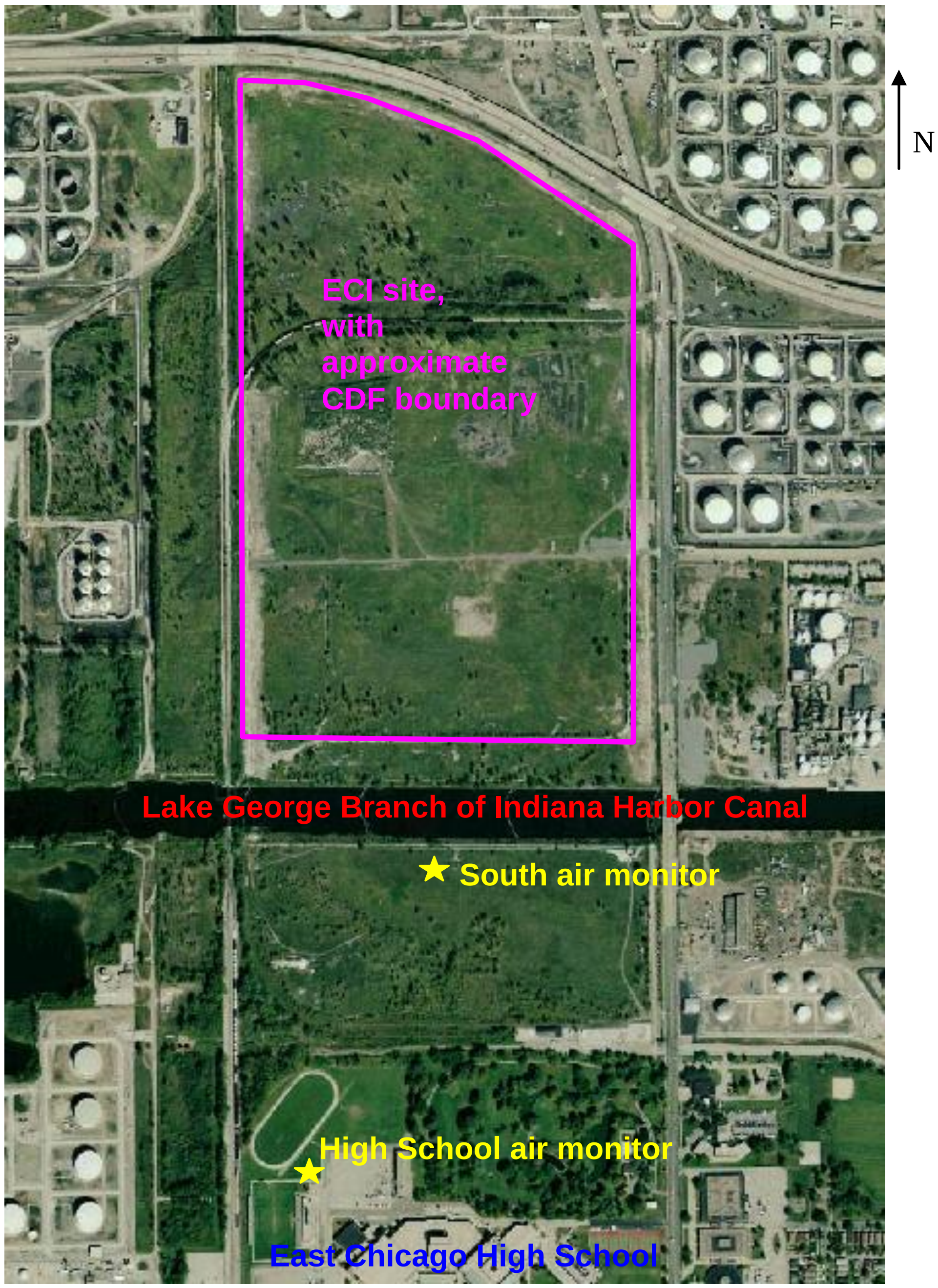

**Table 1:** Air Monitoring Analytes

| | |
|---|---|
| **PAHs**<br>Acenaphthene<br>Acenaphthylene<br>Fluoranthene<br>Fluorene<br>Naphthalene<br>Phenanthrene<br>Pyrene<br>**PCBs**<br>Congener 8<br>Congener 15<br>Congener 18<br>Congener 28<br>Congener 31 | **Metals**<br>Aluminum<br>Arsenic<br>Barium<br>Chromium<br>Cobalt<br>Copper<br>Iron<br>Lead<br>Manganese<br>Nickel<br>Selenium<br>Zinc |
| **VOCs**<br>Benzene<br>Toluene | Total Suspended Particulates (TSP) |

The PAH and PCB samples are obtained using a high-volume vacuum pump air sampler, with a glass fiber filter, a polyurethane foam (PUF) and adsorbent resin (XAD-2) media. Total suspended particulates and metals are collected using a separate high-volume vacuum pump air sampler, with a glass fiber filter medium. VOCs are collected using specially treated stainless steel canisters, which utilize a bellows-type pump to draw in air.

Data Organization

For analyzing the ambient air monitoring data, the data are subdivided into two main groups: Active and Idle. Active refers to data collected while construction activities were occurring on the ECI site. Various types of construction were occurring from 2004 through 2011. Construction activities included excavations, obstruction removal, grading, embankment (dike) construction, cut-off wall construction, well installation, and construction of various other structures. This construction work occurred at various times of the year over the 2004 to 2011 time period. Idle refers to data collected while no construction activities are occurring. This includes the initial years of data collection, before construction started on the ECI site (2001-2003), as well as data from more recent years when construction activities were not occurring, such as during winter and shutdown periods, and finally, data in 2012 before dredging and dredged material disposal into the CDF in November 2012.

Air data, particularly for volatile compounds, show temperature related trends. For this reason, the data were broken down by season: spring/fall (March, April, May, October, November), summer (June, July, August, September), and winter (December, January, February). These groups correspond to mean monthly temperatures of <40$^o$F (winter), 40 – 60$^o$F (spring/fall), and >60$^o$F (summer). Thus, based on seasonal subgroups and also the status of construction activities, there are a total of twelve data subsets for each parameter:

- South site, Active, spring/fall
- South site, Active, summer
- South site, Active, winter
- South site, Idle, spring/fall
- South site, Idle, summer
- South site, Idle, winter
- HS site, Active, spring/fall
- HS site, Active, summer
- HS site, Active, winter
- HS site, Idle, spring/fall
- HS site, Idle, summer
- HS site, Idle, winter

Statistical Analysis

The ambient air monitoring data were compared using a non-parametric comparison of means, the Mann-Whitney test. Non-parametric tests are used when a normal distribution of the data cannot be assumed or when there are small numbers of data points. The handling of non-detectable data and other details of the statistical analysis can be found in previous reports.

## Results

Appendix A contains the results of comparisons of means. These tables give the updated means and the results of statistical comparisons of the data sets. The continued primary objective of this analysis is to evaluate the potential impacts of construction activities at the ECI site on the ambient air quality near the facility. To facilitate this evaluation, the data have been compared based on location and activity (or lack of activity). The data presentation follows the format used in previous Indiana Harbor and Canal ambient air monitoring reports. The results are discussed further, below.

South Site versus High School Site

The ambient concentrations of each analyte were compared between locations (south monitoring site versus the high school monitoring site) for both idle (no construction) and active (construction) periods. Data were broken down into seasonal groups for comparison, and the overall data group was also used for comparison. Tables A1 through A8 show the mean concentrations and also the statistical significance of each comparison.

For PAHs (shown in Tables A1 and A2), acenaphthene, acenaphthylene, and fluorene were significantly different between the south site and the high school for idle conditions, with the south site having a higher acenaphthene, acenaphthylene, and fluorene concentration than the high school in the spring/fall,, the south site having higher acenaphthene and fluorene concentration than the high school in the winter, the south site having higher acenaphthylene and fluorene concentration than the high school overall. For the active period, spring/fall and overall acenaphthylene concentrations, and spring/fall fluorene concentrations were also higher at the south site than at the high school site. However, summer acenaphthene, fluoranthene, and naphthalene concentrations, as well as overall naphthalene concentrations were statistically higher at the high school site than the south site during the active period. The remaining data show no seasonal or overall differences. It should be noted that for this and for all subsequent data analyses in this report, because construction activities were essentially complete in 2011, all data collected in 2012 during the pre-dredging period were considered "Idle" data, and inclusion of the pre-dredging 2012 data had no impact on any of the "Active" only data analyses. For the "Idle" PAH data comparison between locations, acenaphthylene was previously higher at the south site than the high school in the summer, and acenaphthene was previously higher at the south site than the high school overall with data collected through 2011. With the 2012 data, these trends were not confirmed. The higher concentrations of acenaphthene, acenaphthylene, and fluorene at the south site during idle conditions and higher fluorene and acenaphthylene concentrations at the south site during active conditions are attributed to the known concentrations of PAHs in the canal sediment and water column. It is not known why some PAHs are higher at the high school than at the south site during the active summer season. It is possible that there is a local source of PAH emissions nearer the high school than the south monitoring site.

For PCBs (shown in Tables A3 and A4), there were differences between the south site and the high school for all seasons and overall, for both idle and active periods. Congeners 15, 18, 28, 31, and the total PCB concentration were statistically different, with concentrations at the south site being higher than the concentrations at the high school site in the spring/fall, summer, and overall for both the idle and active periods. Congeners 18, 28, 31, and total PCBs were also statistically higher at the south site for the winter, idle conditions than at the high school. Congener 8 did not show any statistically significant differences between the two monitoring locations for any season for both idle and active periods. The higher concentrations of PCBs at the south site are attributed to the known concentrations of PCBs in the canal sediment and water column. All PCB trends are consistent with previously reported results; there were no new trends with inclusion of the latest data.

Except for the overall benzene concentration being higher at the high school site than the south site for the idle period, the concentrations of VOCs (benzene and toluene) were statistically similar for all seasons, for both idle and active conditions. Concentrations are very similar for all seasons, and do not appear to show strong seasonality. VOC data are summarized in Tables A5 and A6. Elevated toluene concentrations were detected at both sites, but especially at the High School site throughout June of 2011. This spike shifted the cumulative 2001-2011 summer toluene mean concentrations at the High School site from 3.3 $\mu g/m^3$ to 9.8 $\mu g/m^3$, while the cumulative mean concentrations at the South site also increased, but much less dramatically. This data suggests a temporary condition at or south of the high school site during the summer of June 2011. The East Chicago High School conducted construction activities at their campus during the summer of 2011. Artificial turf was installed on their football and soccer fields, which may explain this unusual episode of increased toluene concentrations. Despite the large shift in mean toluene concentrations over the 2004-2011 time period, the non-parametric Mann-Whitney test compares the two groups of data and finds no significant difference between the groups overall, suggesting that the June 2011 points are essentially outliers. All other VOC trends are consistent with previously reported results.

Only one metal, copper, showed any statistical differences between the two monitoring sites. During active conditions, copper concentrations were higher at the south site for the spring/fall and overall, but higher at the school during the summer. During idle conditions, no metal showed any statistical differences between the two monitoring sites. The copper concentration had previously been higher at the south site during the summer idle conditions, but this trend was not confirmed with the latest data. Metals data are summarized in Tables A7 and A8. The difference in trends between the two sites suggests that there may be different local sources of copper in the area.

<u>Idle versus Active</u>

Data for each monitoring site, the south site and the high school, were compared between idle (no construction) and active (construction) periods. The intent of this comparison is to evaluate differences in ambient air conditions that may be attributed to construction activities. The data were analyzed as seasonal groups and also as an overall data group. The data are presented in Appendix A, Tables A9 through A16.

Several PAHs (Table A9 and A10) showed seasonal and overall differences between active and idle conditions. At the south site, acenaphthene, acenaphthylene and naphthalene were statistically higher in the summer and/or overall during idle conditions. Fluoranthene, fluorene, phenanthrene, and pyrene were higher overall during active conditions. All of these trends are consistent with previously reported results, except for acenaphthene being higherduring summer idle conditions, which is a new trend. Also, acenaphthylene was previously higher overall during idle conditions, but this trend was not confirmed with the latest data. Higher concentrations during idle conditions and summer months may indicate that these compounds are originating from other local sources, possibly seasonal sources such as warm weather maintenance or operations, rather than from the ECI site. Higher active overall concentrations of some PAHs (fluoranthene, fluorene, phenanthrene, and pyrene) are attributed to the prevalence of summer data (when most PAH concentrations are highest – see Tables A17 and A18 and the Seasonal Dependence discussion below) in the active period data set, rather than actual impact from construction activities. This is confirmed by the fact that the active vs. idle comparisons of these PAHs by season do not show statistical differences.

At the school, naphthalene and acenaphthylene were higher during the idle conditions than the active conditions during the summer. However, naphthalene and acenaphthylene were higher during active conditions than the idle conditions in the winter. The acenaphthylene summer trend and naphthalene winter trend are new with the latest data. Higher concentrations during idle conditions and summer months may indicate that these compounds are originating from other local sources, possibly seasonal sources such as warm weather maintenance or operations, rather than from the ECI site. Acenaphthene, fluoranthene, fluorene, phenanthrene, and pyrene were higher overall during the active conditions. As discussed in the previous paragraph, the higher active overall concentrations of most of the PAHs are attributed to the prevalence of summer data (when most PAH concentrations are highest – see Tables A17 and A18 and the Seasonal Dependence discussion below) in the active period data set, rather than actual impact from construction activities. This is confirmed by the fact the active vs. idle comparisons of these PAHs by season do not show statistical differences.

For PCBs at the south site (Table A11), the overall concentrations of congeners 8, 15, 18, 28, 31, and total PCBs were all statistically higher during active periods. At the school (Table A12), the overall concentrations of congeners 8, 15, 18, 28, 31, and total PCBs were also all statistically higher during active periods. As discussed in the previous paragraphs about PAHs, the higher active overall concentrations of these PCBs are attributed to the prevalence of summer data (when the PCB concentrations are highest – see Tables A19 and A20 and the Seasonal Dependence discussion below) in the active period data set, rather than actual impact from construction activities. This is confirmed by the fact the active vs. idle comparisons of PCBs by season do not show any statistical differences. These trends are consistent with previous years' analyses.

Also, it should be noted that although the PCB concentrations were found to be higher during active periods at both the south site and the high school site, the mean total PCB concentrations are 0.000122 ug/m$^3$ and 0.000086 ug/m$^3$ (at the south site and high school site, respectively) during idle conditions and 0.000184 ug/m$^3$ (south site) and 0.000120 ug/m$^3$ (high school site) during active conditions. These concentrations are more than 10 times *less* than the USEPA Region 3 risk based concentration for total PCBs in ambient air. The risk based concentration for total PCBs in ambient air is 0.0031 ug/m$^3$, which corresponds to a lifetime cancer risk of 1 x $10^{-6}$. The PCB concentrations measured at the south site and high school represent an even lower risk.

VOC data are summarized in Tables A13 and A14. At the south site, the overall toluene concentration is statistically higher for the active period. For the high school site, benzene is statistically higher during the idle than the active periods for the spring/fall and summer seasons and overall. Compounds with higher concentrations during idle conditions may be emitted from industry or other local sources. Toluene, on the other hand, is statistically higher during the active period overall at the high school. The higher active overall toluene concentration is attributed to the prevalence of summer data when toluene concentrations are highest. These are consistent with previous trends observed of the VOC data.

Concentrations of some metals showed statistically significant differences between active and idle conditions (Tables A15 and A16). At the south site (Table A15), overall aluminum, overall arsenic, overall barium, overall chromium, overall iron, overall lead, overall manganese, and overall total suspended particulates (TSP) concentrations were statistically higher during active conditions than during idle conditions. The south site spring/fall selenium concentration was statistically higher during active than idle conditions. The selenium trend is new with the latest data. The south site summer cobalt concentration was statistically higher during idle than active conditions. Barium was previously higher during summer idle conditions, but this trend was not confirmed with the latest data. As with PAHs and PCBs, the higher active overall concentrations of some metals and TSP are attributed to the prevalence of summer data (when metal and TSP concentrations are higher – see Tables A23 and A24 and the Seasonal Dependence discussion below) in the active period data set, rather than actual impact from construction activities. This is generally confirmed by the fact that the active vs. idle comparisons of metals and TSP at the south site by season do not show any statistical differences.

At the high school site (Table A16), overall aluminum, overall chromium, overall iron, overall lead, overall manganese, overall TSP, and spring/fall cobalt concentrations were statistically greater during active conditions. The high school site spring/fall, summer, and overall copper concentrations and summer cobalt concentration were statistically higher during idle than active conditions. The summer cobalt trend is new with the latest data. Again, as with PAHs, PCBs, and metals and TSP at the south site, the higher overall concentrations of some metals and TSP at the high school site during the active periods are attributed to the prevalence of summer data (when metal and TSP concentrations are higher – see Tables A23 and A24 and the Seasonal Dependence discussion below) in the active period data set, rather than actual impact from construction activities. This is generally confirmed by the fact that the active vs. idle comparisons of metals and TSP at the high school site by season do not show any statistical differences. Copper does not follow this trend (higher during idle periods at the high school for spring/fall, summer, and overall). The copper trends suggest that the sources of copper to the air may be different from that of other metals in this area.

Seasonal Dependence of Concentration

Many factors, including air temperature and wind velocity, can impact the concentration of compounds in the ambient air. For this reason, the average concentrations for each compound during each period, and at each location were compared between seasons. The data are presented in Appendix A, Tables A17 through A24.

In general, the PAHs had statistically greater concentrations during the summer period than during the spring/fall or winter (Tables A17 and A18). Most of the PAHs also show a significant difference between the spring/fall concentration and the winter concentration. Although the concentrations may be different between location and period, the tendency for seasonally higher concentrations holds true for all the data except for acenaphthylene and naphthalene at both sites during active and idle conditions.

Acenaphthylene concentrations were not statistically different between the seasons at the South site or the High School site during the idle period. Naphthalene concentrations were not statistically different between the seasons at the High School site during the active period. The spring/fall and winter acenaphthylene concentrations were higher than the summer concentration at the south site during active conditions, and the winter acenaphthylene concentration is higher than the spring/fall and summer acenaphthylene concentrations at the high school site during the active period. Winter naphthalene concentrations also exceeded summer naphthalene concentrations at the South site during the active period. This is not consistent with greater volatility of the compounds during warmer months and likely rules out volatilization as a source as acenaphthylene and naphthalene.

The PCB data during idle conditions (Table A19) showed a temperature-dependent expected trend, with the summer concentrations being statistically greater than the spring/fall concentrations, which were in turn statistically greater than the winter concentrations for both the south and high school sites. During active conditions (Table A20), PCB data also showed a temperature-dependent trend, with the summer concentrations statistically greater than the spring/fall concentrations which were in turn statistically greater than the winter concentrations for both the south and high school sites. This confirms previous year's data trends and is consistent with greater volatility of the compounds with warmer temperatures. It is likely that volatilization from a constant source (e.g., canal sediments) is a source of PCBs to the air in this area.

The VOC data showed fewer trends based on temperature. The idle toluene data (Table A21) for both the south site and the high school were statistically greater during the summer than during the spring/fall and during the winter. This is consistent with previous years' data trends. The benzene data during idle and active conditions showed no significant difference between the seasons for either the south or high school site. During active conditions (Table A22), summer toluene concentrations were statistically higher than spring/fall concentrations at both sites. Summer toluene concentrations were also statistically significantly higher than winter concentrations at the south site. It is likely that the benzene and toluene data do not show as much seasonal trend for two reasons: first these compounds are quite volatile, even at lower temperatures and so are already in the air regardless of the air temperature, and second, there are probably many local sources of these ubiquitous compounds and the multiple emissions may have a greater impact than temperature or other climactic factors.

The metals data (Tables A23 and A24) showed some seasonal trends, more for the idle datasets than the active datasets. It should be noted that metals are not expected to show as many temperature dependent trends as organic compounds, since the atmospheric transport of metals is driven by particulate concentration (except for mercury) rather than volatilization. There is some seasonal correlation to metal concentrations in the air, which may be attributed to other factors such as more anthropogenic activity during the warm seasons, or to seasonal wind patterns. In general, the summer concentrations were statistically higher than the spring/fall and winter concentrations for idle conditions for most but not all metals. Selenium concentrations at both the south site (idle conditions) and the high school site (idle and active conditions) were greater during the spring/fall than during the summer for idle conditions. This trend is not consistent with other metals' results and is difficult to explain.

## Conclusions

The air monitoring data presented were statistically analyzed based on location, season, and whether construction activities were occurring on the ECI site. The data and statistical significance are presented in tables. Inclusion of the latest data from 2012 confirmed most of the previously demonstrated trends, with a very few new trends revealed. Even with the few new trends, the general conclusion of the statistical analysis remains the same as from previous years' analyses, that there is no indication that construction activities at the ECI site had caused degradation of the ambient air at either the south monitoring site or at the high school. Other general conclusions from the statistical analysis are that there appears to be a source of PCBs to the air closer to the CDF than the high school (likely, the Canal sediments and water column), but sources of PAHs, VOCs, particulate matter, and metals to the air are more ubiquitous in the area and therefore, impact on the ambient air is less predictable for these parameters.

As construction activities were substantially complete as of the end of calendar year 2011 and dredging started in the IHC in November 2012, this report serves as a compilation of all data collected prior to the start of dredging in the IHC and disposal of dredged material into the CDF, and documents conditions prior to dredging/disposal start. Because sufficient data were not available for the dredging period, no analysis has been done of the dredging/dredged material disposal air impacts for this report. At this time, it is recommended that an adequate level of monitoring continue during the start of dredging activities at the ECI site, and that the data be re-evaluated on an annual basis to determine whether dredging and dredged material disposal activities are having an adverse impact on the ambient air conditions near the CDF.

# Appendix A  Data Summary

**Table A 1:** Comparison of Mean Concentrations between Locations (South site vs. High School site) of PAHs during IDLE conditions

| *Analyte & Location* | | **Spring/Fall** | | **Summer** | | **Winter** | | **Overall** | |
|---|---|---|---|---|---|---|---|---|---|
| | | $ng/m^3$ | S/D* | $ng/m^3$ | S/D* | $ng/m^3$ | S/D* | $ng/m^3$ | S/D* |
| **Acenaphthene** | South | 8.894 | yes | 15.565 | | 3.773 | yes | 8.836 | |
| | HS | 7.606 | | 17.748 | | 2.717 | | 8.644 | |
| **Acenaphthylene** | South | 2.602 | yes | 2.707 | | 2.978 | | 2.746 | yes |
| | HS | 2.170 | | 2.071 | | 2.656 | | 2.288 | |
| **Fluoranthene** | South | 3.073 | | 5.914 | | 2.020 | | 3.407 | |
| | HS | 3.040 | | 7.282 | | 2.098 | | 3.797 | |
| **Fluorene** | South | 8.759 | yes | 15.059 | | 4.816 | yes | 8.989 | yes |
| | HS | 7.135 | | 16.561 | | 3.679 | | 8.447 | |
| **Naphthalene** | South | 80.370 | | 93.869 | | 71.935 | | 80.866 | |
| | HS | 85.751 | | 105.295 | | 76.985 | | 87.580 | |
| **Phenanthrene** | South | 14.465 | | 27.880 | | 8.633 | | 15.769 | |
| | HS | 13.794 | | 31.440 | | 8.064 | | 16.451 | |
| **Pyrene** | South | 2.064 | | 3.279 | | 1.837 | | 2.278 | |
| | HS | 2.053 | | 3.543 | | 1.793 | | 2.342 | |

*S/D indicates a statistically significant difference between the two values at a 95% confidence interval

**Table A 2:** Comparison of Mean Concentrations between Locations (South site vs. High School site) of PAHs during ACTIVE conditions

| *Analyte & Location* | | **Spring/Fall** | | **Summer** | | **Winter** | | **Overall** | |
|---|---|---|---|---|---|---|---|---|---|
| | | $ng/m^3$ | S/D* | $ng/m^3$ | S/D* | $ng/m^3$ | S/D* | $ng/m^3$ | S/D* |
| **Acenaphthene** | South | 7.014 | | 12.117 | | 3.693 | | 9.023 | |
| | HS | 6.922 | | 16.322 | yes | 2.770 | | 10.748 | |
| **Acenaphthylene** | South | 2.858 | yes | 1.797 | | 3.684 | | 2.454 | yes |
| | HS | 2.322 | | 1.499 | | 3.437 | | 2.092 | |
| **Fluoranthene** | South | 3.093 | | 5.408 | | 2.243 | | 4.080 | |
| | HS | 3.222 | | 6.829 | yes | 2.313 | | 4.756 | |
| **Fluorene** | South | 8.350 | yes | 13.620 | | 5.054 | | 10.435 | |
| | HS | 7.094 | | 16.178 | | 4.171 | | 10.766 | |
| **Naphthalene** | South | 74.077 | | 60.907 | | 78.888 | | 68.325 | |
| | HS | 79.677 | | 75.939 | yes | 87.545 | | 77.501 | yes |
| **Phenanthrene** | South | 15.691 | | 29.277 | | 8.810 | | 21.265 | |
| | HS | 14.899 | | 35.250 | | 8.466 | | 23.220 | |
| **Pyrene** | South | 2.367 | | 3.239 | | 1.993 | | 2.732 | |
| | HS | 2.139 | | 3.403 | | 2.023 | | 2.713 | |

*S/D indicates a statistically significant difference between the two values at a 95% confidence interval

**Table A 3:** Comparison of Mean Concentrations between Locations (South site vs. High School site) of PCBs during IDLE Conditions

| *Analyte & Location* | | Spring/Fall | | Summer | | Winter | | Overall | |
|---|---|---|---|---|---|---|---|---|---|
| | | $pg/m^3$ | S/D* | $pg/m^3$ | S/D* | $pg/m^3$ | S/D* | $pg/m^3$ | S/D* |
| **Congener 8** | South | 32.823 | | 69.515 | | 16.134 | | 36.033 | |
| | HS | 30.565 | | 63.759 | | 14.188 | | 33.472 | |
| **Congener 15** | South | 6.136 | yes | 12.643 | yes | 2.517 | | 6.502 | yes |
| | HS | 4.386 | | 9.665 | | 2.096 | | 4.948 | |
| **Congener 18** | South | 32.505 | yes | 55.547 | yes | 11.257 | yes | 31.225 | yes |
| | HS | 18.123 | | 37.277 | | 7.185 | | 19.322 | |
| **Congener 28** | South | 22.864 | yes | 44.118 | yes | 8.369 | yes | 23.030 | yes |
| | HS | 13.259 | | 28.808 | | 5.210 | | 14.501 | |
| **Congener 31** | South | 24.250 | yes | 46.169 | yes | 8.533 | yes | 24.434 | yes |
| | HS | 13.525 | | 28.684 | | 5.256 | | 14.603 | |
| **Sum PCBs** | South | 118.792 | yes | 229.633 | yes | 47.161 | yes | 121.811 | yes |
| | HS | 79.400 | | 168.837 | | 32.306 | | 85.676 | |

*S/D indicates a statistically significant difference between the two values at a 95% confidence interval

**Table A 4:** Comparison of Mean Concentrations between Locations (South site vs. High School site) of PCBs during ACTIVE Conditions

| *Analyte & Location* | | Spring/Fall | | Summer | | Winter | | Overall | |
|---|---|---|---|---|---|---|---|---|---|
| | | $pg/m^3$ | S/D* | $pg/m^3$ | S/D* | $pg/m^3$ | S/D* | $pg/m^3$ | S/D* |
| **Congener 8** | South | 35.653 | | 68.811 | | 16.127 | | 48.930 | |
| | HS | 33.425 | | 62.685 | | 19.148 | | 45.756 | |
| **Congener 15** | South | 6.327 | yes | 14.224 | yes | 2.921 | | 9.635 | yes |
| | HS | 4.345 | | 9.190 | | 2.842 | | 6.472 | |
| **Congener 18** | South | 30.162 | yes | 66.066 | yes | 13.916 | | 45.114 | yes |
| | HS | 17.304 | | 35.715 | | 13.066 | | 25.534 | |
| **Congener 28** | South | 21.880 | yes | 61.270 | yes | 9.527 | | 39.090 | yes |
| | HS | 12.920 | | 29.271 | | 8.640 | | 20.177 | |
| **Congener 31** | South | 23.398 | yes | 58.629 | yes | 9.561 | | 38.295 | yes |
| | HS | 13.113 | | 28.367 | | 8.869 | | 19.859 | |
| **Sum PCBs** | South | 118.229 | yes | 276.426 | yes | 49.902 | | 184.492 | yes |
| | HS | 80.995 | | 169.062 | | 50.219 | | 119.831 | |

*S/D indicates a statistically significant difference between the two values at a 95% confidence interval

**Table A 5:** Comparison of Mean Concentrations between Locations (South site vs. High School site) of VOCs during IDLE Conditions

| *Analyte & Location* | | **Spring/Fall** | | **Summer** | | **Winter** | | **Overall** | |
|---|---|---|---|---|---|---|---|---|---|
| | | ug/m$^3$ | S/D* | ug/m$^3$ | S/D* | ug/m$^3$ | S/D* | ug/m$^3$ | S/D* |
| **Benzene** | South | 1.3111 | | 1.3062 | | 1.2575 | | 1.2931 | |
| | HS | 1.2787 | | 1.4818 | | 1.4216 | | 1.3707 | yes |
| **Toluene** | South | 1.8209 | | 2.7200 | | 1.8273 | | 2.0477 | |
| | HS | 1.8600 | | 2.9907 | | 2.1415 | | 2.2155 | |

*S/D indicates a statistically significant difference between the two values at a 95% confidence interval

**Table A 6:** Comparison of Mean Concentrations between Locations (South site vs. High School site) of VOCs during ACTIVE Conditions

| *Analyte & Location* | | **Spring/Fall** | | **Summer** | | **Winter** | | **Overall** | |
|---|---|---|---|---|---|---|---|---|---|
| | | ug/m$^3$ | S/D* | ug/m$^3$ | S/D* | ug/m$^3$ | S/D* | ug/m$^3$ | S/D* |
| **Benzene** | South | 1.0521 | | 1.3147 | | 1.0445 | | 1.1824 | |
| | HS | 1.1438 | | 1.4083 | | 1.4523 | | 1.3066 | |
| **Toluene** | South | 1.9568 | | 3.5518 | | 1.5546 | | 2.7382 | |
| | HS | 2.4771 | | 9.8452 | | 2.2057 | | 5.9891 | |

*S/D indicates a statistically significant difference between the two values at a 95% confidence interval

**Table A 7:** Comparison of Mean Concentrations between Locations (South site vs. High School site) of Metals during IDLE Conditions

| ***Analyte & Location*** | | **Spring/Fall** | | **Summer** | | **Winter** | | **Overall** | |
|---|---|---|---|---|---|---|---|---|---|
| | | ug/m$^3$ | S/D* | ug/m$^3$ | S/D* | ug/m$^3$ | S/D* | ug/m$^3$ | S/D* |
| **Aluminum** | South | 0.3324 | | 0.3676 | | 0.1833 | | 0.2949 | |
| | HS | 0.3462 | | 0.3750 | | 0.1743 | | 0.3047 | |
| **Arsenic** | South | 0.0018 | | 0.0018 | | 0.0013 | | 0.0015 | |
| | HS | 0.0016 | | 0.0017 | | 0.0013 | | 0.0015 | |
| **Barium** | South | 0.0172 | | 0.0231 | | 0.0147 | | 0.0176 | |
| | HS | 0.0179 | | 0.0245 | | 0.0149 | | 0.0187 | |
| **Chromium** | South | 0.0051 | | 0.0054 | | 0.0033 | | 0.0046 | |
| | HS | 0.0049 | | 0.0052 | | 0.0031 | | 0.0045 | |
| **Cobalt** | South | 0.00072 | | 0.00093 | | 0.00070 | | 0.00077 | |
| | HS | 0.00074 | | 0.00092 | | 0.00063 | | 0.00075 | |
| **Copper** | South | 0.0793 | | 0.1181 | | 0.1035 | | 0.0954 | |
| | HS | 0.0920 | | 0.1441 | | 0.0856 | | 0.1032 | |
| **Iron** | South | 0.9662 | | 1.1956 | | 0.6241 | | 0.8957 | |
| | HS | 0.9726 | | 1.0701 | | 0.6021 | | 0.8867 | |
| **Lead** | South | 0.0271 | | 0.0214 | | 0.0133 | | 0.0217 | |
| | HS | 0.0185 | | 0.0185 | | 0.0123 | | 0.0166 | |
| **Manganese** | South | 0.0928 | | 0.1033 | | 0.0546 | | 0.0839 | |
| | HS | 0.0893 | | 0.0987 | | 0.0505 | | 0.0801 | |
| **Nickel** | South | 0.0018 | | 0.0018 | | 0.0015 | | 0.0017 | |
| | HS | 0.0018 | | 0.0019 | | 0.0016 | | 0.0018 | |
| **Selenium** | South | 0.0020 | | 0.0018 | | 0.0016 | | 0.0019 | |
| | HS | 0.0022 | | 0.0017 | | 0.0016 | | 0.0019 | |
| **Zinc** | South | 0.1051 | | 0.1017 | | 0.0830 | | 0.0976 | |
| | HS | 0.1014 | | 0.0920 | | 0.0746 | | 0.0911 | |
| **TSP (g/m$^3$)** | South | 4.78E-05 | | 5.43E-05 | | 3.61E-05 | | 4.58E-05 | |
| | HS | 4.86E-05 | | 5.67E-05 | | 3.52E-05 | | 4.66E-05 | |

*S/D indicates a statistically significant difference between the two values at a 95% confidence interval

**Table A 8:** Comparison of Mean Concentrations between Locations (South site vs. High School) of Metals during ACTIVE Conditions

| ***Analyte & Location*** | | **Spring/Fall** | | **Summer** | | **Winter** | | **Overall** | |
|---|---|---|---|---|---|---|---|---|---|
| | | ug/m$^3$ | S/D* | ug/m$^3$ | S/D* | ug/m$^3$ | S/D* | ug/m$^3$ | S/D* |
| **Aluminum** | South | 0.3334 | | 0.4313 | | 0.1907 | | 0.3665 | |
| | HS | 0.3192 | | 0.3823 | | 0.1924 | | 0.3415 | |
| **Arsenic** | South | 0.0022 | | 0.0017 | | 0.0012 | | 0.0019 | |
| | HS | 0.0020 | | 0.0016 | | 0.0015 | | 0.0018 | |
| **Barium** | South | 0.0199 | | 0.0209 | | 0.0177 | | 0.0202 | |
| | HS | 0.0198 | | 0.0233 | | 0.0189 | | 0.0214 | |
| **Chromium** | South | 0.0054 | | 0.0059 | | 0.0037 | | 0.0055 | |
| | HS | 0.0049 | | 0.0054 | | 0.0037 | | 0.0051 | |
| **Cobalt** | South | 0.0012 | | 0.0007 | | 0.0006 | | 0.0009 | |
| | HS | 0.0011 | | 0.0007 | | 0.0006 | | 0.0008 | |
| **Copper** | South | 0.0888 | yes | 0.1122 | | 0.0763 | | 0.0988 | yes |
| | HS | 0.0706 | | 0.1152 | yes | 0.1013 | | 0.0962 | |
| **Iron** | South | 0.9423 | | 1.3386 | | 0.6361 | | 1.1062 | |
| | HS | 0.8545 | | 1.2190 | | 0.6218 | | 1.0227 | |
| **Lead** | South | 0.0261 | | 0.0256 | | 0.0143 | | 0.0247 | |
| | HS | 0.0205 | | 0.0227 | | 0.0147 | | 0.0227 | |
| **Manganese** | South | 0.0884 | | 0.1186 | | 0.0490 | | 0.0991 | |
| | HS | 0.0790 | | 0.1053 | | 0.0465 | | 0.0902 | |
| **Nickel** | South | 0.0026 | | 0.0020 | | 0.0015 | | 0.0021 | |
| | HS | 0.0022 | | 0.0020 | | 0.0016 | | 0.0021 | |
| **Selenium** | South | 0.0022 | | 0.0018 | | 0.0016 | | 0.0019 | |
| | HS | 0.0020 | | 0.0018 | | 0.0016 | | 0.0019 | |
| **Zinc** | South | 0.0926 | | 0.0998 | | 0.0665 | | 0.0941 | |
| | HS | 0.0800 | | 0.0965 | | 0.0626 | | 0.0862 | |
| **TSP (g/m$^3$)** | South | 4.93E-05 | | 6.17E-05 | | 3.51E-05 | | 5.39E-05 | |
| | HS | 4.67E-05 | | 5.63E-05 | | 3.48E-05 | | 5.06E-05 | |

*S/D indicates a statistically significant difference between the two values at a 95% confidence interval

**Table A 9:** Comparison of Mean Concentrations between Periods (Idle vs. Active) of PAHs at the South Site

| *Analyte & Location* | | **Spring/Fall** | | **Summer** | | **Winter** | | **Overall** | |
|---|---|---|---|---|---|---|---|---|---|
| | | ng/m$^3$ | S/D* | ng/m$^3$ | S/D* | ng/m$^3$ | S/D* | ng/m$^3$ | S/D* |
| **Acenaphthene** | Idle | 8.894 | | 15.565 | yes | 3.773 | | 8.636 | |
| | Active | 7.014 | | 12.117 | | 3.693 | | 9.023 | |
| **Acenaphthylene** | Idle | 2.602 | | 2.707 | yes | 2.978 | | 2.746 | |
| | Active | 2.858 | | 1.797 | | 3.684 | | 2.454 | |
| **Fluoranthene** | Idle | 3.073 | | 5.914 | | 2.020 | | 3.407 | |
| | Active | 3.093 | | 5.408 | | 2.243 | | 4.080 | yes |
| **Fluorene** | Idle | 8.759 | | 15.059 | | 4.816 | | 8.989 | |
| | Active | 8.350 | | 13.620 | | 5.054 | | 10.435 | yes |
| **Naphthalene** | Idle | 80.370 | | 93.869 | yes | 71.935 | | 80.866 | yes |
| | Active | 74.077 | | 60.907 | | 78.888 | | 68.325 | |
| **Phenanthrene** | Idle | 14.465 | | 27.880 | | 8.633 | | 15.769 | |
| | Active | 15.691 | | 29.277 | | 8.810 | | 21.265 | yes |
| **Pyrene** | Idle | 2.064 | | 3.279 | | 1.837 | | 2.278 | |
| | Active | 2.367 | | 3.239 | | 1.993 | | 2.732 | yes |

*S/D indicates a statistically significant difference between the two values at a 95% confidence interval

**Table A 10:** Comparison of Mean Concentrations between Periods (Idle vs. Active) of PAHs at the High School Site

| *Analyte & Location* | | **Spring/Fall** | | **Summer** | | **Winter** | | **Overall** | |
|---|---|---|---|---|---|---|---|---|---|
| | | ng/m$^3$ | S/D* | ng/m$^3$ | S/D* | ng/m$^3$ | S/D* | ng/m$^3$ | S/D* |
| **Acenaphthene** | Idle | 7.606 | | 17.748 | | 2.717 | | 8.644 | |
| | Active | 6.922 | | 16.322 | | 2.770 | | 10.748 | yes |
| **Acenaphthylene** | Idle | 2.170 | | 2.071 | yes | 2.656 | | 2.288 | |
| | Active | 2.322 | | 1.499 | | 3.437 | yes | 2.092 | |
| **Fluoranthene** | Idle | 3.040 | | 7.282 | | 2.098 | | 3.797 | |
| | Active | 3.222 | | 6.829 | | 2.313 | | 4.756 | yes |
| **Fluorene** | Idle | 7.135 | | 16.561 | | 3.679 | | 8.447 | |
| | Active | 7.094 | | 16.178 | | 4.171 | | 10.766 | yes |
| **Naphthalene** | Idle | 85.751 | | 105.295 | yes | 76.985 | | 87.580 | |
| | Active | 79.677 | | 75.939 | | 87.545 | yes | 77.501 | |
| **Phenanthrene** | Idle | 13.794 | | 31.440 | | 8.064 | | 16.451 | |
| | Active | 14.899 | | 35.250 | | 8.466 | | 23.220 | yes |
| **Pyrene** | Idle | 2.053 | | 3.543 | | 1.795 | | 2.342 | |
| | Active | 2.139 | | 3.403 | | 2.023 | | 2.713 | yes |

*S/D indicates a statistically significant difference between the two values at a 95% confidence interval

**Table A 11:** Comparison of Mean Concentrations between Periods (Idle vs. Active) of PCBs at the South Site

| *Analyte & Location* | | Spring/Fall | | Summer | | Winter | | Overall | |
|---|---|---|---|---|---|---|---|---|---|
| | | pg/m$^3$ | S/D* | pg/m$^3$ | S/D* | pg/m$^3$ | S/D* | pg/m$^3$ | S/D* |
| **Congener 8** | Idle | 32.823 | | 69.515 | | 16.134 | | 36.033 | |
| | Active | 35.653 | | 68.811 | | 16.127 | | 48.930 | yes |
| **Congener 15** | Idle | 6.136 | | 12.643 | | 2.517 | | 6.502 | |
| | Active | 6.327 | | 14.224 | | 2.921 | | 9.635 | yes |
| **Congener 18** | Idle | 32.505 | | 55.547 | | 11.257 | | 31.225 | |
| | Active | 30.162 | | 66.066 | | 13.916 | | 45.114 | yes |
| **Congener 28** | Idle | 22.864 | | 44.118 | | 8.369 | | 23.030 | |
| | Active | 21.880 | | 61.270 | | 9.527 | | 39.090 | yes |
| **Congener 31** | Idle | 23.250 | | 46.169 | | 8.533 | | 24.434 | |
| | Active | 23.398 | | 58.629 | | 9.561 | | 38.295 | yes |
| **Sum PCBs** | Idle | 118.792 | | 229.633 | | 47.161 | | 121.811 | |
| | Active | 118.229 | | 276.426 | | 49.902 | | 184.492 | yes |

*S/D indicates a statistically significant difference between the two values at a 95% confidence interval

**Table A 12:** Comparison of Mean Concentrations between Periods (Idle vs. Active) of PCBs at the High School Site

| *Analyte & Location* | | Spring/Fall | | Summer | | Winter | | Overall | |
|---|---|---|---|---|---|---|---|---|---|
| | | pg/m$^3$ | S/D* | pg/m$^3$ | S/D* | pg/m$^3$ | S/D* | pg/m$^3$ | S/D* |
| **Congener 8** | Idle | 30.565 | | 63.759 | | 14.188 | | 33.472 | |
| | Active | 33.425 | | 62.685 | | 19.148 | | 45.756 | yes |
| **Congener 15** | Idle | 4.386 | | 9.665 | | 2.096 | | 4.948 | |
| | Active | 4.345 | | 9.190 | | 2.842 | | 6.472 | yes |
| **Congener 18** | Idle | 18.123 | | 37.277 | | 7.185 | | 19.322 | |
| | Active | 17.304 | | 35.715 | | 13.066 | | 25.534 | yes |
| **Congener 28** | Idle | 13.259 | | 28.808 | | 5.210 | | 14.501 | |
| | Active | 12.920 | | 29.271 | | 8.640 | | 20.177 | yes |
| **Congener 31** | Idle | 13.525 | | 28.684 | | 5.256 | | 14.603 | |
| | Active | 13.113 | | 28.367 | | 8.869 | | 19.859 | yes |
| **Sum PCBs** | Idle | 79.400 | | 168.837 | | 32.306 | | 85.676 | |
| | Active | 80.995 | | 169.062 | | 50.219 | | 119.831 | yes |

*S/D indicates a statistically significant difference between the two values at a 95% confidence interval

**Table A 13:** Comparison of Mean Concentrations between Periods (Idle vs. Active) of VOCs at the South Site

| *Analyte & Location* | | **Spring/Fall** | | **Summer** | | **Winter** | | **Overall** | |
|---|---|---|---|---|---|---|---|---|---|
| | | ug/m$^3$ | S/D* | ug/m$^3$ | S/D* | ug/m$^3$ | S/D* | ug/m$^3$ | S/D* |
| **Benzene** | Idle | 1.3111 | | 1.3062 | | 1.2575 | | 1.2931 | |
| | Active | 1.0521 | | 1.3147 | | 1.0445 | | 1.1824 | |
| **Toluene** | Idle | 1.8209 | | 2.7200 | | 1.8275 | | 2.0477 | |
| | Active | 1.9568 | | 3.5518 | | 1.5546 | | 2.7382 | yes |

*S/D indicates a statistically significant difference between the two values at a 95% confidence interval

**Table A 14:** Comparison of Mean Concentrations between Periods (Idle vs. Active) of VOCs at the High School Site

| *Analyte & Location* | | **Spring/Fall** | | **Summer** | | **Winter** | | **Overall** | |
|---|---|---|---|---|---|---|---|---|---|
| | | ug/m$^3$ | S/D* | ug/m$^3$ | S/D* | ug/m$^3$ | S/D* | ug/m$^3$ | S/D* |
| **Benzene** | Idle | 1.2787 | yes | 1.4818 | yes | 1.4216 | | 1.3707 | yes |
| | Active | 1.1438 | | 1.4083 | | 1.4523 | | 1.3066 | |
| **Toluene** | Idle | 1.8600 | | 2.9907 | | 2.1415 | | 2.2155 | |
| | Active | 2.4771 | | 9.8452 | | 2.2057 | | 5.9891 | yes |

*S/D indicates a statistically significant difference between the two values at a 95% confidence interval

**Table A 15:** Comparison of Mean Concentrations between Periods (Idle vs. Active) of Metals at the South Site

| ***Analyte & Location*** | | **Spring/Fall** | | **Summer** | | **Winter** | | **Overall** | |
|---|---|---|---|---|---|---|---|---|---|
| | | ug/m$^3$ | S/D* | ug/m$^3$ | S/D* | ug/m$^3$ | S/D* | ug/m$^3$ | S/D* |
| **Aluminum** | Idle | 0.3324 | | 0.3620 | | 0.1833 | | 0.2949 | |
| | Active | 0.3334 | | 0.4313 | | 0.1907 | | 0.3665 | yes |
| **Arsenic** | Idle | 0.0018 | | 0.0018 | | 0.0013 | | 0.0015 | |
| | Active | 0.0022 | | 0.0017 | | 0.0012 | | 0.0019 | yes |
| **Barium** | Idle | 0.0172 | | 0.0231 | | 0.0147 | | 0.0176 | |
| | Active | 0.0199 | | 0.0209 | | 0.0177 | | 0.0202 | yes |
| **Chromium** | Idle | 0.0051 | | 0.0054 | | 0.0033 | | 0.0046 | |
| | Active | 0.0054 | | 0.0059 | | 0.0037 | | 0.0055 | yes |
| **Cobalt** | Idle | 0.0007 | | 0.0009 | yes | 0.0007 | | 0.0008 | |
| | Active | 0.0012 | | 0.0007 | | 0.0006 | | 0.0009 | |
| **Copper** | Idle | 0.0793 | | 0.1181 | | 0.1035 | | 0.0954 | |
| | Active | 0.0888 | | 0.1122 | | 0.0763 | | 0.0988 | |
| **Iron** | Idle | 0.9662 | | 1.0956 | | 0.6241 | | 0.8957 | |
| | Active | 0.9423 | | 1.3386 | | 0.6361 | | 1.1062 | yes |
| **Lead** | Idle | 0.0271 | | 0.0214 | | 0.0133 | | 0.0217 | |
| | Active | 0.0261 | | 0.0256 | | 0.0143 | | 0.0247 | yes |
| **Manganese** | Idle | 0.0928 | | 0.1033 | | 0.0546 | | 0.0839 | |
| | Active | 0.0884 | | 0.1186 | | 0.0490 | | 0.0991 | yes |
| **Nickel** | Idle | 0.0018 | | 0.0018 | | 0.0015 | | 0.0017 | |
| | Active | 0.0026 | | 0.0020 | | 0.0015 | | 0.0021 | |
| **Selenium** | Idle | 0.0020 | | 0.0018 | | 0.0016 | | 0.0019 | |
| | Active | 0.0022 | yes | 0.0018 | | 0.0016 | | 0.0019 | |
| **Zinc** | Idle | 0.1051 | | 0.1017 | | 0.0830 | | 0.0976 | |
| | Active | 0.0926 | | 0.0998 | | 0.0665 | | 0.0941 | |
| **TSP (g/m$^3$)** | Idle | 4.78E-05 | | 5.43E-05 | | 3.61E-05 | | 4.58E-05 | |
| | Active | 4.93E-05 | | 6.17E-05 | | 3.51E-05 | | 5.39E-05 | yes |

*S/D indicates a statistically significant difference between the two values at a 95% confidence interval

**Table A 16:** Comparison of Mean Concentrations between Periods (Idle vs. Active) of Metals at the High School Site

| *Analyte & Location* | | Spring/Fall | | Summer | | Winter | | Overall | |
|---|---|---|---|---|---|---|---|---|---|
| | | ug/m$^3$ | S/D* | ug/m$^3$ | S/D* | ug/m$^3$ | S/D* | ug/m$^3$ | S/D* |
| **Aluminum** | Idle | 0.3462 | | 0.3850 | | 0.1743 | | 0.3047 | |
| | Active | 0.3192 | | 0.3823 | | 0.1924 | | 0.3415 | yes |
| **Arsenic** | Idle | 0.0016 | | 0.0017 | | 0.0013 | | 0.0015 | |
| | Active | 0.0020 | | 0.0016 | | 0.0015 | | 0.0018 | |
| **Barium** | Idle | 0.0179 | | 0.0245 | | 0.0149 | | 0.0187 | |
| | Active | 0.0198 | | 0.0233 | | 0.0189 | | 0.0214 | |
| **Chromium** | Idle | 0.0049 | | 0.0052 | | 0.0031 | | 0.0045 | |
| | Active | 0.0049 | | 0.0054 | | 0.0037 | | 0.0051 | yes |
| **Cobalt** | Idle | 0.00072 | | 0.00092 | yes | 0.0063 | | 0.00075 | |
| | Active | 0.00108 | yes | 0.00067 | | 0.0064 | | 0.00084 | |
| **Copper** | Idle | 0.0920 | yes | 0.1441 | yes | 0.0856 | | 0.1032 | yes |
| | Active | 0.0706 | | 0.1152 | | 0.1013 | | 0.0962 | |
| **Iron** | Idle | 0.9726 | | 1.070 | | 0.6021 | | 0.8867 | |
| | Active | 0.8545 | | 1.219 | | 0.6218 | | 1.0227 | yes |
| **Lead** | Idle | 0.0185 | | 0.0185 | | 0.0123 | | 0.0166 | |
| | Active | 0.0205 | | 0.0227 | | 0.0147 | | 0.0227 | yes |
| **Manganese** | Idle | 0.0893 | | 0.0987 | | 0.0505 | | 0.0801 | |
| | Active | 0.0790 | | 0.1053 | | 0.0465 | | 0.0902 | yes |
| **Nickel** | Idle | 0.0018 | | 0.0019 | | 0.0016 | | 0.0018 | |
| | Active | 0.0022 | | 0.0020 | | 0.0016 | | 0.0021 | |
| **Selenium** | Idle | 0.0022 | | 0.0017 | | 0.0016 | | 0.0019 | |
| | Active | 0.0020 | | 0.0018 | | 0.0016 | | 0.0019 | |
| **Zinc** | Idle | 0.1014 | | 0.0920 | | 0.0746 | | 0.0911 | |
| | Active | 0.0800 | | 0.0965 | | 0.0626 | | 0.0862 | |
| **TSP (g/m$^3$)** | Idle | 4.86E-05 | | 5.67E-05 | | 3.52E-05 | | 4.66E-05 | |
| | Active | 4.67E-05 | | 5.63E-05 | | 3.48E-05 | | 5.06E-05 | yes |

*S/D indicates a statistically significant difference between the two values at a 95% confidence interval

**Table A 17:** Comparison of Mean Seasonal Concentrations of PAHs during IDLE Conditions

| *Analyte & Location* | | Concentration (ng/m$^3$) | | | Statistical Significance* |
|---|---|---|---|---|---|
| | | Spring/Fall | Summer | Winter | |
| **Acenaphthene** | South | 8.894 | 15.565 | 3.773 | Summer > Spring/Fall > Winter |
| | HS | 7.606 | 17.748 | 2.717 | Summer > Spring/Fall > Winter |
| **Acenaphthylene** | South | 2.602 | 2.707 | 2.978 | |
| | HS | 2.170 | 2.071 | 2.656 | |
| **Fluoranthene** | South | 3.073 | 5.914 | 2.020 | Summer > Spring/Fall > Winter |
| | HS | 3.040 | 7.282 | 2.098 | Summer > Spring/Fall > Winter |
| **Fluorene** | South | 8.759 | 15.059 | 4.816 | Summer > Spring/Fall > Winter |
| | HS | 7.135 | 16.561 | 3.679 | Summer > Spring/Fall > Winter |
| **Naphthalene** | South | 80.370 | 93.869 | 71.935 | Summer > Spring/Fall |
| | HS | 85.751 | 105.295 | 76.985 | Summer > Spring/Fall |
| **Phenanthrene** | South | 14.465 | 27.880 | 8.633 | Summer > Spring/Fall > Winter |
| | HS | 13.794 | 31.440 | 8.064 | Summer > Spring/Fall > Winter |
| **Pyrene** | South | 2.064 | 3.279 | 1.837 | Summer > Spring/Fall > Winter |
| | HS | 2.053 | 3.543 | 1.793 | Summer > Spring/Fall > Winter |

*S/D indicates a statistically significant difference between the two values at a 95% confidence interval

**Table A 18:** Comparison of Mean Seasonal Concentrations of PAHs during ACTIVE Conditions

| *Analyte & Location* | | Concentration (ng/m$^3$) | | | Statistical Significance* |
|---|---|---|---|---|---|
| | | Spring/Fall | Summer | Winter | |
| **Acenaphthene** | South | 7.014 | 12.117 | 3.693 | Summer > Spring/Fall > Winter |
| | HS | 6.922 | 16.322 | 2.770 | Summer > Spring/Fall > Winter |
| **Acenaphthylene** | South | 2.858 | 1.797 | 3.684 | Spring/Fall > Summer, Winter > Summer |
| | HS | 2.322 | 1.499 | 3.437 | Winter > Spring/Fall > Summer |
| **Fluoranthene** | South | 3.093 | 5.408 | 2.243 | Summer > Spring/Fall, Summer > Winter |
| | HS | 3.222 | 6.829 | 2.313 | Summer > Spring/Fall, Summer > Winter |
| **Fluorene** | South | 8.350 | 13.620 | 5.054 | Summer > Spring/Fall > Winter |
| | HS | 7.094 | 16.178 | 4.171 | Summer > Spring/Fall > Winter |
| **Naphthalene** | South | 74.077 | 60.907 | 78.888 | Winter > Summer |
| | HS | 79.677 | 75.939 | 87.545 | |
| **Phenanthrene** | South | 15.691 | 29.277 | 8.810 | Summer > Spring/Fall > Winter |
| | HS | 14.899 | 35.250 | 8.466 | Summer > Spring/Fall > Winter |
| **Pyrene** | South | 2.367 | 3.239 | 1.993 | Summer > Spring/Fall, Summer > Winter |
| | HS | 2.139 | 3.403 | 2.023 | Summer > Spring/Fall, Summer > Winter |

*S/D indicates a statistically significant difference between the two values at a 95% confidence interval

**Table A 19:** Comparison of Mean Seasonal Concentrations of PCBs during IDLE Conditions

| *Analyte & Location* | | Concentration ($pg/m^3$) | | | Statistical Significance* |
|---|---|---|---|---|---|
| | | Spring/Fall | Summer | Winter | |
| **Congener 8** | South | 32.823 | 69.515 | 16.134 | Summer > Spring/Fall > Winter |
| | HS | 30.565 | 63.759 | 14.188 | Summer > Spring/Fall > Winter |
| **Congener 15** | South | 6.136 | 12.643 | 2.517 | Summer > Spring/Fall > Winter |
| | HS | 4.386 | 9.665 | 2.096 | Summer > Spring/Fall > Winter |
| **Congener 18** | South | 32.505 | 55.547 | 11.257 | Summer > Spring/Fall > Winter |
| | HS | 18.123 | 37.277 | 7.185 | Summer > Spring/Fall > Winter |
| **Congener 28** | South | 22.864 | 44.118 | 8.369 | Summer > Spring/Fall > Winter |
| | HS | 13.259 | 28.808 | 5.210 | Summer > Spring/Fall > Winter |
| **Congener 31** | South | 24.250 | 46.169 | 8.533 | Summer > Spring/Fall > Winter |
| | HS | 13.525 | 28.684 | 5.256 | Summer > Spring/Fall > Winter |
| **Sum PCBs** | South | 118.792 | 229.633 | 47.161 | Summer > Spring/Fall > Winter |
| | HS | 79.400 | 168.837 | 32.306 | Summer > Spring/Fall > Winter |

*S/D indicates a statistically significant difference between the two values at a 95% confidence interval

**Table A 20:** Comparison of Mean Seasonal Concentrations of PCBs during ACTIVE Conditions

| *Analyte & Location* | | Concentration ($pg/m^3$) | | | Statistical Significance* |
|---|---|---|---|---|---|
| | | Spring/Fall | Summer | Winter | |
| **Congener 8** | South | 35.653 | 68.811 | 16.127 | Summer > Spring/Fall > Winter |
| | HS | 33.425 | 62.685 | 19.148 | Summer > Spring/Fall > Winter |
| **Congener 15** | South | 6.327 | 14.224 | 2.921 | Summer > Spring/Fall > Winter |
| | HS | 4.345 | 9.190 | 2.842 | Summer > Spring/Fall > Winter |
| **Congener 18** | South | 30.162 | 66.066 | 13.916 | Summer > Spring/Fall > Winter |
| | HS | 17.304 | 35.715 | 13.066 | Summer > Spring/Fall > Winter |
| **Congener 28** | South | 21.880 | 61.270 | 9.527 | Summer > Spring/Fall > Winter |
| | HS | 12.920 | 29.271 | 8.640 | Summer > Spring/Fall > Winter |
| **Congener 31** | South | 23.398 | 58.629 | 9.561 | Summer > Spring/Fall > Winter |
| | HS | 13.113 | 28.367 | 8.869 | Summer > Spring/Fall > Winter |
| **Sum PCBs** | South | 118.229 | 276.426 | 49.902 | Summer > Spring/Fall > Winter |
| | HS | 80.995 | 169.062 | 50.219 | Summer > Spring/Fall > Winter |

*S/D indicates a statistically significant difference between the two values at a 95% confidence interval

**Table A 21:** Comparison of Mean Seasonal Concentrations of VOCs during IDLE Conditions

| *Analyte & Location* | | Concentration ($ug/m^3$) | | | Statistical Significance* |
|---|---|---|---|---|---|
| | | Spring/Fall | Summer | Winter | |
| **Benzene** | South | 1.3111 | 1.3062 | 1.2575 | |
| | HS | 1.2787 | 1.4818 | 1.4216 | |
| **Toluene** | South | 1.8209 | 2.7200 | 1.8273 | Summer > Spring/Fall, Summer > Winter |
| | HS | 1.8600 | 2.9907 | 2.1415 | Summer > Spring/Fall, Summer > Winter |

*S/D indicates a statistically significant difference between the two values at a 95% confidence interval

**Table A 22:** Comparison of Mean Seasonal Concentrations between Locations (South site vs. High School) of VOCs during ACTIVE Conditions

| *Analyte & Location* | | Concentration ($ug/m^3$) | | | Statistical Significance* |
|---|---|---|---|---|---|
| | | Spring/Fall | Summer | Winter | |
| **Benzene** | South | 1.0521 | 1.3147 | 1.0445 | |
| | HS | 1.1438 | 1.4083 | 1.4523 | |
| **Toluene** | South | 1.9568 | 3.5518 | 1.5546 | Summer > Spring/Fall, Summer > Winter |
| | HS | 2.4771 | 9.8452 | 2.2057 | Summer > Spring/Fall |

*S/D indicates a statistically significant difference between the two values at a 95% confidence interval

**Table A 23:** Comparison of Mean Seasonal Concentrations of Metals during IDLE Conditions

| *Analyte & Location* | | Concentration ($ug/m^3$) | | | Statistical Significance* |
|---|---|---|---|---|---|
| | | Spring/Fall | Summer | Winter | |
| **Aluminum** | South | 0.3324 | 0.3676 | 0.1833 | Spring/Fall > Winter, Summer > Winter |
| | HS | 0.3462 | 0.3750 | 0.1743 | Summer > Spring/Fall > Winter |
| **Arsenic** | South | 0.0018 | 0.0018 | 0.0013 | Summer > Spring/Fall > Winter |
| | HS | 0.0016 | 0.0017 | 0.0013 | Summer > Spring/Fall > Winter |
| **Barium** | South | 0.0172 | 0.0231 | 0.0147 | Summer > Spring/Fall > Winter |
| | HS | 0.0179 | 0.0245 | 0.0149 | Summer > Spring/Fall > Winter |
| **Chromium** | South | 0.0051 | 0.0054 | 0.0033 | Spring/Fall > Winter, Summer > Winter |
| | HS | 0.0049 | 0.0052 | 0.0031 | Spring/Fall > Winter, Summer > Winter |
| **Cobalt** | South | 0.00072 | 0.00093 | 0.00070 | Summer > Spring/Fall, Summer > Winter |
| | HS | 0.00074 | 0.00092 | 0.00063 | Spring/Fall > Winter, Summer > Winter |
| **Copper** | South | 0.0793 | 0.1181 | 0.1035 | Summer > Spring/Fall, Summer > Winter |
| | HS | 0.0920 | 0.1441 | 0.0856 | Summer > Spring/Fall, Summer > Winter |
| **Iron** | South | 0.9662 | 1.1956 | 0.6241 | Spring/Fall > Winter, Summer > Winter |
| | HS | 0.9726 | 1.0701 | 0.6021 | Spring/Fall > Winter, Summer > Winter |
| **Lead** | South | 0.0271 | 0.0214 | 0.0133 | Spring/Fall > Winter, Summer > Winter |
| | HS | 0.0185 | 0.0185 | 0.0123 | Summer > Spring/Fall > Winter |
| **Manganese** | South | 0.0928 | 0.1033 | 0.0546 | Spring/Fall > Winter, Summer > Winter |
| | HS | 0.0893 | 0.0987 | 0.0505 | Spring/Fall > Winter, Summer > Winter |
| **Nickel** | South | 0.0018 | 0.0018 | 0.0015 | Spring/Fall > Winter, Summer > Winter |
| | HS | 0.0018 | 0.0019 | 0.0016 | Spring/Fall > Winter, Summer > Winter |
| **Selenium** | South | 0.0020 | 0.0018 | 0.0016 | Spring/Fall > Summer |
| | HS | 0.0022 | 0.0017 | 0.0016 | Spring/Fall > Summer |
| **Zinc** | South | 0.1051 | 0.1017 | 0.0830 | Summer > Winter |
| | HS | 0.1014 | 0.0920 | 0.0746 | Spring/Fall > Winter, Summer > Winter |
| **TSP ($g/m^3$)** | South | 4.78E-05 | 5.43E-05 | 3.61E-05 | Summer > Spring/Fall > Winter |
| | HS | 4.86E-05 | 5.67E-05 | 3.52E-05 | Summer > Spring/Fall > Winter |

*S/D indicates a statistically significant difference between the two values at a 95% confidence interval

**Table A 24:** Comparison of Mean Seasonal Concentrations of Metals during ACTIVE Conditions

| *Analyte & Location* | | Concentration (ug/m$^3$) | | | Statistical Significance* |
|---|---|---|---|---|---|
| | | Spring/Fall | Summer | Winter | |
| **Aluminum** | South | 0.3334 | 0.4313 | 0.1907 | Summer > Spring/Fall > Winter |
| | HS | 0.3192 | 0.3823 | 0.1924 | Summer > Spring/Fall > Winter |
| **Arsenic** | South | 0.0022 | 0.0017 | 0.0012 | Spring/Fall > Winter, Summer > Winter |
| | HS | 0.0020 | 0.0016 | 0.0015 | Summer > Winter |
| **Barium** | South | 0.0199 | 0.0209 | 0.0177 | |
| | HS | 0.0198 | 0.0233 | 0.0189 | |
| **Chromium** | South | 0.0054 | 0.0059 | 0.0037 | Summer > Winter |
| | HS | 0.0049 | 0.0054 | 0.0037 | Summer > Winter |
| **Cobalt** | South | 0.0012 | 0.0007 | 0.0006 | |
| | HS | 0.0011 | 0.0007 | 0.0006 | |
| **Copper** | South | 0.0888 | 0.1122 | 0.0763 | Summer > Spring/Fall, Summer> Winter |
| | HS | 0.0706 | 0.1152 | 0.1013 | |
| **Iron** | South | 0.9423 | 1.3386 | 0.6361 | Summer > Spring/Fall > Winter |
| | HS | 0.8545 | 1.2190 | 0.6218 | Summer > Spring/Fall > Winter |
| **Lead** | South | 0.0261 | 0.0256 | 0.0143 | Spring/Fall > Summer, Summer > Winter |
| | HS | 0.0205 | 0.0227 | 0.0147 | Summer > Spring/Fall, Summer > Winter |
| **Manganese** | South | 0.0884 | 0.1186 | 0.0490 | Summer > Spring/Fall > Winter |
| | HS | 0.0790 | 0.1053 | 0.0465 | Summer > Spring/Fall > Winter |
| **Nickel** | South | 0.0026 | 0.0020 | 0.0015 | Summer > Winter |
| | HS | 0.0022 | 0.0020 | 0.0016 | |
| **Selenium** | South | 0.0022 | 0.0018 | 0.0016 | |
| | HS | 0.0020 | 0.0018 | 0.0016 | Spring/Fall > Summer |
| **Zinc** | South | 0.0926 | 0.0998 | 0.0665 | Summer > Winter |
| | HS | 0.0800 | 0.0965 | 0.0626 | Summer > Spring/Fall, Summer> Winter |
| **TSP (g/m$^3$)** | South | 4.93E-05 | 6.17E-05 | 3.51E-05 | Summer > Spring/Fall > Winter |
| | HS | 4.67E-05 | 5.63E-05 | 3.48E-05 | Summer > Spring/Fall, Summer > Winter |

*S/D indicates a statistically significant difference between the two values at a 95% confidence interval