

FINAL

INHALATION HUMAN HEALTH RISK ASSESSMENT

BERKS COUNTY, PENNSYLVANIA

Prepared for:

Pennsylvania Institute for Children's Environmental Health

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EXECUTIVE SUMMARY

The objective of this inhalation human health risk assessment (HHRA) report is to estimate the chronic risks (excess lifetime cancer risk and noncancer health effects) associated with the inhalation exposure to the contaminants measured in the ambient air at two monitoring sites in Berks County, Pennsylvania. One monitoring site is located at Kutztown University; the other site is at the Reading Airport. The health risks associated with inhaling the measured concentrations of the contaminants were assessed using risk assessment methods approved by the Pennsylvania Department of Environmental Protection (PADEP) and the U.S. Environmental Protection Agency (EPA).

In addition to the estimation of the chronic risks, other analyses were also performed in this assessment. The contaminant concentrations measured at Kutztown University and the Reading Airport were compared to acute health benchmarks to identify any potential for acute health effects at maximum measured concentrations. Also, the calculated Berks County risks were compared to the calculated risks at other monitoring sites in Pennsylvania as well as with risks based on modeled ambient concentrations in the EPA's National Air Toxics Assessments (NATA) that were performed in 1996 and 1999.

Key Results

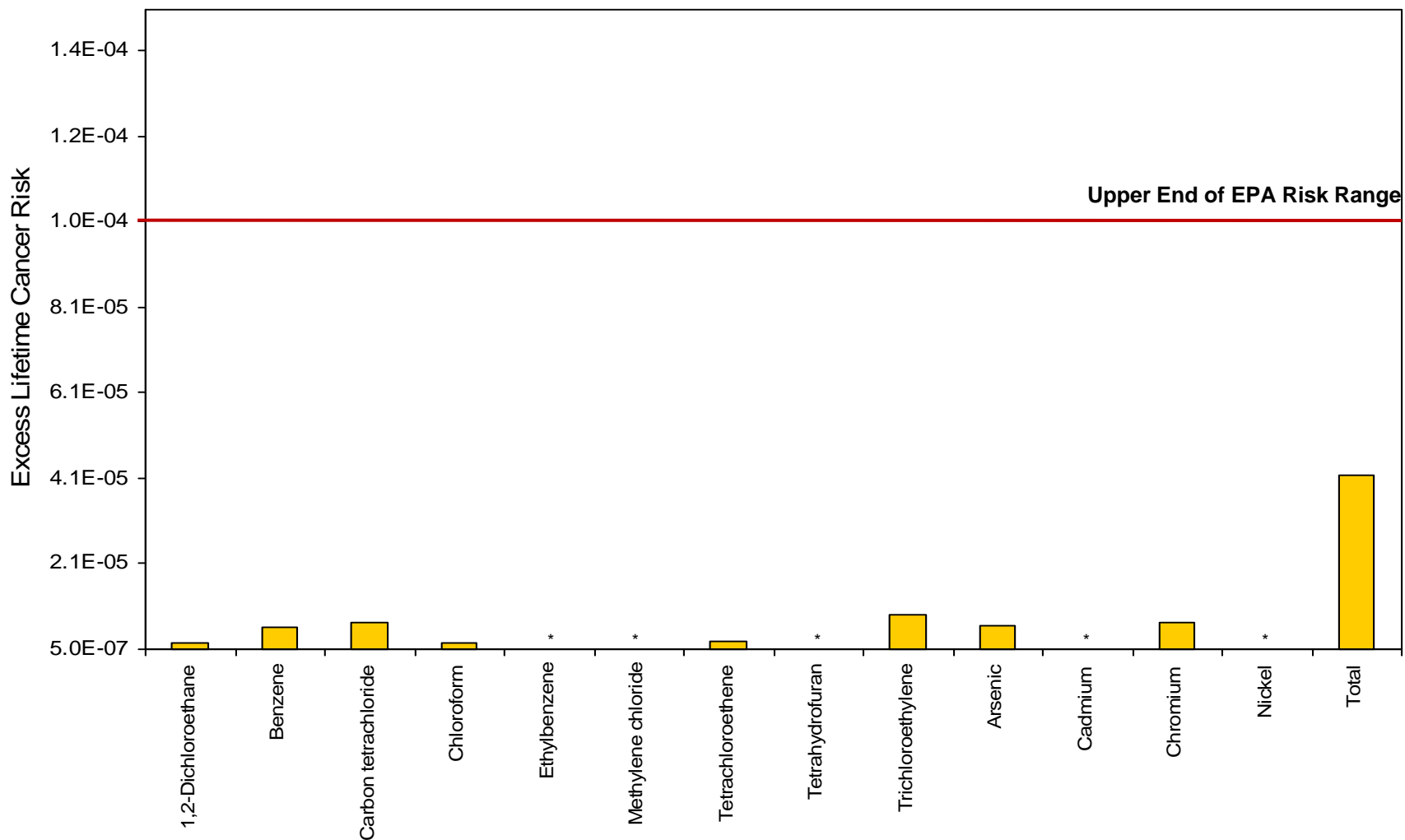
- A number of evaluations were performed in the HHRA. These include an evaluation of chronic health impacts (cancer and noncancer), acute risks, and comparisons with risks from other Pennsylvania monitoring sites and EPA modeled concentrations, specific to Berks County.
- Cancer risks for the Kutztown and Reading sites were within the EPA risk range as described in Section 3. The estimated total excess lifetime cancer risk ranges between 4.1 and 5.0 per 100,000, meaning 4.1 to 5.0 people per 100,000 people are likely to develop cancer from breathing the air over a 70-year period. Noncancer hazard indices were below one indicating that there is very little likelihood of any noncancer impacts in the impacted populations. See Figures ES-1 through ES-4.
- The 3-month rolling average concentrations of lead at both sites are less than the NAAQS value of $0.15 \mu\text{g}/\text{m}^3$.

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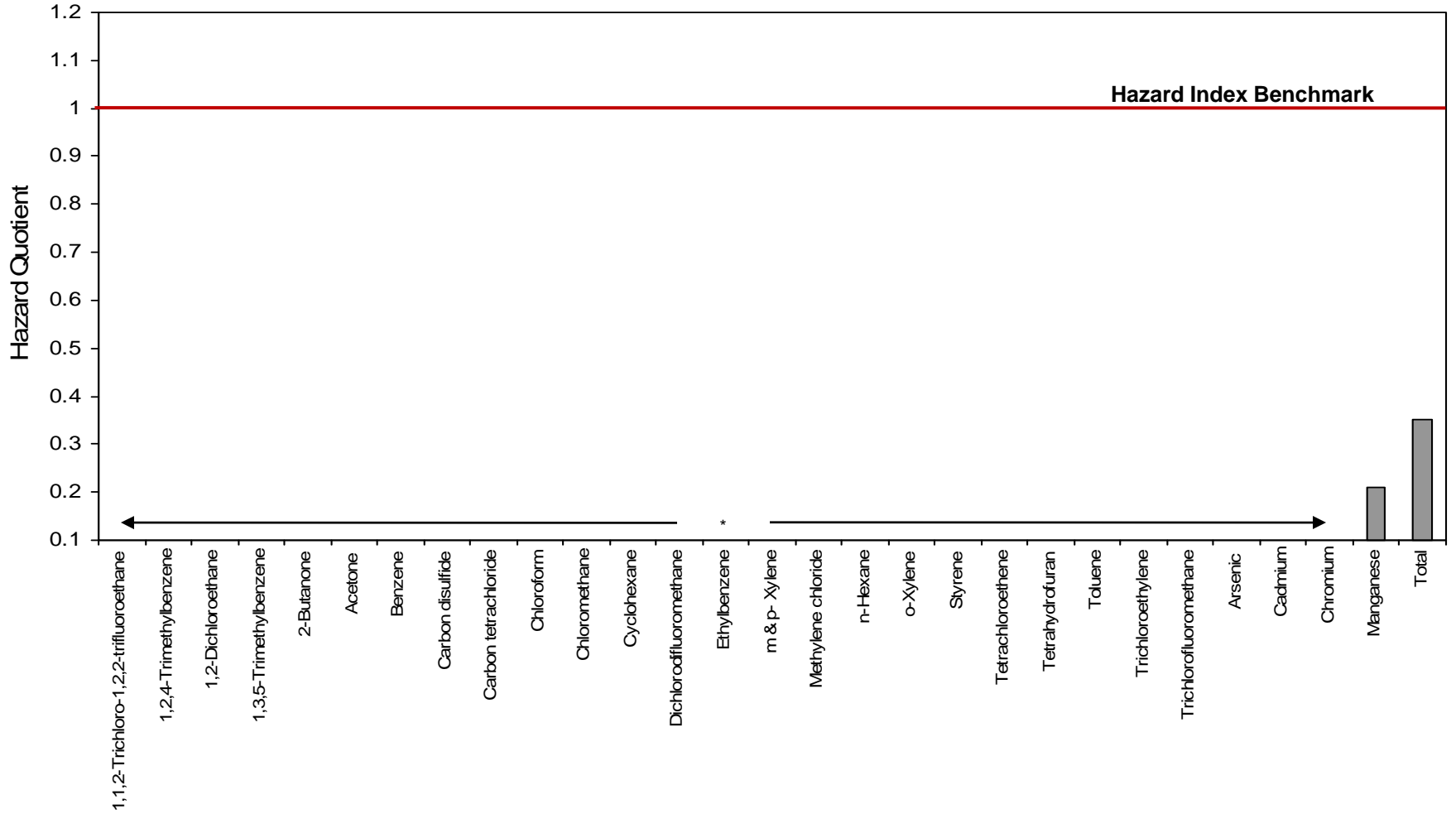
- A comparison of maximum 24-hour concentrations to acute health effects criteria indicates that no acute health impacts are anticipated.
- Comparisons to PADEP monitoring sites indicate that the Kutztown and Reading risks are similar to other Pennsylvania sites, with certain exceptions including (see Figures ES-5 and ES-6):
 - The risks from trichloroethylene (TCE), a chlorinated organic compound often used as an industrial solvent, at Kutztown and Reading, while less than half of the Collegeville TCE cancer risk, are, in general, greater than the risks associated with the other contaminants at the other PADEP sampling sites.
 - The cancer risks from arsenic and hexavalent chromium (Cr VI), a form of chromium metal that is particularly toxic because of its chemical state, at Kutztown and Reading are slightly greater than the other sites. The Cr VI risks are based on the assumption that 17% of the total chromium measured at the monitoring sites is in the Cr VI form. To better characterize cancer risks associated with air toxics in Berks County's ambient air, it would be valuable to install and operate a chromium sampler that can directly measure Cr VI concentrations.
- TCE is an industrial solvent and TCE air emissions are often associated with metal degreasing operations. Chromium emissions are typically associated with chrome plating and with steel manufacturing operations. Arsenic was commonly used as an agricultural pesticide and is present in certain agricultural soils. Arsenic is also present in certain specialty metal alloys.
- Comparisons to risks based on EPA NATA modeled concentrations in Berks County in 1996 and 1999 indicate that the Kutztown and Reading risks, based on actual measure concentrations for most of the contaminants, are either similar to or less than the predicted NATA concentrations for both years evaluated. See Figures ES-7 and ES-8.

FIGURE ES-1
SUMMARY OF EXCESS LIFETIME CANCER RISKS
KUTZTOWN SITE – 2007/2008 DATA



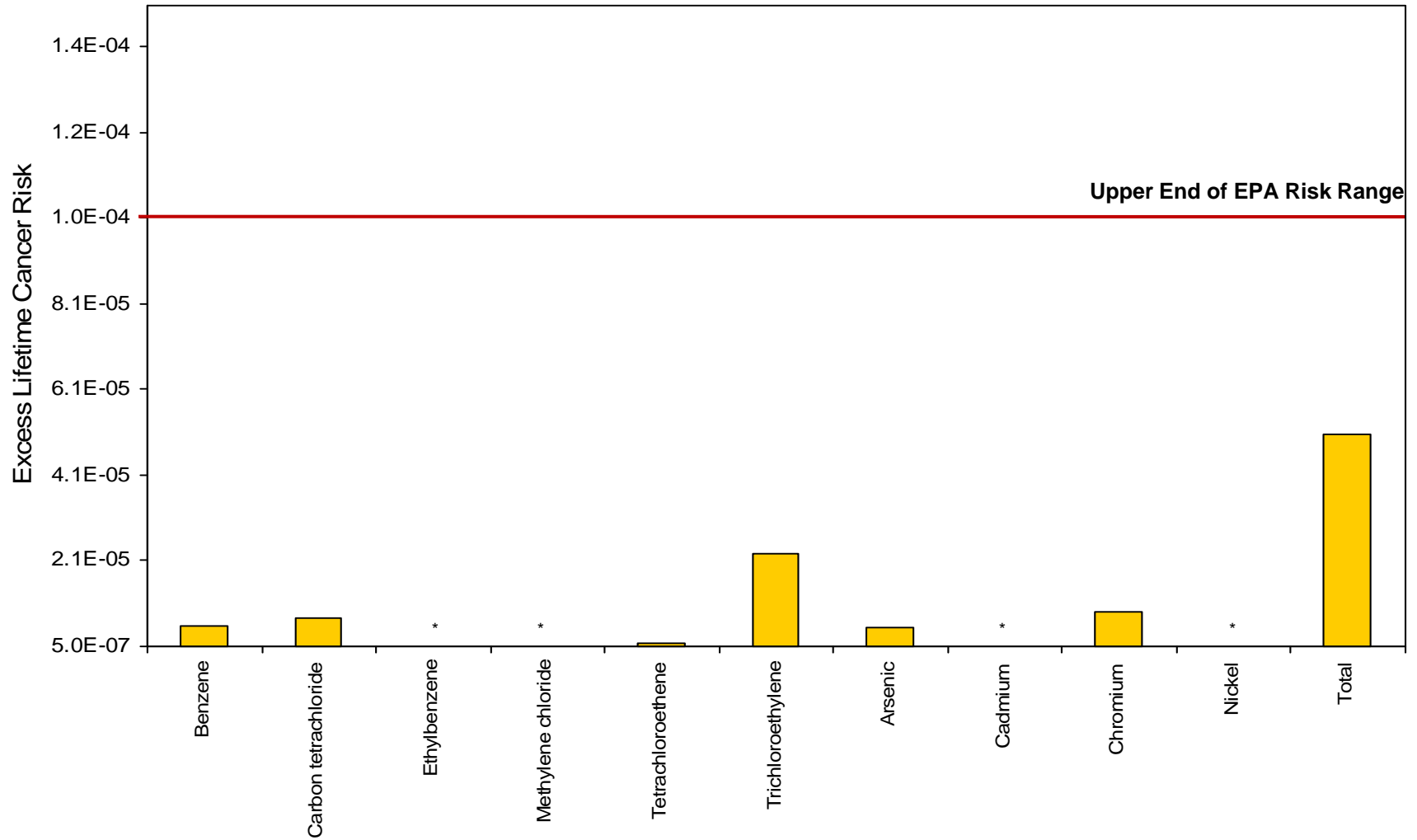
* = less than 1×10^{-6} .

**FIGURE ES-2
SUMMARY OF HAZARD QUOTIENTS
KUTZTOWN SITE – 2007/2008 DATA**



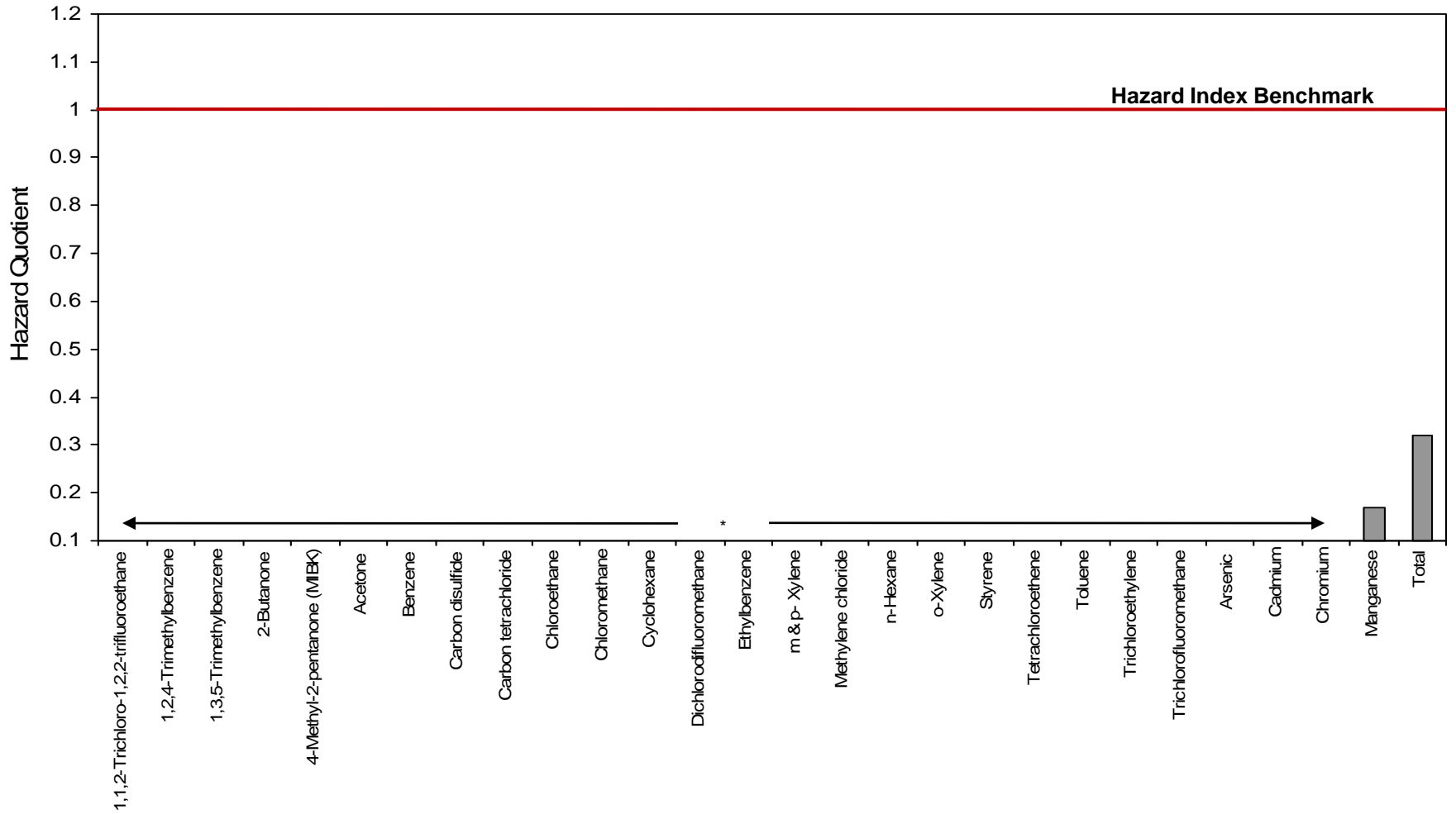
* = less than 0.1.

**FIGURE ES-3
SUMMARY OF EXCESS LIFETIME CANCER RISKS
READING SITE – 2007/2008 DATA**



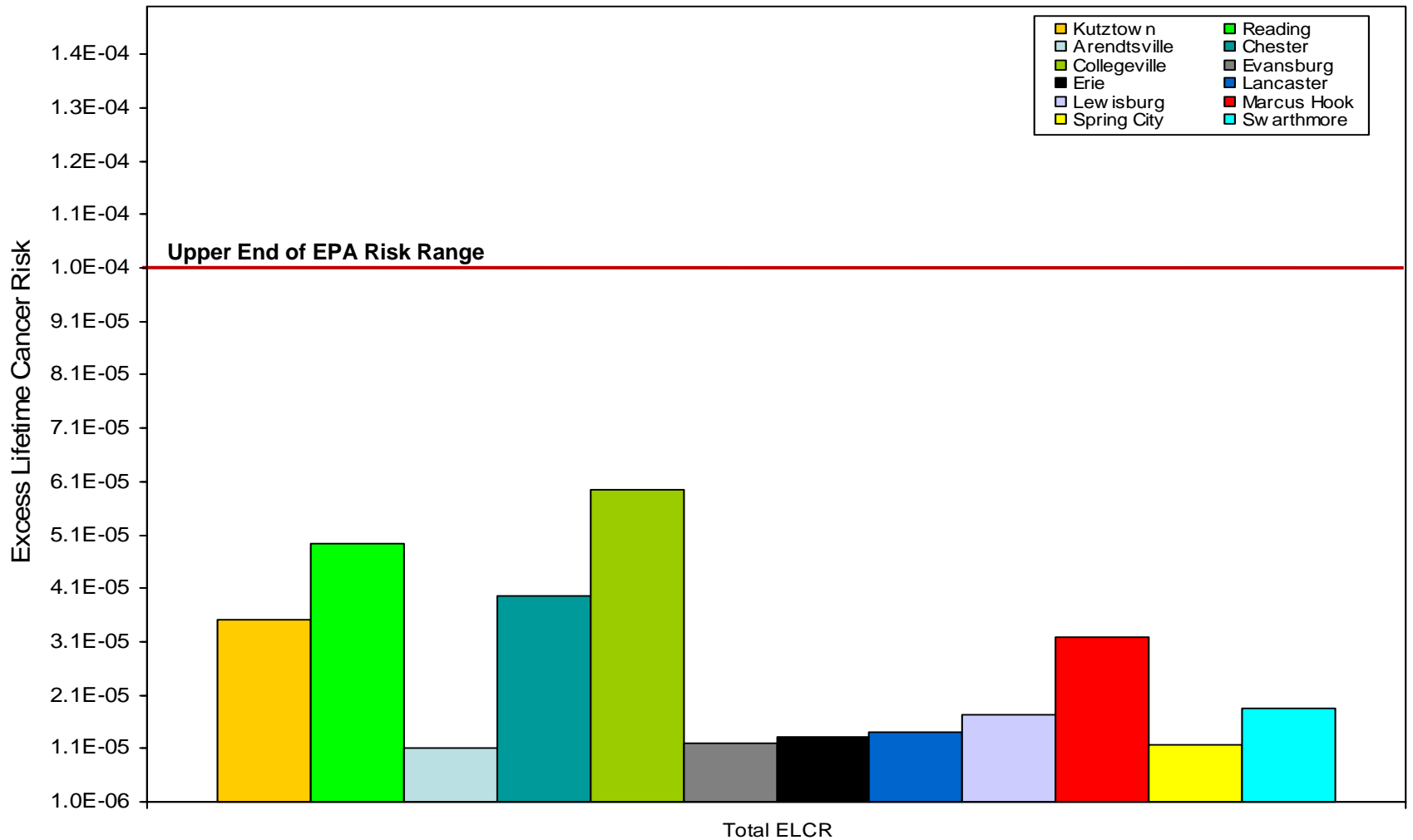
* = less than 1E-06.

**FIGURE ES-4
SUMMARY OF HAZARD QUOTIENTS
READING SITE – 2007/2008 DATA**



* = less than 0.1.

**FIGURE ES-5
COMPARISON OF TOTAL 2007/2008 EXCESS LIFETIME CANCER RISKS FROM BERKS COUNTY
WITH 2008 ESTIMATES FROM PADEP MONITORING SITES**



**FIGURE ES-6
COMPARISON OF TOTAL 2007/2008 HAZARD INDICES FROM BERKS COUNTY
WITH 2008 ESTIMATES FROM PADEP MONITORING SITES**

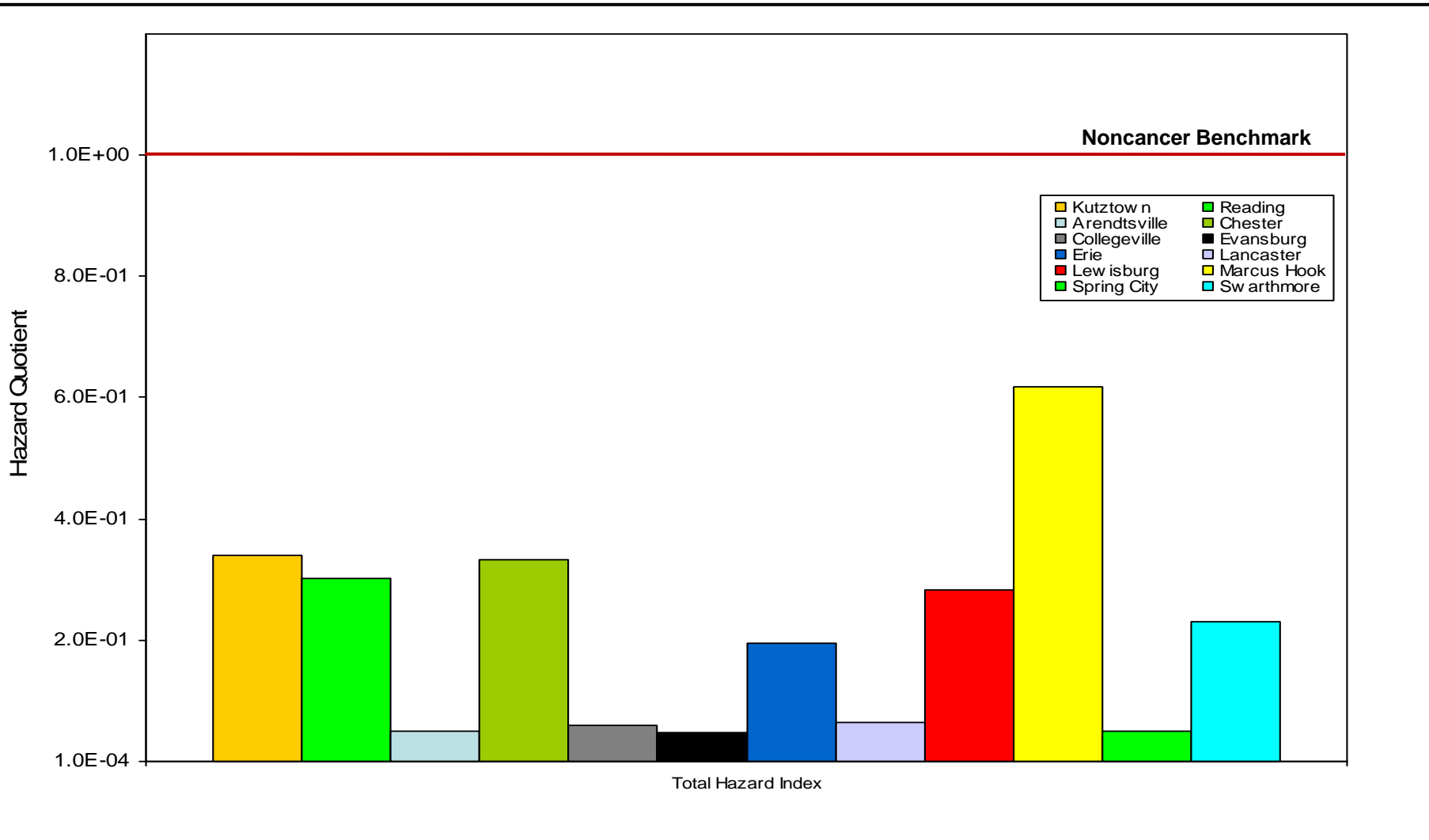


FIGURE ES-7
COMPARISON OF TOTAL 2007/2008 EXCESS LIFETIME CANCER RISKS FROM BERKS COUNTY
WITH TOTAL 1996 AND 1999 NATA BERKS COUNTY ESTIMATES

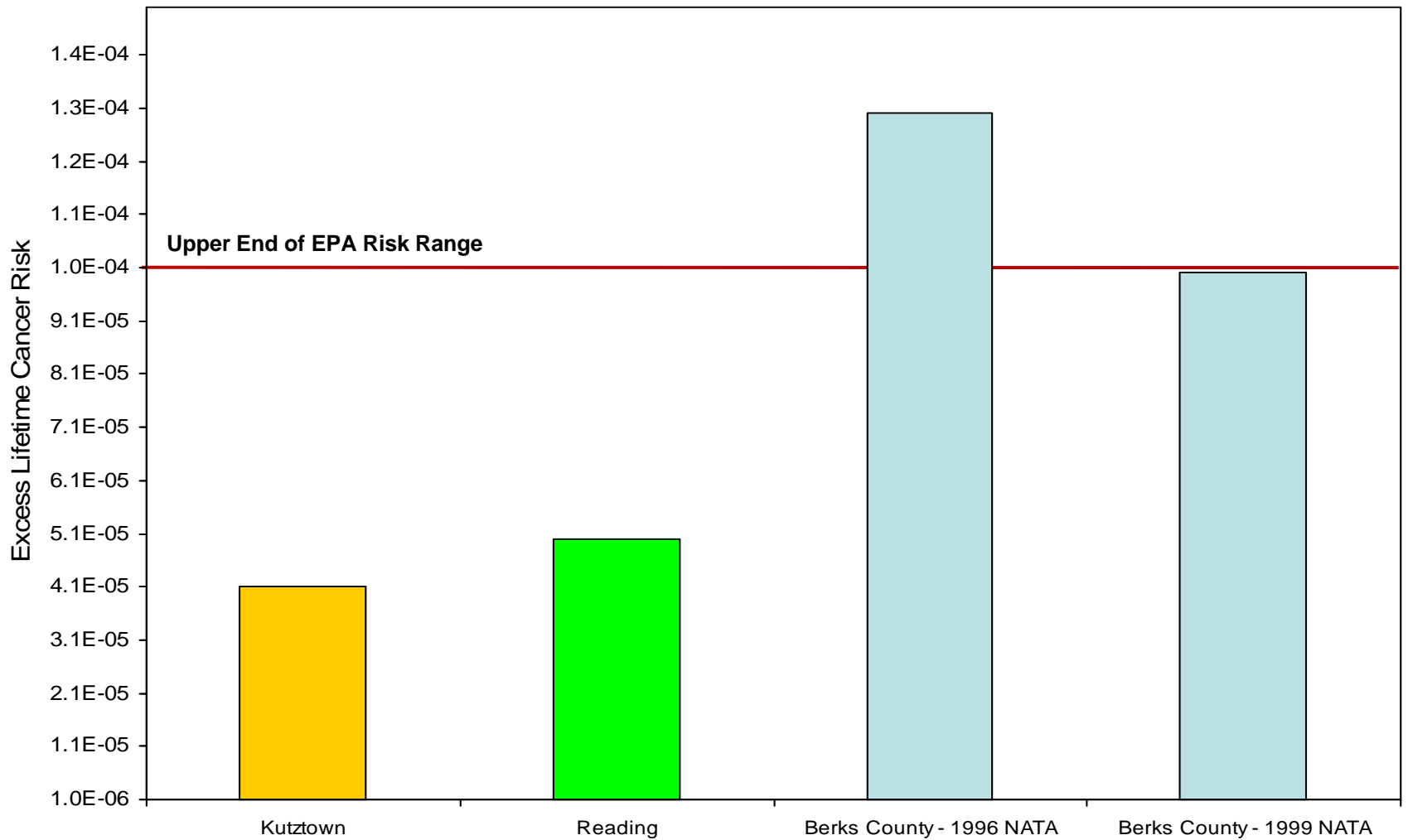
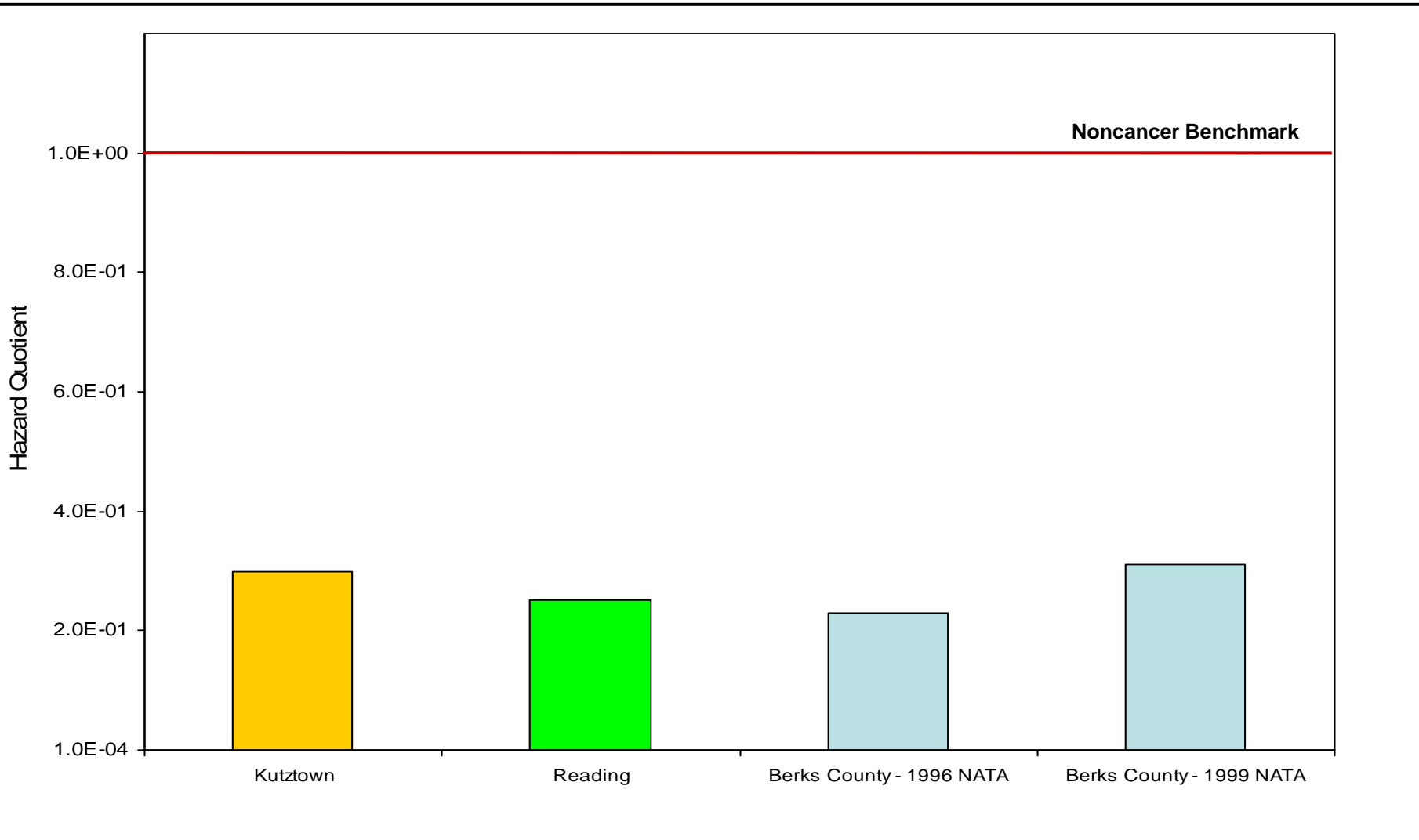


FIGURE ES-8
COMPARISON OF TOTAL 2007/2008 HAZARD INDICES FROM BERKS COUNTY
WITH TOTAL 1996 AND 1999 NATA BERKS COUNTY ESTIMATES



Berks County Inhalation Risk Assessment Report**1. INTRODUCTION****1.1 PROJECT OBJECTIVES AND BACKGROUND**

The objective of this inhalation human health risk assessment (HHRA) report is to estimate the chronic risks (excess lifetime cancer risk and noncancer health effects) associated with the inhalation exposure to the contaminants measured in the ambient air at two monitoring sites in Berks County, Pennsylvania. One monitoring site is located at Kutztown University; the other site is at the Reading Airport.

As part of a partnership with the Pennsylvania Department of Environmental Protection (PADEP) and Kutztown University, the Pennsylvania Institute for Children's Environmental Health (PICEH) began ambient air monitoring for targeted volatile organic compounds (VOCs) and metals at Kutztown University in October 2007. Prior to that date, in June 2007, PADEP began ambient air monitoring for the same contaminants at the Reading Airport. To more fully evaluate the contaminant concentrations in the ambient air in Berks County and the potential risks, both air monitoring sites were used in this inhalation HHRA. The health risks associated with inhaling the measured concentrations of the contaminants were assessed using risk assessment methods approved by PADEP and the U.S. Environmental Protection Agency (EPA). The risks calculated in this report are representative of a limited period of time during 2007 and 2008. It is the intention of PICEH to continue to collect and evaluate new air monitoring data at regular intervals in the future.

In addition to the estimation of the chronic risks, other analyses were also performed in this assessment. The contaminant concentrations measured at Kutztown University and the Reading Airport were compared to acute health benchmarks to identify any potential for acute health effects at maximum measured concentrations. Also, the calculated Berks County risks were compared to the calculated risks at other monitoring sites in Pennsylvania as well as with risks based on modeled ambient concentrations in the EPA's National Air Toxics Assessments (NATA) that were performed in 1996 and 1999.

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The PADEP reviewed and provided comments on the draft version of the Berks County inhalation risk assessment. Appendix A summarizes the PADEP comments and the manner in which the comments were addressed in this draft final version of the risk assessment.

1.2 MONITORING

The purpose of the monitoring is to determine the concentration of air toxics in the ambient air (outdoor air), and to evaluate the risks to residents associated with inhalation exposure to those contaminants at the concentrations observed. Air samples are collected over a 24-hour period from midnight to midnight once every 6 days by PICEH at the Kutztown University monitoring site and by PADEP at the Reading Airport monitoring site. The same 1-in-6 day schedule for monitoring air toxics is used at most of the PADEP air toxics monitoring sites in PA. The PADEP central laboratory analyzes all the samples collected at the Kutztown and Reading sites. Summa canister samples are analyzed for 55 organic compounds using U.S. EPA Method TO-15. Filter samples are analyzed for the metals arsenic, beryllium, cadmium, chromium (total), lead, manganese, nickel and zinc using EPA Method IO-3. Table 1-1 presents the list of the analyzed contaminants. Appendix B describes the sampling and analysis procedures in greater detail.

2. SUMMARY OF MONITORING RESULTS

The objectives of this section are to present, discuss, and summarize the ambient air monitoring data that were collected at the Kutztown and Reading sites.

2.1 DATA EVALUATION APPROACH

The available data from 2007 and 2008 from each site were combined and summarized to evaluate the data over a year in an effort to factor out the potential seasonal variability of the ambient concentrations. There are limited 2007 data for Kutztown as monitoring began at the end of October. The 2008 Kutztown data in this evaluation include samples collected from January to the end of June. Thus, although it does not represent an entire year, the combined 2007 and 2008 Kutztown data is somewhat representative of data from each season. A full year

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of data is available for the Reading site where the 2007 monitoring began in June and the available 2008 data include samples collected to the end of June.

Two data summaries are presented: Kutztown data (2007/2008) and Reading data (2007/2008). Each data summary presents the following information:

- The list of detected contaminants.
- The minimum detected concentrations.
- The maximum detected concentrations.
- The frequency of detection (the number of times a contaminant is detected out of the total number of samples collected).
- The annual average concentrations.
- The standard deviation of the data.

2.1.1 Treatment of Nondetects

In cases where samples are reported as ND, a value of one-half the Method Detection Limit (MDL) for organic compounds or one-half the Reporting Limit (RL) for metals is used as a proxy value in the calculation of the annual average concentrations. This approach is followed when the contaminant is detected in at least one sample over the year. This is a conservative assumption and is likely to result in slightly greater average concentrations, thus, slightly greater risk estimates.

2.1.2 Estimation of Annual Averages

The annual arithmetic average concentrations are used to estimate the risk resulting from chronic inhalation exposure. The annual average concentration is the arithmetic average of all the valid 24-hour samples with one-half of the MDL or RL substituted when the contaminant is not detected in a sample. If a contaminant is reported as ND in every sample collected in a given year, the annual average concentration is not calculated.

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2.2 MONITORING RESULTS

Tables 2-1 and 2-2 present summaries of the monitoring results from the Kutztown and Reading sites. Appendix C presents the analytical data of the monitoring results from the Kutztown and Reading sites from 2007 and 2008. Note that reporting units for the VOC results presented in Appendix C are in parts per billion by volume (ppbv). The units for the VOCs in Tables 2-1 and 2-2 have been converted to micrograms per cubic meter ($\mu\text{g}/\text{m}^3$). This conversion was necessary for the calculation of the risks.

2.2.1 Kutztown Site

Table 2-1 presents a summary of the monitoring results from the Kutztown site. At the time this report was written, a total of 24 VOC samples were collected and analyzed from the Kutztown site. Of the 55 VOCs that were sampled, 26 were detected at least once. There is a wide variation in the frequency of detection of the various VOCs over the monitoring period. A number of the VOCs were detected in all of the samples. These included: 1,1,2-trichloro-1,2,2-trifluoroethane, 2-butanone (MEK), acetone, carbon tetrachloride, chloromethane, dichlorodifluoromethane, toluene, and trichlorotrifluoromethane. Benzene and propene were detected in 23 of the 24 samples (96%). N-Hexane was detected in 88% of the samples. N-heptane was detected in 79% of the samples. Methylene chloride and m/p-xylenes were detected in 71% of the samples. O-xylene and ethylbenzene were detected in approximately 50% of the samples. The remaining contaminants were detected in less than 50% of the samples.

At the time this report was written, 37 metals samples were collected and analyzed from Kutztown. With the exception of beryllium, each metal was detected at least once with most metals detected all or most of the time. Cadmium, manganese, and zinc were detected in all of the samples. Lead was detected in 97% of the samples. Arsenic was detected in 65% of the samples. Chromium (measured as total chromium) was detected in 40% of the samples. Nickel was detected in 16% of the samples.

Berks County Inhalation Risk Assessment Report**2.2.2 Reading Site**

Table 2-2 presents a summary of the monitoring results from the Reading Airport site. At the time this report was written, a total of 49 VOCs samples were collected and analyzed. Twenty-seven VOCs were detected. The VOCs detected at the Reading site are similar to the VOCs detected at the Kutztown site. There is a wide variation of the frequency of detection for the VOCs.

A number of the VOCs were detected in all of the samples. These included: 1,1,2-trichloro-1,2,2-trifluoroethane, 2-butanone, acetone, carbon tetrachloride, chloromethane, dichlorodifluoromethane, propene, toluene, and trichlorotrifluoromethane. Benzene was detected in 98% of the samples (48 out of 49). N-hexane was detected in 90% of the samples. N-heptane was detected in 73% of the samples. Methylene chloride was detected in 67% of the samples. The remaining contaminants were detected in less than 50% of the samples.

At the time this report was written, 50 metals samples were collected and analyzed from the Reading Airport site. With the exception of beryllium, each metal was detected at least once. All of the other metals had a high frequency of detection. Manganese and zinc were detected in all of the samples. Lead was detected in 96% of the samples. Cadmium was detected in 90% of the samples. Arsenic was detected in 74% of the samples. Chromium (measured as total chromium) was detected in 60% of the samples. Nickel was detected in 56% of the samples.

3. CHARACTERIZATION OF RISKS

The objectives of this section are to identify the toxicity values that are used to estimate risk associated with inhalation, to describe the approach that is followed to estimate the chronic risks, and to present the results of the chronic risk analysis.

3.1 SUMMARY OF TOXICITY VALUES

The excess lifetime cancer risk for each of the contaminants is calculated using inhalation unit risk factors (URFs). The URF is a measure of the probability of developing cancer from exposure over a lifetime to a specified concentration of a given contaminant. URFs are expressed

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in units of per micrograms of contaminant per cubic meter of air ($\mu\text{g}/\text{m}^3$)⁻¹. If adequate data exists, EPA assigns each contaminant a “weight-of-evidence”, category that represents the likelihood of it being a human carcinogen (EPA, 1989). Six weight-of-evidence categories exist:

- A – Human carcinogen;
- B1 – Probable human carcinogen, limited human data are available;
- B2 – Probable human carcinogen, sufficient evidence in animals and inadequate or no evidence in humans;
- C – Possible human carcinogen;
- D – Not classifiable as to human carcinogenicity; and
- E – Evidence of non-carcinogenicity for humans.

As of 2005, EPA revised the weight-of-evidence categories to include the following five cancer hazard descriptors (EPA, 2005a):

- Carcinogenic to humans;
- Likely to be carcinogenic to humans;
- Suggestive evidence of carcinogenic potential;
- Inadequate information to assess carcinogenic potential; and
- Not likely to be carcinogenic in humans.

Contaminants that are classified in categories A through C following the 1989 weight-of-evidence classification and in the first three categories according to the 2005 classification system are generally carried through the risk characterization step if URFs have been developed.

The potential for noncancer health effects is calculated using reference concentrations (RfCs). The RfC is the concentration below which noncancer adverse health effects are not expected to occur over a lifetime of continuous exposure. RfCs are expressed in units of mg/m^3 . The premise of noncancer toxicity values is that there is an exposure level below which deleterious noncancer effects are not expected to occur.

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The URFs and RfCs assume an adult body weight of 70 kilograms (154 pounds) and an inhalation rate of 20 cubic meters (m³) of ambient air per day for 365 days a year over 70 year lifetime of exposure. While the URFs and RfCs reflect adult exposure with regards to body weight and inhalation, additional safety factors are applied by the organization (e.g., EPA) deriving the toxicity values to ensure that the toxicity values are protective of sensitive populations (i.e., young children). Safety factors are applied to compensate for the uncertainties and limitations associated with data that are used as the basis of the URF or RfC.

Consistent with EPA's combustor guidance (2005b), EPA's Integrated Risk Information System (IRIS, EPA, 2008a) database was the primary source for the toxicity criteria used in this assessment. In some cases, there were no inhalation risk data for a contaminant in the IRIS database, so the Provisional Peer-Reviewed Toxicity Values (PPRTVs) presented on EPA's Regional Screening Level Table (EPA, 2008b) were referenced. Other peer-reviewed sources were also considered including California Environmental Protection Agency (CalEPA) values, the Agency for Toxic Substances and Disease Registry (ATSDR) chronic Minimum Risk Levels (MRLs), the Health Effects Assessment Summary Tables (HEAST), and older health effects assessment documents not incorporated into HEAST from EPA's National Center for Environmental Assessment (NCEA). Table 3-1 presents the URFs and RfCs, and summarizes their sources.

The toxicity values that are used in this inhalation HHRA represent the current toxicity values from EPA and PADEP. As one would expect, toxicity criteria may change over time as a result of the discovery of new or additional information related to a contaminant's toxicity. As such, there is usually not complete agreement in toxicity values used in risk assessments performed in different time periods. The toxicity values used in this risk assessment were compared to the toxicity values used in recent risk assessments at PADEP air monitoring sites. In general, there was relatively good agreement in the toxicity values. The majority of the differences would not significantly affect the risk estimates.

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3.2 SPECIAL TOXICITY CONSIDERATIONSTrichloroethylene

The trichloroethylene (TCE) toxicity values used in this risk assessment are based on a draft study by EPA. Recent EPA guidance recommends against using the draft values and to use toxicity values from CalEPA. However, in order to develop meaningful comparisons with PADEP risk assessments for other monitoring sites, which used the draft TCE toxicity values, this risk assessment used the more stringent draft TCE toxicity values.

Chromium

The chromium concentrations presented in the previous section are reported as total chromium (see Tables 2-1 and 2-2). Chromium has various oxidation states with divalent, trivalent, and hexavalent being the most important. Divalent and hexavalent chromium are rarely found in the environment given their instability and tendency to change to the trivalent state. Divalent chromium is readily oxidized in the environment to the more stable trivalent state and hexavalent chromium is generally reduced to the trivalent state. It is likely that the measured total chromium concentrations are actually a combination of the speciated forms. Of the two chromium speciations, hexavalent chromium (Cr VI) is significantly more toxic. Hexavalent chromium is classified as a human carcinogen through the inhalation route of exposure. Trivalent chromium is not classifiable as to its carcinogenicity. Hexavalent chromium has an RfC; trivalent chromium does not.

Previous samples collected at PADEP monitoring sites were unable to reliably estimate concentrations of the hexavalent form using PADEP's standard analytical methodology. This is primarily because Cr VI is not stable and transforms to the trivalent and other less toxic forms between the time a sample is collected and analyzed. When estimating risks for chromium, it is necessary to apply a factor to the measured total chromium levels to adjust for the fraction that is assumed to be Cr VI.

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For this report, it is assumed that the total chromium concentrations contain 17% Cr VI. For comparison, EPA's 1996 NATA study assumed that 34% of the modeled total chromium concentrations were in the hexavalent form. EPA indicated that 34% is likely an overestimate for many areas. The percentage of Cr VI assumed in this HHRA is half of the amount EPA assumed in the 1996 NATA analysis. Thus, the measured total chromium concentrations are multiplied by a factor of 0.17 to account for the fraction that is assumed to be in the hexavalent form. The resulting Cr VI concentrations are used to estimate the excess lifetime cancer risks and the noncancer health effects based on the URF and RfC for Cr VI.

The assumption of 17% is uncertain and is likely to be an overestimate of actual Cr VI exposure for Berks County. It may be of value to the overall analysis to consider additional chromium samples to determine the actual degree of chromium speciation in the ambient air and to reduce the level of uncertainty in this HHRA.

Lead

As presented on Table 3-1, toxicity values are not listed for lead. Lead is evaluated in a different manner from the other contaminants because it is designated as a "criteria pollutant" and EPA has established a National Ambient Air Quality Standard (NAAQS) for lead. In October 2008, EPA substantially strengthened the NAAQS for lead by reducing the allowable ambient concentration by a factor of 10. Lead is evaluated by comparing a 3-month 'rolling' average concentration to the recently revised NAAQS of $0.15 \mu\text{g}/\text{m}^3$.

Contrary to EPA guidance on lead, an additional evaluation of lead is conducted using a URF from CalEPA ($0.000012 (\mu\text{g}/\text{m}^3)^{-1}$) and an RfC ($0.00009 \text{ mg}/\text{m}^3$) from the Boiler and Industrial Furnace (BIF) regulations. EPA does not recognize these toxicity values. Nevertheless, the lead risks associated with these toxicity values are qualitatively discussed in Section 3.4.4.

Nickel

The URF for nickel used in this HHRA is based on nickel refinery dust. It is assumed that nickel refinery dust best represents the nickel observed in the ambient air in Berks County. There is

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another nickel related URF listed in IRIS. It is based on nickel subsulfide. If the URF for nickel subsulfide was used, the nickel cancer risks would slightly increase.

3.3 RISK CHARACTERIZATION APPROACH

This section presents that approach this is followed to estimate the chronic risks, which include both cancer risks and noncancer health effects.

3.3.1 Cancer Risks

The lifetime excess cancer risk is expressed as the probability that an individual will develop cancer during a 70-year lifetime in excess of the background risk for developing cancer. Therefore, the calculated cancer risks in this HHRA represent the lifetime cancer risk to the specific receptors, in excess of the background probability of developing cancer, from breathing the specified concentrations over a lifetime. The excess lifetime cancer risk is calculated for each contaminant by multiplying its URF by its annual average concentration (see equation below).

$$\text{Excess Lifetime Cancer Risk} = \text{URF } (\mu\text{g}/\text{m}^3)^{-1} \times C_{\text{annual avg}} (\mu\text{g}/\text{m}^3)$$

The individual risks for each contaminant are summed to yield the total excess lifetime cancer risk (ELCR) for the monitoring site. The ELCR numbers are written in an exponential format (e.g. 1.0E-04). The list below should be referred to when interpreting these numbers. For example, an excess lifetime cancer risk of 3.2E-04 means that 3.2 more people in a population of 10,000 are likely to develop cancer assuming continuous exposure (24 hours per day, 365 days per year over 70 years) and assuming that the URFs accurately estimate cancer risk. This is above and beyond the national lifetime cancer risk of approximately 1 in 2 for men and 1 in 3 for women (ACS, 2005).

Interpreting cancer risks			
Risks	Exponential	Decimal	Read as
1.0E-08	1x10 ⁻⁸	0.00000001	1 in 100 million
1.0E-07	1x10 ⁻⁷	0.0000001	1 in 10 million
1.0E-06	1x10 ⁻⁶	0.000001	1 in 1 million
1.0E-05	1x10 ⁻⁵	0.00001	1 in 100,000

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1.0E-04	1x10 ⁻⁴	0.0001	1 in 10,000
1.0E-03	1x10 ⁻³	0.001	1 in 1,000

EPA has developed a cancer risk range for evaluating exposure to contaminants at hazardous waste sites and determining whether some type of remediation is necessary. EPA's cancer risk range is an increased risk of developing cancer, based on a plausible upper-bound estimate of risk, of approximately 1 in 1,000,000 (1E-06) to 1 in 10,000 (1E-04). EPA generally considers a total site cancer risk of less than 1E-06 to be acceptable without remediation being required. If total site cancer risk falls between 1E-06 and 1E-04, EPA will usually consider the risk acceptable without remediation. Sites with total cancer risk greater than 1E-04 are generally considered unacceptable and require some form of action.

3.3.2 Noncancer Health Effects

Potential noncancer health effects are evaluated by the calculation of hazard quotients (HQs) and hazard indices (HIs). An HQ is the ratio of a contaminant's annual average concentration and its RfC (see equation below).

$$\text{Hazard Quotient} = C_{\text{annual avg}} (\mu\text{g}/\text{m}^3) / (\text{RfC} (\text{mg}/\text{m}^3) \times 1,000 \mu\text{g}/\text{mg})$$

The individual HQs for each contaminant are summed to yield the total HI for the monitoring site. EPA has defined an HI of one as the point of departure. If the HI is less than one, no further action or evaluation is required and the exposure is considered acceptable and not a threat to human health. If the HI is greater than one, further evaluation is necessary before a recommendation for remediation (or reduced exposure) is made.

3.4 RISK RESULTS

Tables 3-2 and 3-3 present the risk estimates based on the ambient air concentrations measured at the Kutztown and Reading sites. Figures 3-1 through 3-4 present the risk estimates in graphical format. Two sets of risk estimates were calculated for each monitoring site. The first is based on the contaminants that were detected at least once in the monitoring period, where a

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value of one-half the MDL or RL is used for ND samples if present in the dataset in the calculation of the annual average concentration (Tables 3-2 and 3-3). The second set of risk estimates is based on contaminants that were not detected in the sampling period. These risks are based on the MDLs or RLs only and are presented on Tables 3-4 and 3-5.

It is not common practice in most risk assessments to estimate risk from contaminants that are not detected in any sample during the entire time frame of the analysis. Typically, risks would only be estimated for those contaminants that were shown to be present in at least one sample during the sampling period. The nondetected contaminants were evaluated in this HHRA to allow for a more reasonable comparison to PADEP assessments since PADEP combines both detected and non detected concentrations in their assessments. Combining risks based on detected and non-detected contaminants can be misleading to the proper interpretation of the results of the risk assessment. The risks associated with the nondetected contaminants are overestimated since the concentrations used to calculate the risks are the detection limit values. The actual concentrations of the non-detected contaminants, if present at all, are likely to be less than the detection limit values.

3.4.1 Kutztown Site

Table 3-2 presents the ELCRs for inhalation exposure calculated using the annual average concentrations. Figure 3-1 presents these risks graphically. The total ELCR was $4.1E-05$. This value is within EPA's cancer risk range. None of the individual contaminants had risks greater than $1E-05$. The risk from TCE ($8.4E-06$) contributed 20% of the total risk. The cancer risks from carbon tetrachloride and chromium (as hexavalent chromium) both contributed 16% to the total risk. The arsenic risk ($5.9E-06$) contributed 14%. The benzene risk ($5.5E-06$) contributed 13% of the total. The cancer risks from the remaining detected contaminants are at the low end or less than the EPA risk range ($1E-06$).

Table 3-2 also presents the hazard quotients for evaluating noncancer hazard. The total noncancer HI is 0.35, which is below the benchmark level of one. This is shown graphically in

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Figure 3-2. The manganese HQ (0.21) contributed 60% of the total HI. The HQs from the remaining contaminants are less than 0.1.

3.4.2 Reading Site

Table 3-3 presents the ELCRs for inhalation exposure calculated using the annual average concentrations. Figure 3-3 presents these risks graphically. The total cancer risk was 5.0E-05. This value is within EPA's cancer risk range. The risk from TCE (2.2E-05) contributed 44% of the total risk. The risk from chromium (as hexavalent chromium) (8.5E-06) contributed 17% of the total risk. The cancer risk from carbon tetrachloride (7.2E-06) contributed 14% to the total risk. The benzene risk (5.1E-06) contributed 10% of the total. The arsenic risk (4.7E-06) contributed 9%. The excess cancer risks from the remaining detected contaminants are at the low end or less than the EPA risk range.

The total noncancer HI is 0.32 (see Table 3-3). The manganese HQ (0.17) contributed about 53% of the total HI. The HQs from the remaining contaminants are less than 0.1. This is shown graphically in Figure 3-4.

3.4.3 Nondetected Contaminants

Tables 3-4 and 3-5 present the risks from the nondetected contaminants based on one-half the MDLs or RLs. The value of one-half the MDL or RL was the average of the 2007 and 2008 data since some of the limits varied between the two years. In each case, the ELCR is slightly greater than the upper-end of the EPA cancer risk range (1E-04). The MDL for 1,2-dibromoethane contributed the majority (greater than 80%) of the cancer risk. The noncancer HI values are less than one. As noted previously, this type of analysis can be misleading to the interpretation of the risk results as the risk levels are based on contaminant concentrations that have never been detected during the entire sampling program and results in a conservative assessment (i.e., overestimate) of risk from the nondetected contaminants.

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3.4.4 Lead

As presented on the table below, the 3-month rolling average concentrations at both sites are less than the NAAQS value of $0.15 \mu\text{g}/\text{m}^3$. The available lead data indicates that the lead levels are not considered to be a concern.

3-Month Average Lead Concentrations ($\mu\text{g}/\text{m}^3$) (NAAQS = 0.15)			
Kutztown	Lead Concentration	Reading	Lead Concentration
Nov 2007 - Jan 2008	0.011	Jun 2007 - Aug 2007	0.015
Dec 2007 - Feb 2008	0.011	Jul 2007 - Sept 2007	0.017
Jan 2008 - Mar 2008	0.011	Aug 2007 - Oct 2007	0.018
Feb 2008 - April 2008	0.0081	Sept 2007 - Nov 2007	0.017
Mar 2008 - May 2008	0.0081	Oct 2007 - Dec 2007	0.020
Apr 2008 - Jun 2008	0.014	Mar 2008 - May 2008	0.015
		Apr 2008 - Jun 2008	0.012

The lead risks associated with the CalEPA URF and the RfC from the BIF regulations are also below the risk levels of concern.

4. CHARACTERIZATION OF ACUTE EXPOSURE

In addition to long-term chronic impacts, the potential for acute impacts is also evaluated.

4.1 DISCUSSION OF APPROACH

The acute exposure for the Kutztown and Reading sites is characterized by comparing the one day maximum concentrations to acute health benchmarks. In this analysis, three sources of acute health benchmarks are used for comparison. First, the acute Reference Exposure Levels (RELs) developed by the California Environmental Protection Agency (CalEPA) are used when available for a contaminant. The majority of the RELs are based on a one hour exposure. The acute REL is defined by CalEPA (1999) as an exposure concentration that is not likely to cause adverse effects in a human population, including sensitive subgroups, exposed to that concentration for one hour on an intermittent basis. These health-based acute RELs are

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applicable to risk characterization of air releases including actual or potential spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing of a substance into the ambient air that results from routine operation of a facility or that is predictable, including continuous and intermittent releases and predictable process upsets or leaks.

EPA's Acute Exposure Guideline Levels for mild health effects (AEGL-1) are also used for comparison. When available, one hour AEGL-1 values are used. The AEGLs focus on emergency planning and response, not on routine emissions and exposure, which are the focus of the RELs.

Finally, the Short-Term Exposure Limits (STEL) from the National Institute for Occupational Safety and Health (NIOSH) divided by 40 are used. A STEL is a 15-minute time-weighted average exposure that should not be exceeded at any time during a workday. PADEP suggests that the STELs should be divided by a factor of 40. While the exact derivation of the factor of 40 is not clear, it may relate to the difference between a 24 hour per day, 7 day per week (168 total hours per week) potential exposure to hypothetical residents compared to a 40 hour work week assumed for healthy workers in the development of NIOSH standards. The ratio of 168:40 results in a 4.2 factor which is often modified further by an additional safety factor of 10. Rounding this value results in a factor of 40. There are a number of weaknesses in this approach including using a long-term exposure based safety factor and applying it to a short-term exposure condition, as well as the use of a 24-hour average for the acute health effects evaluation, but nevertheless, this approach was included for comparison purposes.

Table 4-1 presents the results of the comparisons. The maximum 24-hour concentrations are less than all of the acute screening criteria. It is important to note that the 24-hour maximum concentrations, which are the only concentrations available in this study, would underestimate the 1-hour maximum concentrations. These 1-hour maximum concentrations are more appropriate for comparison to acute health benchmarks. However, given the large (multiple orders of magnitude) difference between acute criteria and the 24-hour maximum concentrations,

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it is likely that even if one hour maximum concentrations were available, they would be significantly less than the acute benchmarks.

5. MONITORING DATA COMPARISONS

There are other sources of air data available that would be useful to evaluate to put the concentrations and risks observed at the Kutztown and Reading sites in perspective. One source of data is PADEP monitoring stations. Another source is historical (1996 and 1999) modeled concentrations in Berks County from the EPA NATA studies. To develop meaningful comparisons among the different sources of data, the risks (cancer and noncancer) were calculated based on the average concentrations using the toxicity criteria presented on Table 3-1. This was done because of the likely differences in toxicity values used in the various evaluations. By taking this step, it is ensured that the risks are all based on the same toxicity values.

5.1 COMPARISON WITH PADEP DATA FROM OTHER MONITORING SITES

PADEP has been collecting air monitoring data at a number of sites across the state beginning in 1995. Figures 5-1 through 5-4 present graphical comparisons of the risks calculated for the Kutztown and Reading sites in this report and other PADEP monitoring sites. The figures consist of bar charts where each vertical bar represents a risk level. Only those contaminants with a cancer risk level greater than $1E-06$ or a HQ greater than 0.1 are presented so that reasonable visual comparisons could be made. This also applies to the figures discussed in Section 5.2. It is noted when a contaminant is not detected or analyzed at a monitoring site. The cancer risks associated with each contaminant are displayed on Figure 5-1. The total ELCRs are presented on Figure 5-2. The HQs associated with each contaminant are displayed on Figure 5-3. The total HIs are presented on Figure 5-4.

As presented on the figures, the risks based on the Kutztown and Reading data are generally similar to the other PADEP sites. The following observations can be made:

- The benzene and carbon tetrachloride cancer risks are similar across all monitoring sites.
- The TCE cancer risk at the Collegeville site is the greatest out of all of the evaluated contaminants. The TCE risks at Kutztown and Reading, while less than half of the

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- The arsenic and Cr VI cancer risks at Kutztown and Reading are slightly greater than the other sites.
- The Collegeville site has the greatest total ELCR resulting from TCE. The total Kutztown and Reading ELCRs are slightly less than Collegeville.
- The manganese HQs for Kutztown and Reading are less than the Marcus Hook site and are similar to the other sites.
- The Marcus Hook site has the greatest HI followed by the Kutztown, Chester, and Reading sites.

5.2 COMPARISON WITH 1996 AND 1999 EPA NATA AIR CONCENTRATIONS

The U.S. EPA modeled ambient concentrations of air toxics as part of an ongoing comprehensive evaluation of air toxics in the United States. This is different from the monitoring data presented in this HHRA, as it is based on modeled values and not actual ambient concentrations. Figures 5-5 through 5-10 present graphical comparisons of the calculated risks for the Kutztown and Reading sites compared to the 1996 and 1999 NATA studies.

As noted in Section 3.2, the chromium concentrations observed at the Kutztown and Reading sites were adjusted by a factor of 0.17 to account for the portion that is assumed to be in the hexavalent state (Cr VI). A similar procedure was performed for the modeled chromium result for Berks County in the 1996 NATA study. As part of the 1996 study, EPA modeled chromium concentrations under the assumption that it was all in the hexavalent state. This is clearly not the case and the resulting risk estimates will be significantly overestimated. To compensate for this, the modeled 1996 chromium concentration for Berks County was adjusted by a factor of 0.17. Thus, the measured concentrations at Kutztown and Reading and the 1996 modeled concentration each assumed 17% Cr VI. For the 1999 NATA study, a more refined approach was used to model chromium concentrations. Chromium was reported as Cr VI. Therefore, an adjustment to the Cr VI concentration in the 1999 study was not required.

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In general, the NATA risk estimates for most of the contaminants are similar to or are greater than the Kutztown and Reading risk estimates. The following observations can be made:

- The Kutztown and Reading arsenic cancer risks are slightly greater than the 1996 and 1999 estimates.
- The NATA TCE cancer risks from 1996 and 1999 are more than double the Kutztown and Reading risks.
- The 1996 NATA Cr VI cancer risk is significantly greater than the Kutztown and Reading estimates. The 1999 NATA Cr VI cancer risk is similar to the Kutztown and Reading estimates.
- The Kutztown and Reading manganese HQs are slightly greater than the 1996 NATA estimate. The 1999 NATA manganese HQ is similar to the Kutztown and Reading estimates.

6. UNCERTAINTY DISCUSSION

The Berks County inhalation HHRA is based on a number of assumptions, which introduce some level of uncertainty and variability into the analysis. Some of the more important assumptions made for this HHRA include:

- The measured annual average concentration is the concentration that a hypothetical individual is assumed to be exposed to over a lifetime. This does not take into account differences in location or changes in concentrations over time. It essentially represents a “snapshot” of exposure during the time frame evaluated.
- The effects from inhalation exposure to multiple contaminants are additive. This is standard risk assessment practice.
- The only excess risk considered in this report is due to inhalation of ambient air. Other risks from hazardous air pollutants that deposit on the ground and cause exposure through other routes like drinking water, food sources, etc., are not part of this analysis.
- The exposed individual is assumed to breathe the air 24 hours per day, 365 days per year over a 70-year lifetime.
- Risks associated with hexavalent chromium are likely overestimated given the probable lack of any significant hexavalent chromium in the measured concentrations.

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- The risk estimates presented in this report are based on the targeted contaminants. It is likely that individuals are being exposed to contaminants that were not targeted in the monitoring program.
- Acute health impacts used maximum 24-hour concentrations for comparison to acute health criteria because they are the only concentrations available. More applicable 1-hour maximum concentrations would be greater concentrations than the 24-hour concentrations. This results in an underestimate of potential concentrations. However, this is unlikely to be a significant issue given the results of this analysis.

Some of these uncertainties can result in an underestimation of the actual risk any individual would incur and some may result in an overestimate. While the direction (over or underestimate) and degree (significant or insignificant) of these uncertainties cannot be determined, it is important that they be taken into consideration in any effort to interpret the results of this HHRA.

7. DISCUSSION OF RESULTS

- A number of evaluations were performed in the HHRA. These include an evaluation of chronic health impacts (cancer and noncancer), acute risks, and comparisons with risks from other Pennsylvania monitoring sites and EPA modeled concentrations, specific to Berks County.
- Cancer risks for the Kutztown and Reading sites were within the EPA risk range as described in Section 3. They ranged from 4.1E-05 to 5.0E-05. Noncancer hazard indices were below one indicating that there is very little likelihood of any noncancer impacts in the impacted populations.
- A comparison of maximum 24-hour concentrations to acute health effects criteria indicates that no acute health impacts are anticipated.
- Comparisons to PADEP monitoring sites indicate that the Kutztown and Reading risks are similar to other Pennsylvania sites, with certain exceptions including:
 - The TCE risks at Kutztown and Reading, while less than half of the Collegeville TCE cancer risk, are, in general, greater than the risks associated with the other contaminants reported at the other PADEP sampling sites.
 - The arsenic and Cr VI cancer risks at Kutztown and Reading are slightly greater than the PADEP sampling sites.

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- Comparisons to risks based on EPA NATA modeled concentrations in Berks County in 1996 and 1999 indicate that the Kutztown and Reading risks, based on actual measure concentrations for most of the contaminants, are either similar to or less than the predicted NATA concentrations for both years evaluated.

8. REFERENCES

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TABLES

**Table 1-1
Targeted Analytes**

Analyte
VOCs
1,1,1-Trichloroethane
1,1,2,2-Tetrachloroethane
1,1,2-Trichloro-1,2,2-trifluoroethane
1,1,2-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
1,2,4-Trichlorobenzene
1,2,4-Trimethylbenzene
1,2-Dibromoethane
1,2-Dichloro-1,1,2,2,tetrafluoroethane
1,2-Dichlorobenzene
1,2-Dichloroethane
1,2-Dichloropropane
1,3,5-Trimethylbenzene
1,3-Butadiene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
1-Ethyl-4-methyl benzene
2-Butanone (MEK)
2-Hexanone
2-Methoxy-2-methyl propane (MTBE)
4-Methyl-2-pentanone (MIBK)
Acetone
Benzene
Bromodichloromethane
Bromoform
Bromomethane
Carbon disulfide
Carbon tetrachloride
Chlorobenzene
Chloroethane
Chloroethene
Chloroform
Chloromethane
cis-1,2-Dichloroethene
cis-1,3-Dichloro-1-propene
Cyclohexane
Dibromochloromethane
Dichlorodifluoromethane
Ethylbenzene
Hexachloro-1,3-butadiene
m & p- Xylene
Methylene chloride
n-Heptane
n-Hexane
o-Xylene
Propene
Styrene
Tetrachloroethene

Table 1-1
Targeted Analytes

Analyte
Tetrahydrofuran
Toluene
trans-1,2-Dichloroethene
trans-1,3-Dichloro-1-propene
Trichloroethylene (TCE)
Trichlorofluoromethane
Metals
Arsenic
Beryllium
Cadmium
Chromium (total)
Lead
Manganese
Nickel
Zinc

Table 2-1
2007/2008 Data Summary
Kutztown Site

Contaminant	Minimum Detected Concentration (µg/m)³	Maximum Detected Concentration (µg/m)³	Frequency of Detection	Annual Average Concentration (µg/m)³	Standard Deviation (µg/m)³
VOCs					
1,1,2-Trichloro-1,2,2-trifluoroethane	3.06E-01	6.28E-01	24/24	5.04E-01	8.48E-02
1,2,4-Trimethylbenzene	1.97E-01	5.40E-01	4/24	9.85E-02	1.13E-01
1,2-Dichloroethane	2.22E-01	5.26E-01	2/24	8.17E-02	1.05E-01
1,3,5-Trimethylbenzene	3.44E-01	3.44E-01	1/24	6.96E-02	6.13E-02
2-Butanone (MEK)	5.01E-01	4.72E+00	24/24	1.40E+00	8.43E-01
Acetone	2.07E+00	1.19E+01	24/24	5.44E+00	2.31E+00
Benzene	2.20E-01	2.46E+00	23/24	7.08E-01	4.79E-01
Carbon disulfide	4.36E-01	1.18E+00	10/24	4.93E-01	2.65E-01
Carbon tetrachloride	2.77E-01	7.54E-01	24/24	4.56E-01	8.66E-02
Chloroform	4.88E-01	4.88E-01	1/24	8.34E-02	9.38E-02
Chloromethane	6.60E-01	1.28E+00	24/24	9.67E-01	1.74E-01
Cyclohexane	7.23E-02	5.16E-01	4/24	7.07E-02	1.00E-01
Dichlorodifluoromethane	1.83E+00	2.77E+00	24/24	2.20E+00	3.19E-01
Ethylbenzene	1.78E-01	7.38E-01	11/24	1.90E-01	1.59E-01
m & p- Xylene	3.04E-01	1.74E+00	17/24	5.55E-01	4.33E-01
Methylene chloride	1.46E-01	6.25E-01	17/24	2.50E-01	1.56E-01
n-Heptane	9.42E-02	7.37E-01	19/24	2.21E-01	1.70E-01
n-Hexane	1.09E-01	9.51E-01	21/24	4.03E-01	2.81E-01
o-Xylene	1.82E-01	6.08E-01	12/24	1.96E-01	1.51E-01
Propene	4.47E-01	3.44E+00	23/24	1.27E+00	7.78E-01
Styrene	1.40E-01	1.40E-01	1/24	5.37E-02	2.45E-02
Tetrachloroethene	5.56E+00	5.56E+00	1/24	3.73E-01	1.10E+00
Tetrahydrofuran	8.55E-02	1.83E+00	9/24	1.66E-01	3.72E-01
Toluene	2.64E-01	2.26E+01	24/24	2.01E+00	4.46E+00
Trichloroethylene (TCE)	1.72E-01	1.72E-01	1/24	7.65E-02	4.55E-02
Trichlorofluoromethane	1.01E+00	1.63E+00	24/24	1.31E+00	1.86E-01
Metals					
Arsenic	6.24E-04	1.22E-02	24/37	1.38E-03	2.08E-03
Cadmium	1.14E-04	1.44E-03	37/37	3.63E-04	2.50E-04
Chromium	4.19E-03	7.25E-03	15/37	3.21E-03	1.52E-03
Lead	3.07E-03	5.90E-02	36/37	1.13E-02	1.21E-02
Manganese	2.12E-03	4.66E-02	37/37	1.05E-02	1.06E-02
Nickel	2.13E-03	5.03E-03	6/37	1.35E-03	8.46E-04
Zinc	9.80E-03	6.31E-01	37/37	5.59E-02	1.03E-01

Table 2-2
2007/2008 Data Summary
Reading Site

Contaminant	Minimum Detected Concentration (µg/m) ³	Maximum Detected Concentration (µg/m) ³	Frequency of Detection	Annual Average Concentration (µg/m) ³	Standard Deviation (µg/m) ³
VOCs					
1,1,2-Trichloro-1,2,2-trifluoroethane	3.83E-01	6.82E-01	49/49	5.18E-01	6.88E-02
1,2,4-Trimethylbenzene	1.97E-01	5.90E-01	19/49	1.66E-01	1.48E-01
1,3,5-Trimethylbenzene	2.01E-01	5.40E-01	4/49	9.49E-02	8.68E-02
1-Ethyl-4-methyl benzene	2.13E-01	2.22E-01	2/49	7.89E-02	3.75E-02
2-Butanone (MEK)	6.19E-01	1.41E+01	49/49	3.01E+00	2.97E+00
2-Hexanone	8.19E-01	4.01E+00	5/49	5.23E-01	6.46E-01
4-Methyl-2-pentanone (MIBK)	3.28E-01	1.64E+00	7/49	4.90E-01	2.55E-01
Acetone	3.32E+00	5.70E+01	49/49	1.49E+01	1.28E+01
Benzene	2.43E-01	2.52E+00	48/49	6.56E-01	4.23E-01
Carbon disulfide	3.11E-01	2.40E+00	9/49	3.45E-01	3.72E-01
Carbon tetrachloride	3.52E-01	8.17E-01	49/49	4.77E-01	9.21E-02
Chloroethane	1.66E-01	1.66E-01	1/49	6.85E-02	1.94E-02
Chloromethane	6.40E-01	1.53E+00	49/49	9.65E-01	1.74E-01
Cyclohexane	8.95E-02	1.62E-01	5/49	6.12E-02	3.04E-02
Dichlorodifluoromethane	1.68E+00	2.77E+00	49/49	2.20E+00	2.59E-01
Ethylbenzene	1.78E-01	6.94E-01	21/49	1.72E-01	1.30E-01
m & p- Xylene	2.69E-01	2.13E+00	30/49	5.04E-01	4.23E-01
Methylene chloride	1.67E-01	1.91E+00	33/49	2.90E-01	2.91E-01
n-Heptane	1.27E-01	8.60E-01	36/49	2.77E-01	2.01E-01
n-Hexane	1.23E-01	1.02E+00	44/49	3.53E-01	2.15E-01
o-Xylene	1.82E-01	7.38E-01	22/49	1.85E-01	1.43E-01
Propene	6.88E-01	4.99E+00	49/49	1.90E+00	9.21E-01
Styrene	9.79E-02	3.58E-01	3/49	7.57E-02	5.85E-02
Tetrachloroethene	3.73E-01	4.20E-01	2/49	1.79E-01	5.65E-02
Toluene	1.88E-01	4.90E+00	49/49	1.55E+00	9.58E-01
Trichloroethylene (TCE)	1.18E-01	1.18E+00	15/49	2.00E-01	2.29E-01
Trichlorofluoromethane	1.07E+00	1.74E+00	49/49	1.37E+00	1.88E-01
Metals					
Arsenic	6.09E-04	2.93E-03	37/50	1.10E-03	6.49E-04
Cadmium	1.05E-04	1.79E-03	45/50	3.38E-04	3.46E-04
Chromium	4.13E-03	8.55E-03	30/50	4.16E-03	1.94E-03
Lead	2.53E-03	6.30E-02	48/50	1.59E-02	1.29E-02
Manganese	2.31E-03	2.51E-02	50/50	8.42E-03	5.03E-03
Nickel	2.04E-03	9.35E-03	28/50	2.62E-03	1.96E-03
Zinc	6.48E-03	7.12E-02	50/50	2.65E-02	1.50E-02

**Table 3-1
Inhalation Unit Risk Factors and Reference Concentrations**

Contaminant	Inhalation Unit Risk		Reference Concentration	
	Value ($\mu\text{g}/\text{m}^3\text{-}^{-1}$)	Source	Value (mg/m^3)	Source
1,1,1-Trichloroethane	Inadequate information to assess carcinogenic potential	IRIS	5	IRIS
1,1,2,2-Tetrachloroethane	0.000058	IRIS	Not Available	N/A
1,1,2-Trichloro-1,2,2-trifluoroethane	Not Available	N/A	30	HEAST
1,1,2-Trichloroethane	0.000016	IRIS	Not Available	N/A
1,1-Dichloroethane	0.0000016	CalEPA	0.5	HEAST
1,1-Dichloroethene	Suggestive evidence of carcinogenicity, but not sufficient to assess carcinogenic potential	IRIS	0.2	IRIS
1,2,4-Trichlorobenzene	Not Available	N/A	0.004	PPRTV
1,2,4-Trimethylbenzene	Not Available	N/A	0.007	PPRTV
1,2-Dibromoethane	0.0006	IRIS	0.009	IRIS
1,2-Dichloro-1,1,2,2,tetrafluoroethane	Not Available	N/A	Not Available	N/A
1,2-Dichlorobenzene	Not Available	N/A	0.14	HEAST
1,2-Dichloroethane	0.000026	IRIS	2.4	ATSDR
1,2-Dichloropropane	0.00001	CalEPA	0.004	IRIS
1,3,5-Trimethylbenzene	Not Available	N/A	0.006	PPRTV
1,3-Butadiene	0.00003	IRIS	0.002	IRIS
1,3-Dichlorobenzene	Not classifiable as to human carcinogenicity	IRIS	Not Available	N/A
1,4-Dichlorobenzene	0.000011	CalEPA	0.8	IRIS
1-Ethyl-4-methyl benzene	Not Available	N/A	Not Available	N/A
2-Butanone (MEK)	Not Available	N/A	5	IRIS
2-Hexanone	Not Available	N/A	Not Available	N/A
2-Methoxy-2-methyl propane (MTBE)	0.00000026	CalEPA	3	IRIS
4-Methyl-2-pentanone (MIBK)	Not Available	N/A	3	IRIS
Acetone	Not Available	N/A	31	ATSDR
Benzene	0.0000078	IRIS	0.03	IRIS
Bromodichloromethane	Not Available	N/A	Not Available	N/A
Bromoform	0.0000011	IRIS	Not Available	IRIS
Bromomethane	Not Available	N/A	0.005	IRIS
Carbon disulfide	Not Available	N/A	0.7	IRIS
Carbon tetrachloride	0.000015	IRIS	0.19	ATSDR
Chlorobenzene	Not Available	N/A	0.05	PPRTV
Chloroethane	Not Available	N/A	10	IRIS
Chloroethene	0.0000088	IRIS	0.1	IRIS
Chloroform	0.000023	IRIS	0.098	ATSDR
Chloromethane	Not Available	N/A	0.09	IRIS
cis-1,2-Dichloroethene	Not Available	N/A	Not Available	N/A
cis-1,3-Dichloro-1-propene	0.000004	IRIS	0.02	IRIS
Cyclohexane	Not Available	N/A	6	IRIS
Dibromochloromethane	Not Available	N/A	Not Available	N/A
Dichlorodifluoromethane	Not Available	N/A	0.2	HEAST
Ethylbenzene	0.0000025	CalEPA	1	IRIS
Hexachloro-1,3-butadiene	0.000022	IRIS	Not Available	N/A
m & p- Xylene	Not Available	N/A	0.1	IRIS
Methylene chloride	0.00000047	IRIS	1.1	ATSDR
n-Heptane	Not classifiable as to human carcinogenicity	IRIS	Not Available	N/A
n-Hexane	Inadequate information to assess carcinogenic potential	N/A	0.7	IRIS
o-Xylene	Not Available	N/A	0.1	IRIS
Propene	Not Available	N/A	Not Available	N/A
Styrene	Not Available	N/A	1	IRIS
Tetrachloroethene	0.0000059	CalEPA	0.27	ATSDR

**Table 3-1
Inhalation Unit Risk Factors and Reference Concentrations**

Contaminant	Inhalation Unit Risk		Reference Concentration	
	Value ($\mu\text{g}/\text{m}^3)^{-1}$	Source	Value (mg/m^3)	Source
Tetrahydrofuran	0.000019	Prov EPA	0.3	Prov EPA
Toluene	Not Available	N/A	5	IRIS
trans-1,2-Dichloroethene	Not Available	N/A	0.06	PPRTV
trans-1,3-Dichloro-1-propene	0.000004	IRIS	0.02	IRIS
Trichloroethylene (TCE)	0.00011	Draft EPA	0.035	Draft EPA
Trichlorofluoromethane	Not Available	N/A	0.7	HEAST
Arsenic	0.0043	IRIS	0.00003	CalEPA
Beryllium	0.0024	IRIS	0.00002	IRIS
Cadmium	0.0018	IRIS	0.0002	Prov EPA
Chromium	0.012	IRIS ^a	0.0001	IRIS
Lead	Not applicable for lead			
Manganese	Not Available	N/A	0.00005	IRIS
Nickel	0.00024	IRIS ^b	0.00002	CalEPA
Zinc	Not Available	N/A	Information reviewed but value not estimated.	IRIS

ATSDR = Agency for Toxic Substances and Disease Registry

BIF = Boiler and Industrial Furnace Regulation value

CalEPA = California Environmental Protection Agency

HEAST = Health Effects Assessment Summary Tables

IRIS = Integrated Risk Information System

N/A = Not Applicable

NYSDOH = New York State Department of Health

PPRTV = Provisional Peer-Review Toxicity Value

Prov EPA = Provisional EPA toxicity value

^a Chromium values are based on hexavalent chromium.

^b Nickel URF value is based on nickel refinery dust.

**Table 3-2
2007/2008 Inhalation Excess Lifetime Cancer Risks and Noncancer Hazard Quotients -
Detected Contaminants
Kutztown Site**

Contaminant	Annual Average Concentration (µg/m) ³	Excess Lifetime Cancer Risk	Hazard Quotient
VOCs			
1,1,2-Trichloro-1,2,2-trifluoroethane	5.04E-01	---	0.000017
1,2,4-Trimethylbenzene	9.85E-02	---	0.014
1,2-Dichloroethane	8.17E-02	2.1E-06	0.000034
1,3,5-Trimethylbenzene	6.96E-02	---	0.012
2-Butanone (MEK)	1.40E+00	---	0.00028
Acetone	5.44E+00	---	0.00018
Benzene	7.08E-01	5.5E-06	0.024
Carbon disulfide	4.93E-01	---	0.00070
Carbon tetrachloride	4.56E-01	6.8E-06	0.0024
Chloroform	8.34E-02	1.9E-06	0.00085
Chloromethane	9.67E-01	---	0.011
Cyclohexane	7.07E-02	---	0.000012
Dichlorodifluoromethane	2.20E+00	---	0.011
Ethylbenzene	1.90E-01	4.7E-07	0.00019
m & p- Xylene	5.55E-01	---	0.0056
Methylene chloride	2.50E-01	1.2E-07	0.00023
n-Heptane	2.21E-01	---	---
n-Hexane	4.03E-01	---	0.00058
o-Xylene	1.96E-01	---	0.0020
Propene	1.27E+00	---	---
Styrene	5.37E-02	---	0.000054
Tetrachloroethene	3.73E-01	2.2E-06	0.0014
Tetrahydrofuran	1.66E-01	3.2E-07	0.00055
Toluene	2.01E+00	---	0.00040
Trichloroethylene (TCE)	7.65E-02	8.4E-06	0.0022
Trichlorofluoromethane	1.31E+00	---	0.0019
Metals			
Arsenic	1.38E-03	5.9E-06	0.046
Cadmium	3.63E-04	6.5E-07	0.0018
Chromium	5.46E-04	6.6E-06	0.0055
Lead	1.13E-02	---	---
Manganese	1.05E-02	---	0.21
Nickel	1.35E-03	3.2E-07	---
Zinc	5.59E-02	---	---
Total		4.1E-05	0.35

** Chromium **

The annual average concentration and risk estimates assume hexavalent chromium. The annual average concentration is calculated by multiplying the annual average concentration on Table 2-1 for total chromium by 0.17.

**Table 3-3
2007/2008 Inhalation Excess Lifetime Cancer Risks and Noncancer Hazard Quotients -
Detected Contaminants
Reading Site**

Contaminant	Annual Average Concentration (µg/m) ³	Excess Lifetime Cancer Risk	Hazard Quotient
VOCs			
1,1,2-Trichloro-1,2,2-trifluoroethane	5.18E-01	---	0.000017
1,2,4-Trimethylbenzene	1.66E-01	---	0.024
1,3,5-Trimethylbenzene	9.49E-02	---	0.016
1-Ethyl-4-methyl benzene	7.89E-02	---	---
2-Butanone (MEK)	3.01E+00	---	0.00060
2-Hexanone	5.23E-01	---	---
4-Methyl-2-pentanone (MIBK)	4.90E-01	---	0.00016
Acetone	1.49E+01	---	0.00048
Benzene	6.56E-01	5.1E-06	0.022
Carbon disulfide	3.45E-01	---	0.00049
Carbon tetrachloride	4.77E-01	7.2E-06	0.0025
Chloroethane	6.85E-02	---	0.0000069
Chloromethane	9.65E-01	---	0.011
Cyclohexane	6.12E-02	---	0.000010
Dichlorodifluoromethane	2.20E+00	---	0.011
Ethylbenzene	1.72E-01	4.3E-07	0.00017
m & p- Xylene	5.04E-01	---	0.0050
Methylene chloride	2.90E-01	1.4E-07	0.00026
n-Heptane	2.77E-01	---	---
n-Hexane	3.53E-01	---	0.00050
o-Xylene	1.85E-01	---	0.0018
Propene	1.90E+00	---	---
Styrene	7.57E-02	---	0.000076
Tetrachloroethene	1.79E-01	1.1E-06	0.00066
Toluene	1.55E+00	---	0.00031
Trichloroethylene (TCE)	2.00E-01	2.2E-05	0.0057
Trichlorofluoromethane	1.37E+00	---	0.0020
Metals			
Arsenic	1.10E-03	4.7E-06	0.037
Cadmium	3.38E-04	6.1E-07	0.0017
Chromium	7.08E-04	8.5E-06	0.0071
Lead	1.59E-02	---	---
Manganese	8.42E-03	---	0.17
Nickel	2.62E-03	6.3E-07	---
Zinc	2.65E-02	---	---
Total		5.0E-05	0.32

** Chromium **

The annual average concentration and risk estimates assume hexavalent chromium. The annual average concentration is calculated by multiplying the annual average concentration on Table 2-2 for total chromium by 0.17.

**Table 3-4
2007/2008 Inhalation Excess Lifetime Cancer Risks and Noncancer Hazard
Quotients - Non-Detected Contaminants
Kutztown Site**

Contaminant	Half MDL (µg/m) ³	Excess Lifetime Cancer Risk	Hazard Quotient
VOCs			
1,1,1-Trichloroethane	1.64E-01	---	0.000033
1,1,2,2-Tetrachloroethane	2.06E-01	1.2E-05	---
1,1,2-Trichloroethane	2.73E-01	4.4E-06	---
1,1-Dichloroethane	1.21E-01	1.9E-07	0.00024
1,1-Dichloroethene	1.98E-01	---	0.00099
1,2,4-Trichlorobenzene	2.97E-01	---	0.074
1,2-Dibromoethane	3.84E-01	2.3E-04	0.043
1,2-Dichloro-1,1,2,2,tetrafluoroethane	2.10E-01	---	---
1,2-Dichlorobenzene	1.80E-01	---	0.0013
1,2-Dichloropropane	2.31E-01	2.3E-06	0.058
1,3-Butadiene	2.87E-01	8.6E-06	0.14
1,3-Dichlorobenzene	1.80E-01	---	---
1,4-Dichlorobenzene	1.80E-01	2.0E-06	0.00023
1-Ethyl-4-methyl benzene	1.45E-01	---	---
2-Hexanone	7.03E-01	---	---
2-Methoxy-2-methyl propane (MTBE)	1.08E-01	2.8E-08	0.000036
4-Methyl-2-pentanone (MIBK)	8.20E-01	---	0.00027
Bromodichloromethane	3.35E-01	---	---
Bromoform	3.10E-01	3.4E-07	---
Bromomethane	1.94E-01	---	0.039
Chlorobenzene	2.30E-01	---	0.0046
Chloroethane	1.32E-01	---	0.000013
Chloroethene	1.28E-01	1.1E-06	0.0013
cis-1,2-Dichloroethene	1.98E-01	---	---
cis-1,3-Dichloro-1-propene	1.81E-01	7.3E-07	0.0091
Dibromochloromethane	4.26E-01	---	---
Hexachloro-1,3-butadiene	3.20E-01	7.0E-06	---
trans-1,2-Dichloroethene	2.77E-01	---	0.0046
trans-1,3-Dichloro-1-propene	1.81E-01	7.3E-07	0.0091
Total		2.7E-04	0.39

**Table 3-5
2007/2008 Inhalation Excess Lifetime Cancer Risks and Noncancer Hazard
Quotients - Non-Detected Contaminants
Reading Site**

Contaminant	Half MDL (µg/m)³	Excess Lifetime Cancer Risk	Hazard Quotient
VOCs			
1,1,1-Trichloroethane	1.64E-01	---	0.000033
1,1,2,2-Tetrachloroethane	2.06E-01	1.2E-05	---
1,1,2-Trichloroethane	2.73E-01	4.4E-06	---
1,1-Dichloroethane	1.21E-01	1.9E-07	0.00024
1,1-Dichloroethene	1.98E-01	---	0.00099
1,2,4-Trichlorobenzene	2.97E-01	---	0.074
1,2-Dibromoethane	3.84E-01	2.3E-04	0.043
1,2-Dichloro-1,1,2,2,tetrafluoroethane	2.10E-01	---	---
1,2-Dichlorobenzene	1.80E-01	---	0.0013
1,2-Dichloroethane	1.62E-01	4.2E-06	0.000067
1,2-Dichloropropane	2.31E-01	2.3E-06	0.058
1,3-Butadiene	2.87E-01	8.6E-06	0.14
1,3-Dichlorobenzene	1.80E-01	---	---
1,4-Dichlorobenzene	1.80E-01	2.0E-06	0.00023
2-Methoxy-2-methyl propane (MTBE)	1.08E-01	2.8E-08	0.000036
Bromodichloromethane	3.35E-01	---	---
Bromoform	3.10E-01	3.4E-07	---
Bromomethane	1.94E-01	---	0.039
Chlorobenzene	2.30E-01	---	0.0046
Chloroethene	1.28E-01	1.1E-06	0.0013
Chloroform	1.95E-01	4.5E-06	0.0020
cis-1,2-Dichloroethene	1.98E-01	---	---
cis-1,3-Dichloro-1-propene	1.81E-01	7.3E-07	0.0091
Dibromochloromethane	4.26E-01	---	---
Hexachloro-1,3-butadiene	3.20E-01	7.0E-06	---
Tetrahydrofuran	8.84E-02	1.7E-07	0.00029
trans-1,2-Dichloroethene	2.77E-01	---	0.0046
trans-1,3-Dichloro-1-propene	1.81E-01	7.3E-07	0.0091
Total		2.8E-04	0.39

Table 4-1
Comparison of Maximum Detected Concentrations to Acute Health Benchmarks

Contaminant	Maximum Detected Concentration (µg/m ³)		Acute REL* (µg/m ³)	AEGL-1 (µg/m ³)	NIOSH STEL/40 (µg/m ³)
	Kutztown	Reading			
VOCs					
1,1,2-Trichloro-1,2,2-trifluoroethane	6.28E-01	6.82E-01	NA	NA	2.38E+05
1,2,4-Trimethylbenzene	5.40E-01	5.90E-01	NA	6.88E+05	NA
1,2-Dichloroethane	5.26E-01	ND	NA	NA	2.00E+02
1,3,5-Trimethylbenzene	3.44E-01	5.40E-01	NA	6.88E+05	NA
1-Ethyl-4-methyl benzene	ND	2.22E-01	NA	NA	NA
2-Butanone (MEK)	4.72E+00	1.41E+01	1.30E+04	5.90E+05	2.21E+04
2-Hexanone	ND	4.01E+00	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	ND	1.64E+00	NA		7.50E+03
Acetone	1.19E+01	5.70E+01	NA	4.75E+05	NA
Benzene	2.46E+00	2.52E+00	1.30E+03	1.70E+05	7.98E+01
Carbon disulfide	1.18E+00	2.40E+00	6.20E+03	4.00E+04	7.50E+02
Carbon tetrachloride	7.54E-01	8.17E-01	1.90E+03	2.80E+05	3.15E+02
Chloroethane	ND	1.66E-01	NA	NA	NA
Chloroform	4.88E-01	ND	1.50E+02	NA	2.45E+02
Chloromethane	1.28E+00	1.53E+00	NA	NA	NA
Cyclohexane	5.16E-01	1.62E-01	NA	NA	NA
Dichlorodifluoromethane	2.77E+00	2.77E+00	NA	NA	NA
Ethylbenzene	7.38E-01	6.94E-01	NA	1.43E+05	1.36E+04
m & p- Xylene	1.74E+00	2.13E+00	2.20E+04	5.64E+05	1.64E+04
Methylene chloride	6.25E-01	1.91E+00	1.40E+04	6.90E+05	NA
n-Heptane	7.37E-01	8.60E-01	NA	NA	4.50E+04
n-Hexane	9.51E-01	1.02E+00	NA	NA	NA
o-Xylene	6.08E-01	7.38E-01	2.20E+04	5.64E+05	1.64E+04
Propene	3.44E+00	4.99E+00	NA	NA	NA
Styrene	1.40E-01	3.58E-01	2.10E+04	8.50E+04	1.06E+04
Tetrachloroethene	5.56E+00	4.20E-01	2.00E+04	2.40E+05	NA
Tetrahydrofuran	1.83E+00	ND	NA	NA	1.84E+04
Toluene	2.26E+01	4.90E+00	3.70E+04	7.50E+05	1.40E+04
Trichloroethylene (TCE)	1.72E-01	1.18E+00	NA	7.00E+05	NA
Trichlorofluoromethane	1.63E+00	1.74E+00	NA	NA	1.40E+05
Metals					
Arsenic	1.22E-02	2.93E-03	1.90E-01	NA	5.00E-02
Cadmium	1.44E-03	1.79E-03	NA	NA	NA
Chromium	7.25E-03	8.55E-03	NA	NA	NA
Lead	5.90E-02	6.30E-02	NA	NA	NA
Manganese	4.66E-02	2.51E-02	NA	NA	7.50E+01
Nickel	5.03E-03	9.35E-03	6.00E+00	NA	NA
Zinc	6.31E-01	7.12E-02	NA	NA	NA

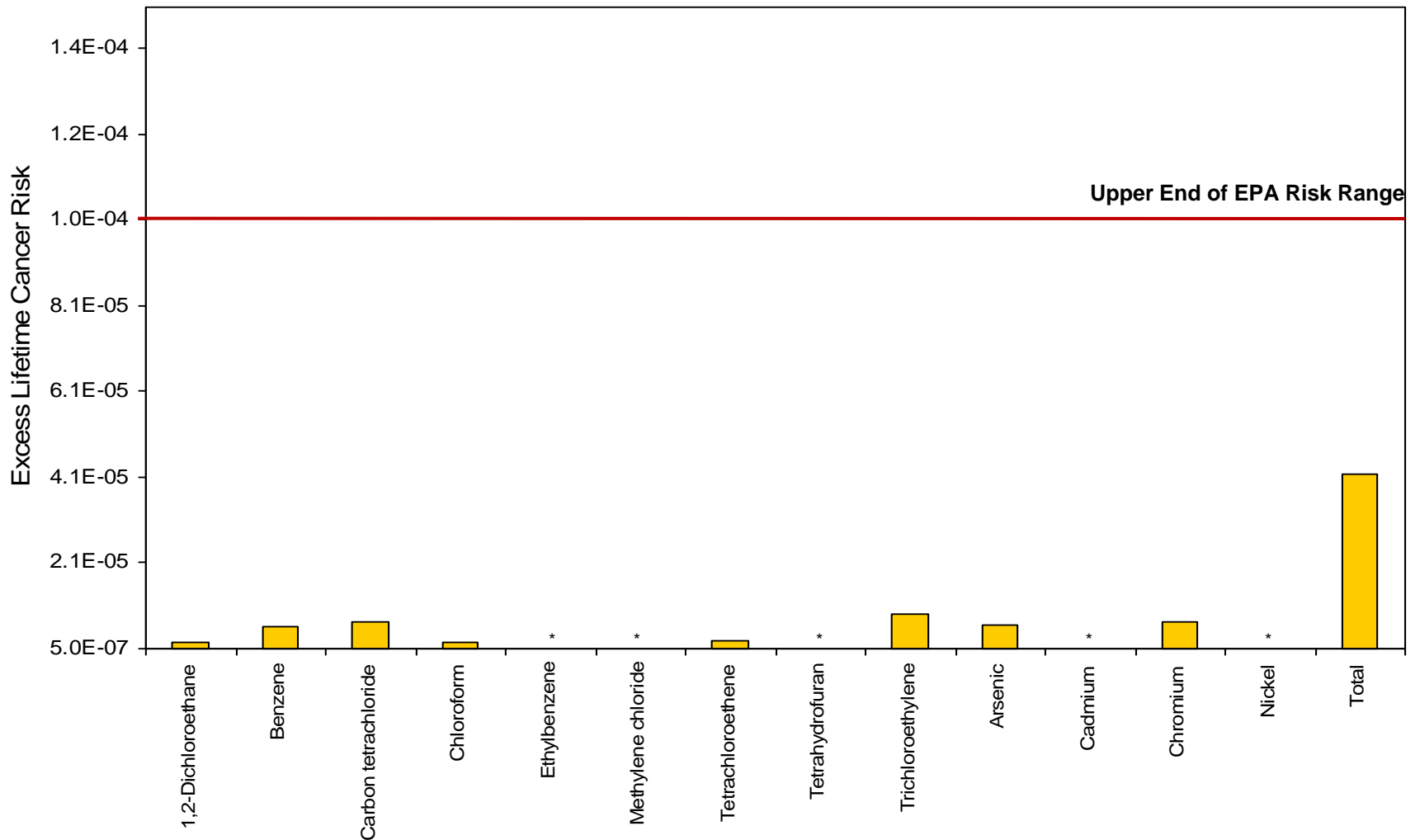
NA = not available.

ND = not detected.

* CalEPA, 1999.

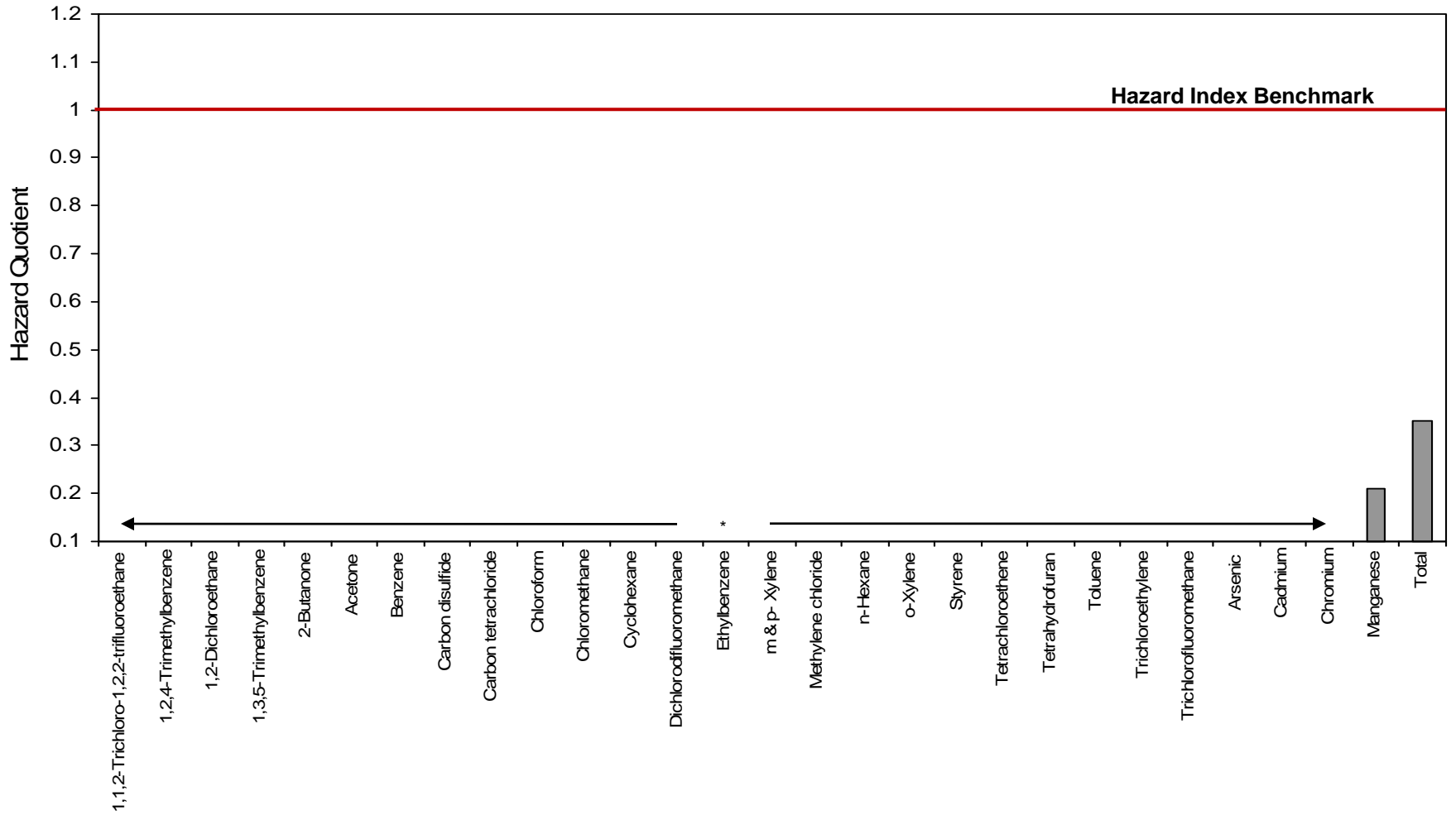
FIGURES

FIGURE 3-1
SUMMARY OF EXCESS LIFETIME CANCER RISKS
KUTZTOWN SITE – 2007/2008 DATA



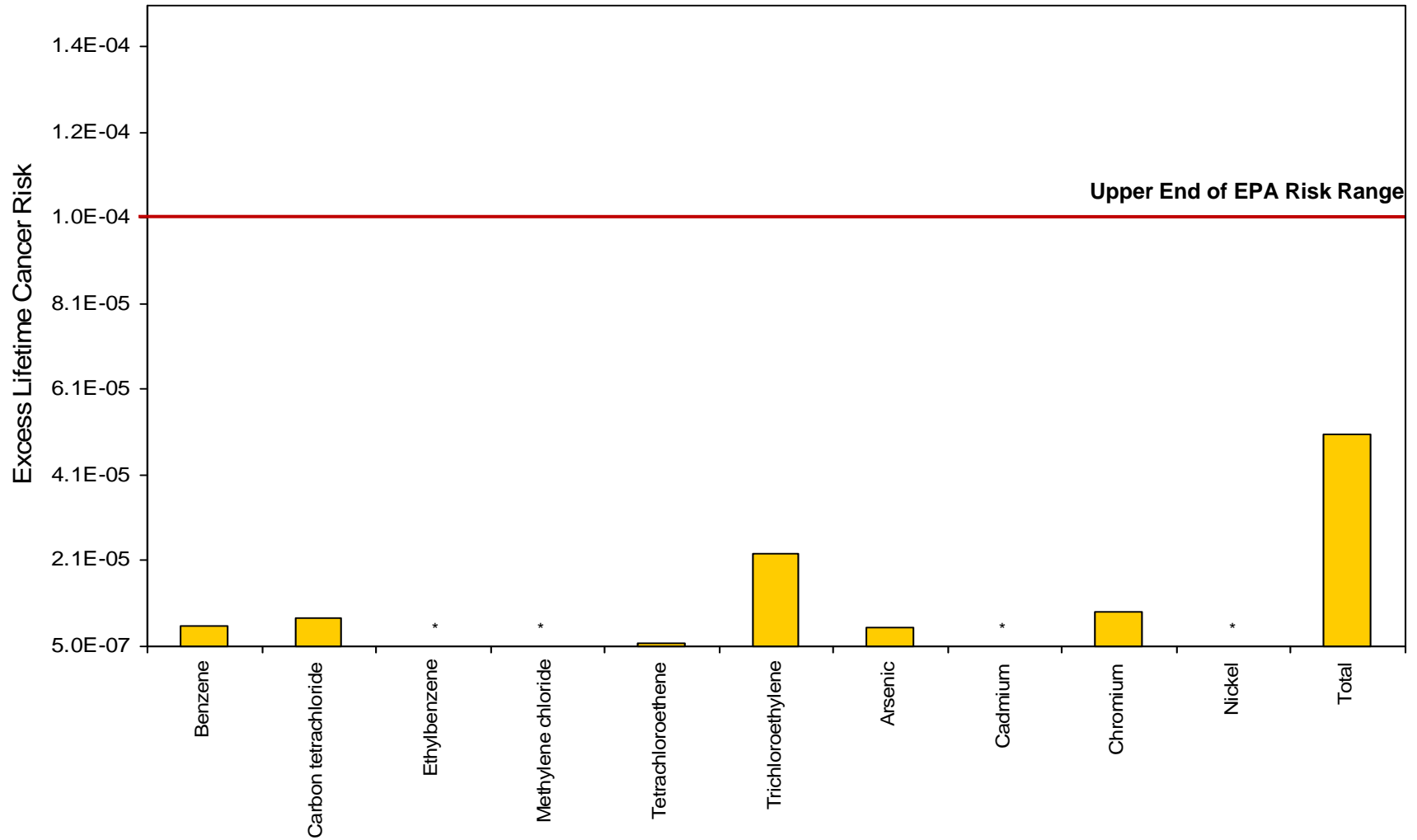
* = less than 1×10^{-6} .

**FIGURE 3-2
SUMMARY OF HAZARD QUOTIENTS
KUTZTOWN SITE – 2007/2008 DATA**



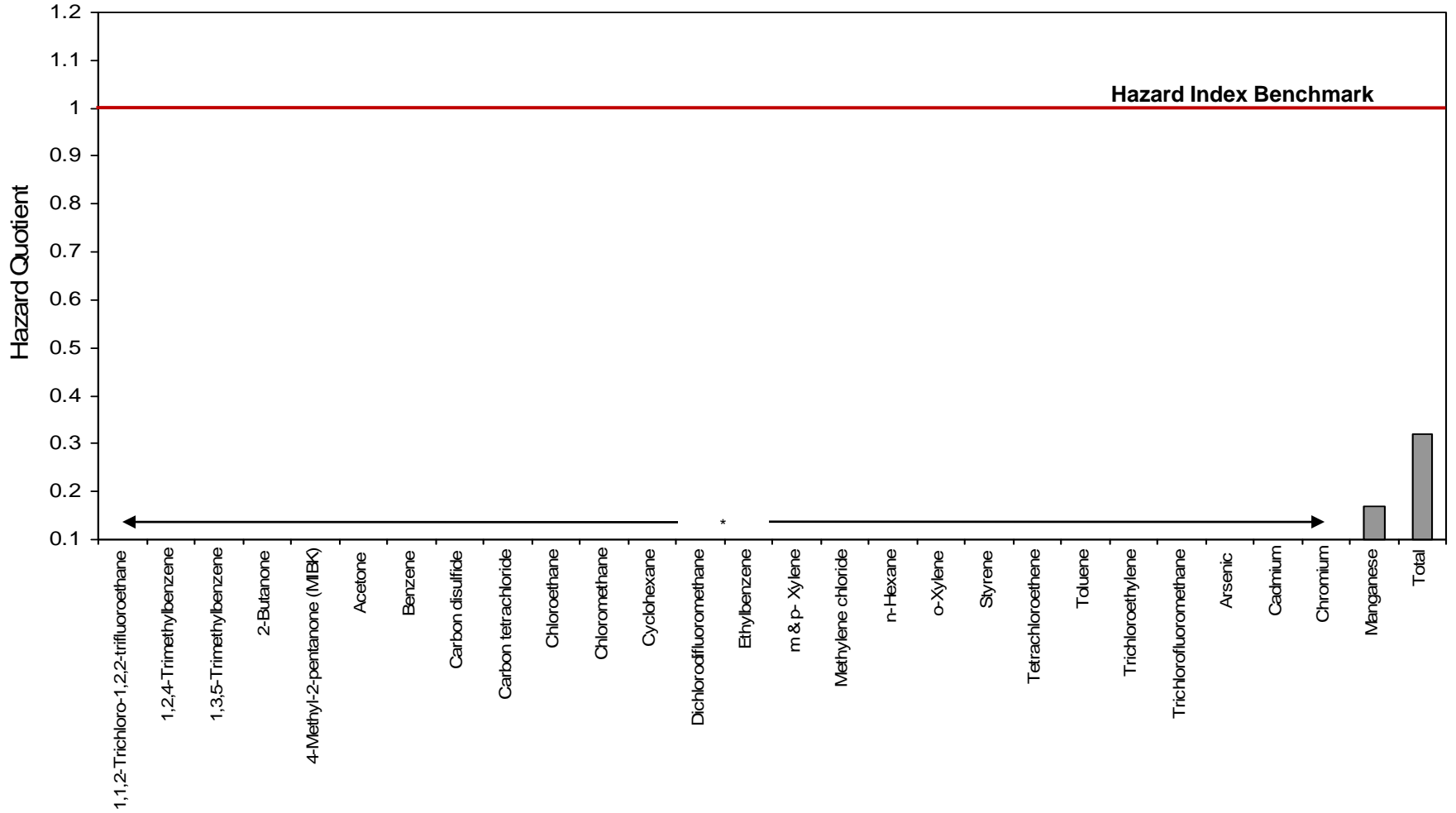
* = less than 0.1.

FIGURE 3-3
SUMMARY OF EXCESS LIFETIME CANCER RISKS
READING SITE – 2007/2008 DATA



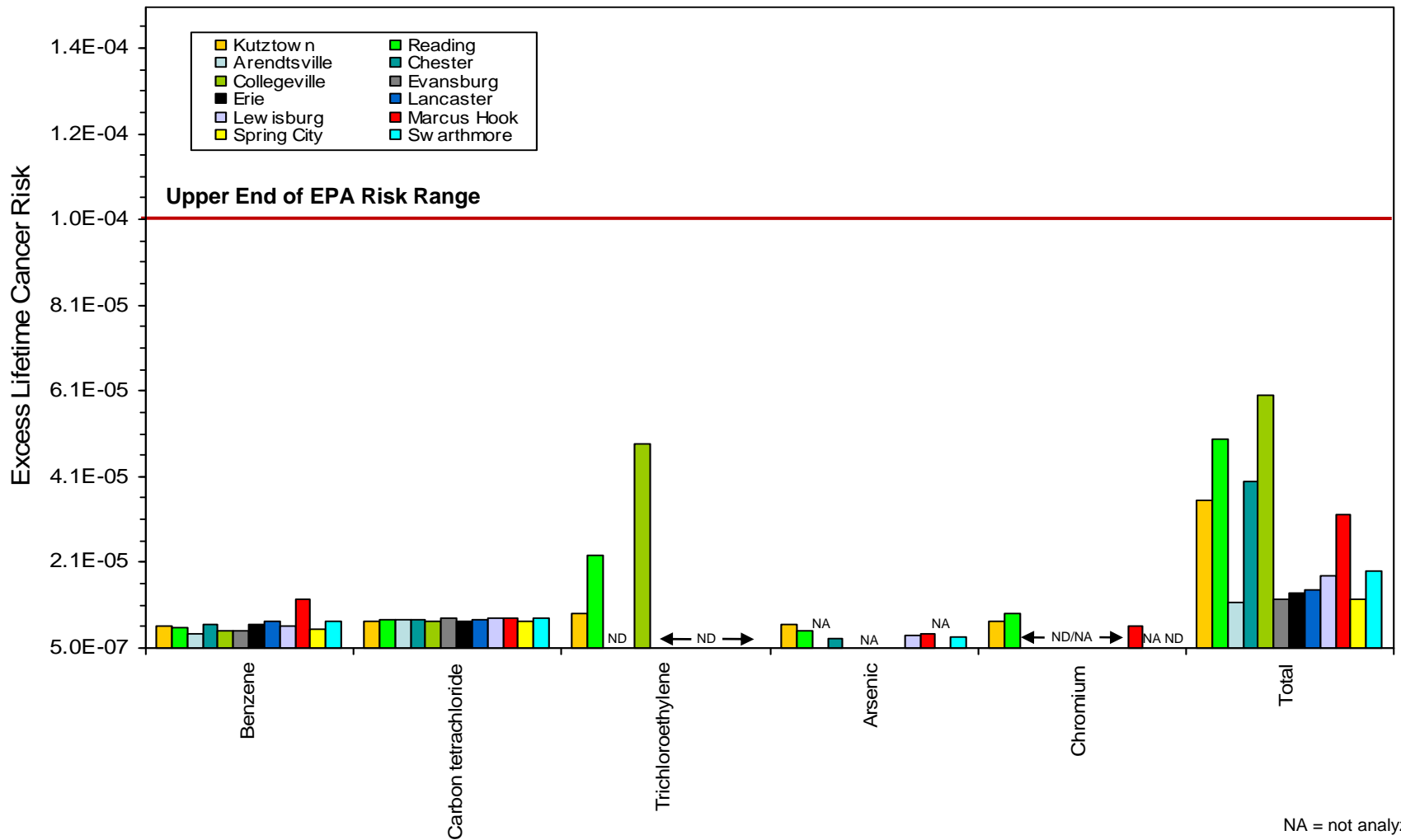
* = less than 1E-06.

**FIGURE 3-4
SUMMARY OF HAZARD QUOTIENTS
READING SITE – 2007/2008 DATA**

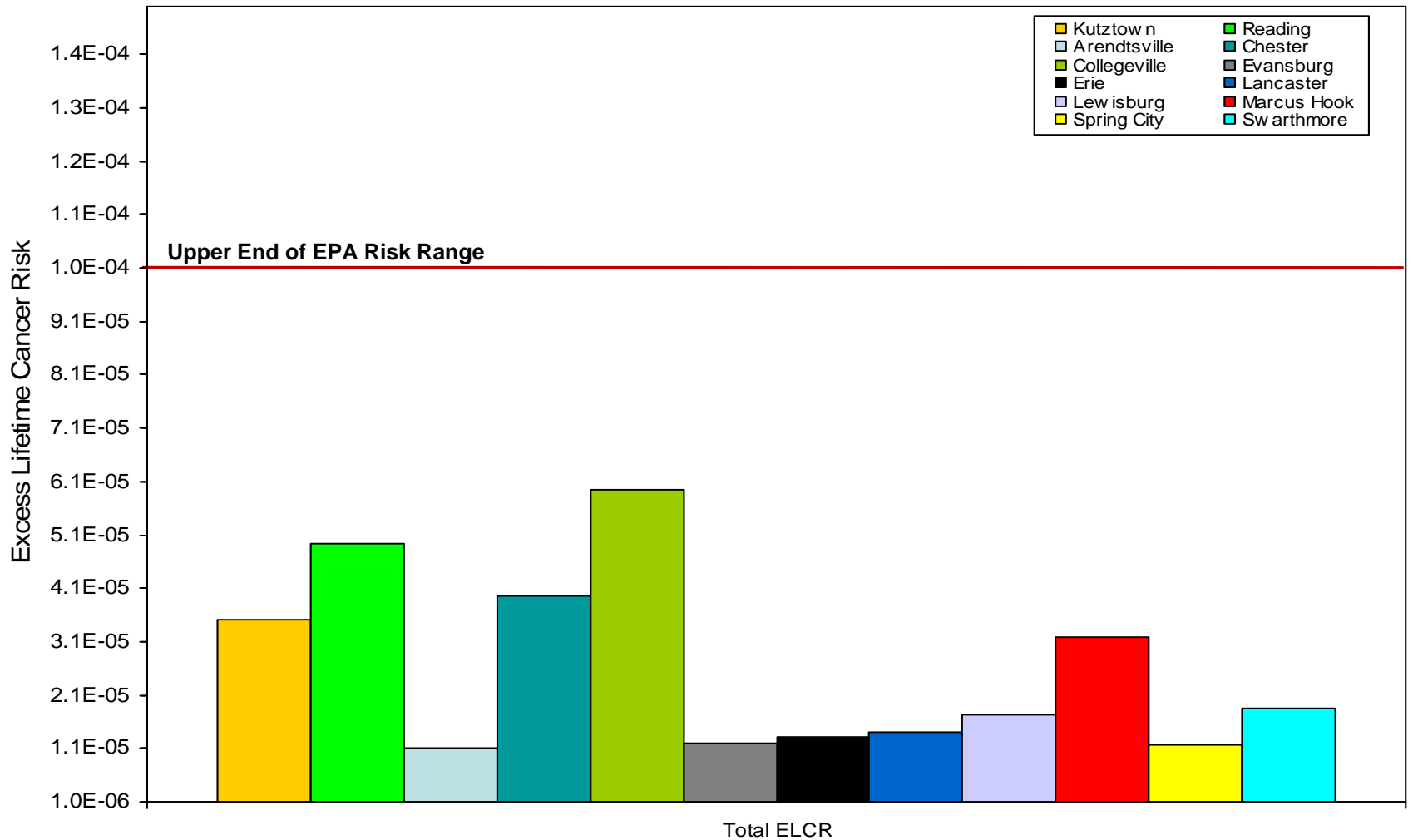


* = less than 0.1.

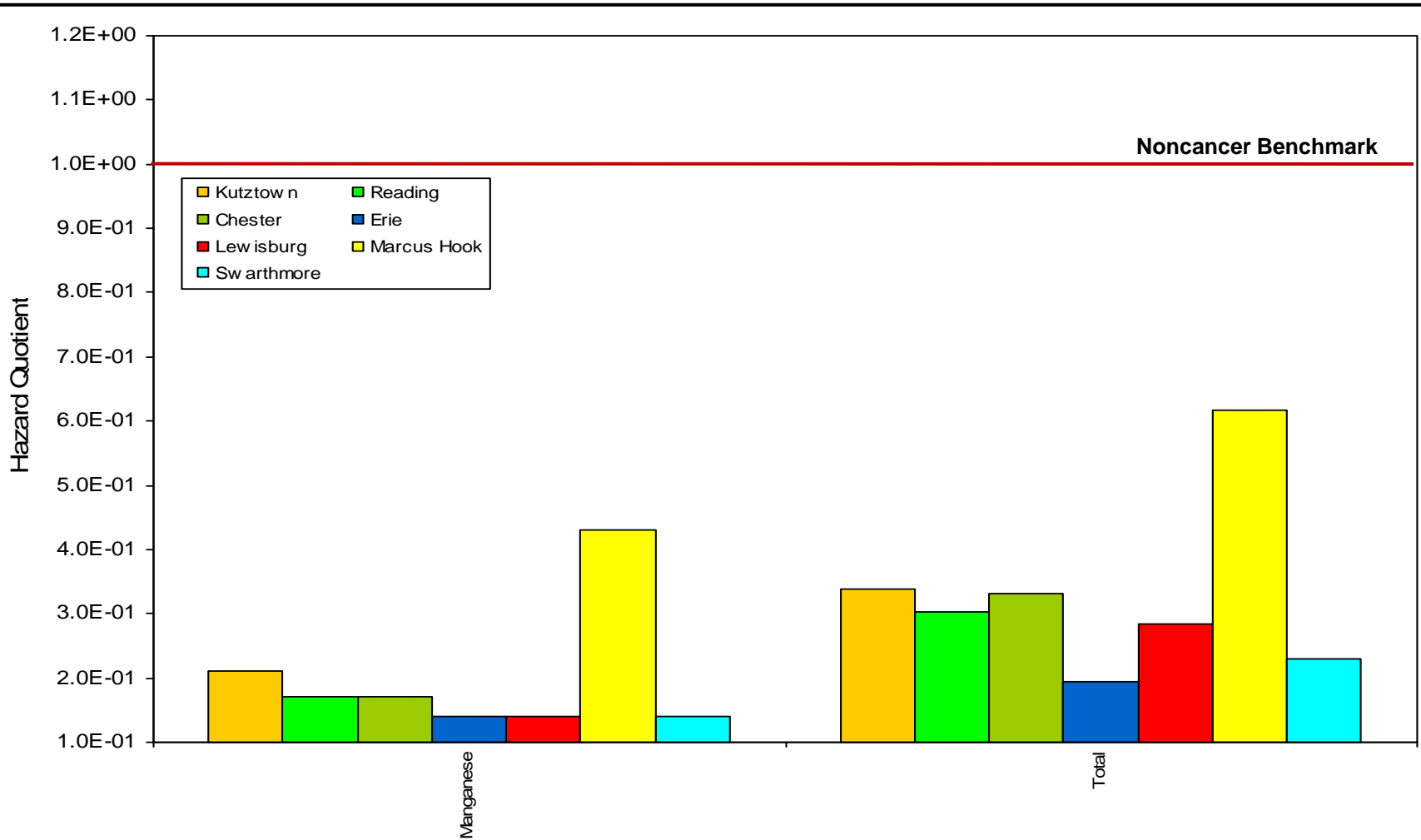
**FIGURE 5-1
COMPARISON OF 2007/2008 EXCESS LIFETIME CANCER RISKS FROM BERKS COUNTY
WITH 2008 ESTIMATES FROM PADEP MONITORING SITES**



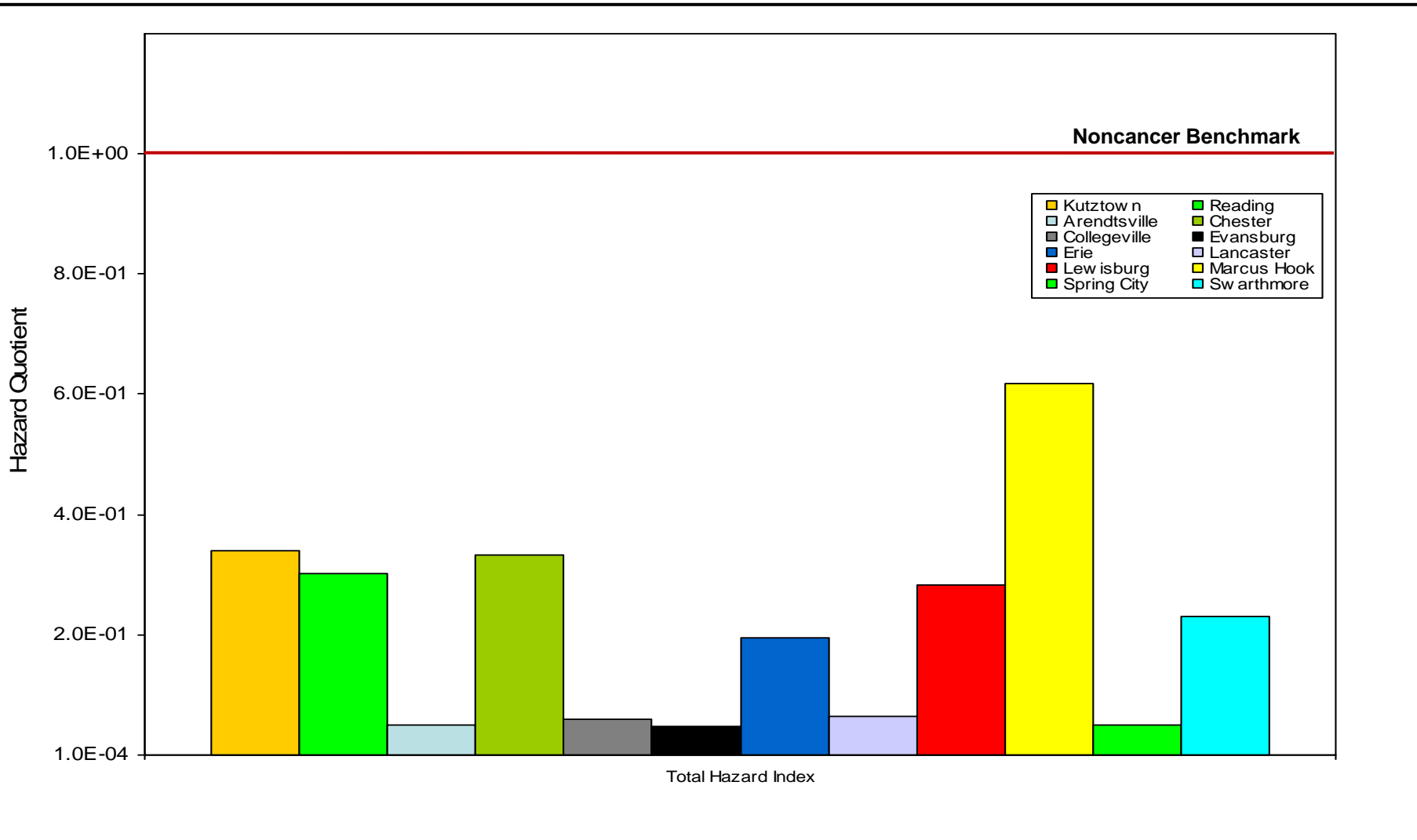
**FIGURE 5-2
COMPARISON OF TOTAL 2007/2008 EXCESS LIFETIME CANCER RISKS FROM BERKS COUNTY
WITH 2008 ESTIMATES FROM PADEP MONITORING SITES**



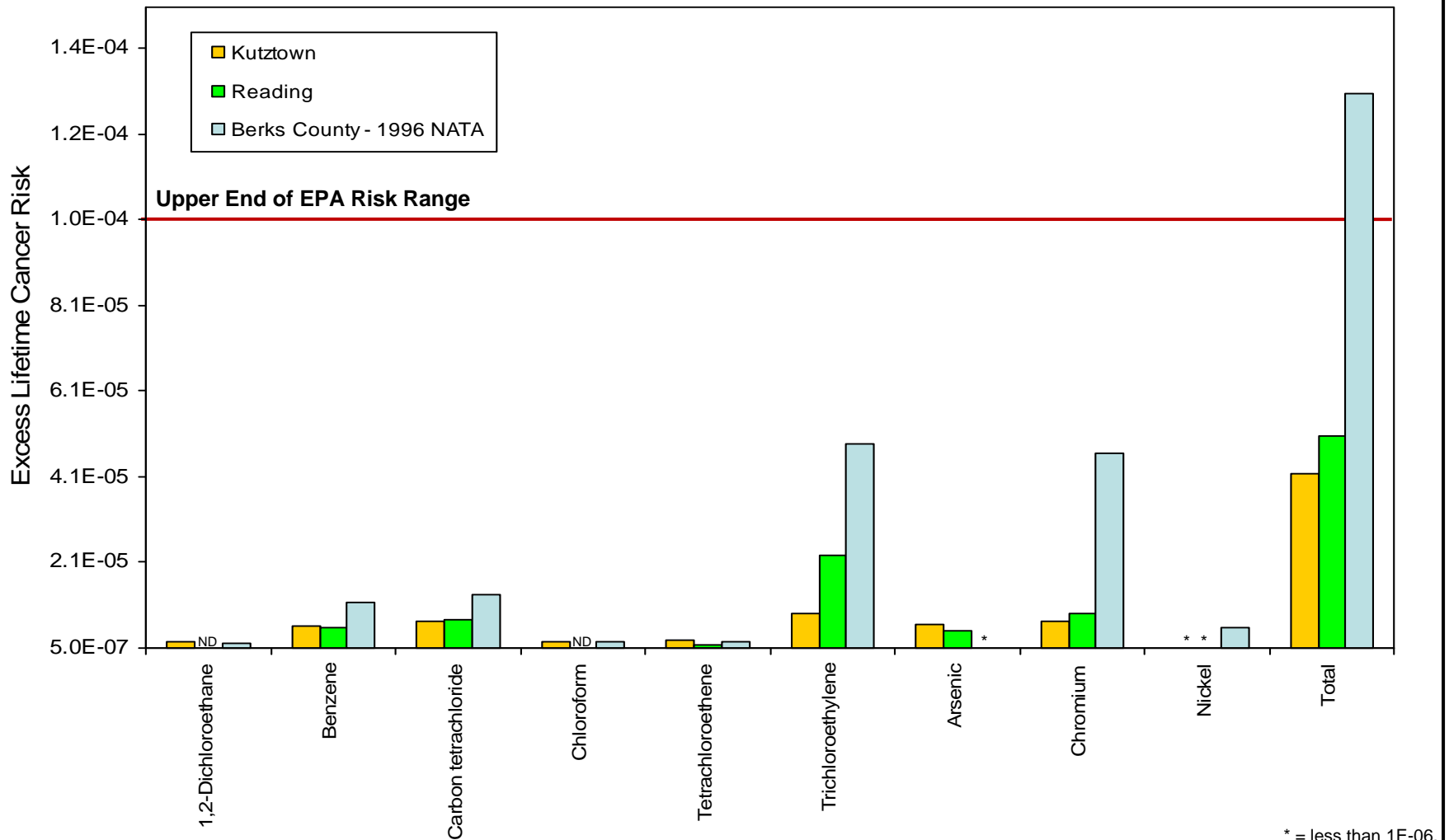
**FIGURE 5-3
COMPARISON OF 2007/2008 HAZARD QUOTIENTS FROM BERKS COUNTY
WITH 2008 ESTIMATES FROM PADEP MONITORING SITES**



**FIGURE 5-4
COMPARISON OF TOTAL 2007/2008 HAZARD INDICES FROM BERKS COUNTY
WITH 2008 ESTIMATES FROM PADEP MONITORING SITES**

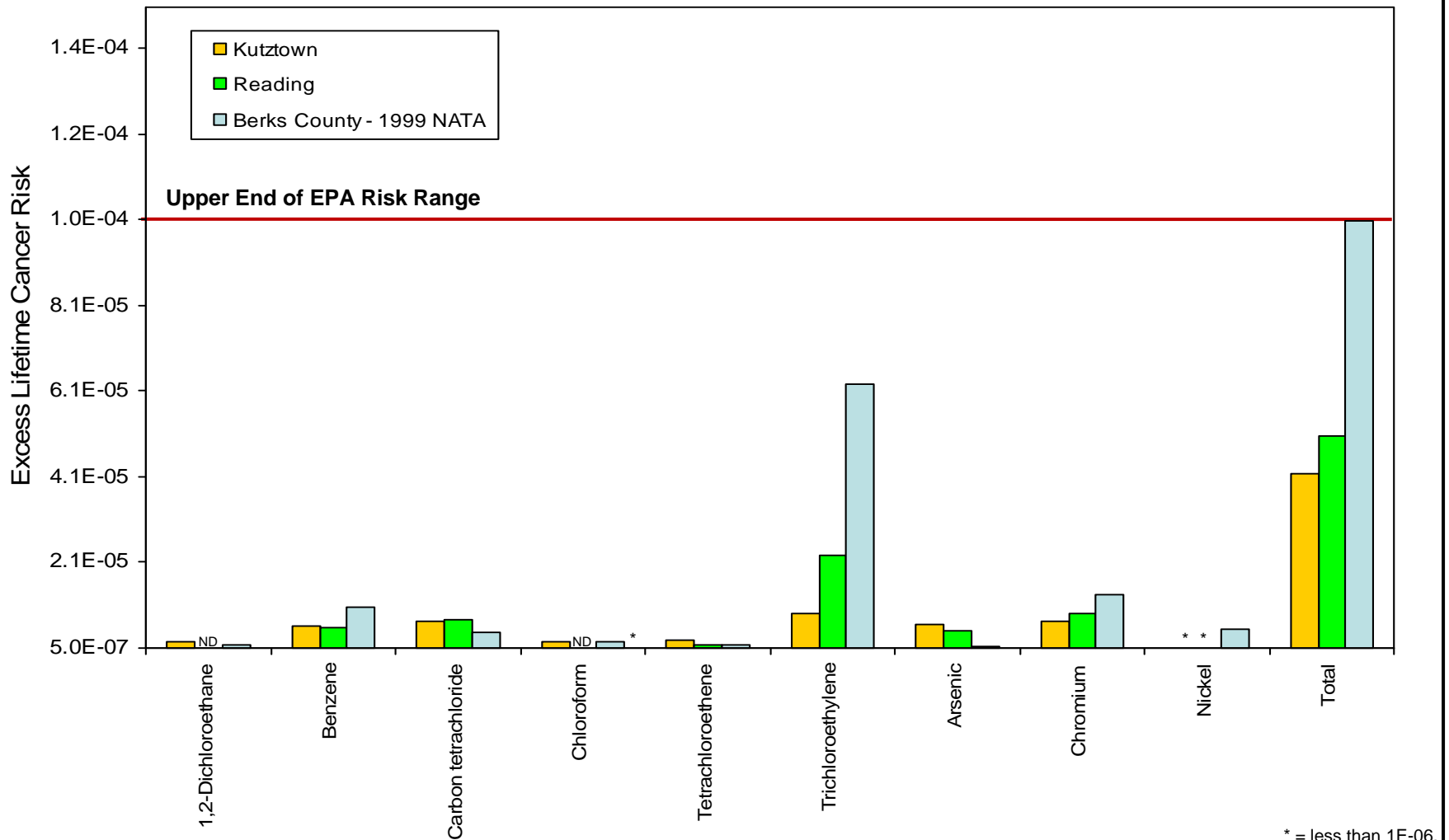


**FIGURE 5-5
COMPARISON OF 2007/2008 EXCESS LIFETIME CANCER RISKS FROM BERKS COUNTY
WITH 1996 NATA BERKS COUNTY ESTIMATES**



* = less than 1E-06.
ND = not detected.

**FIGURE 5-6
COMPARISON OF 2007/2008 EXCESS LIFETIME CANCER RISKS FROM BERKS COUNTY
WITH 1999 NATA BERKS COUNTY ESTIMATES**



* = less than 1E-06.
ND = not detected.

FIGURE 5-7
COMPARISON OF TOTAL 2007/2008 EXCESS LIFETIME CANCER RISKS FROM BERKS COUNTY
WITH TOTAL 1996 AND 1999 NATA BERKS COUNTY ESTIMATES

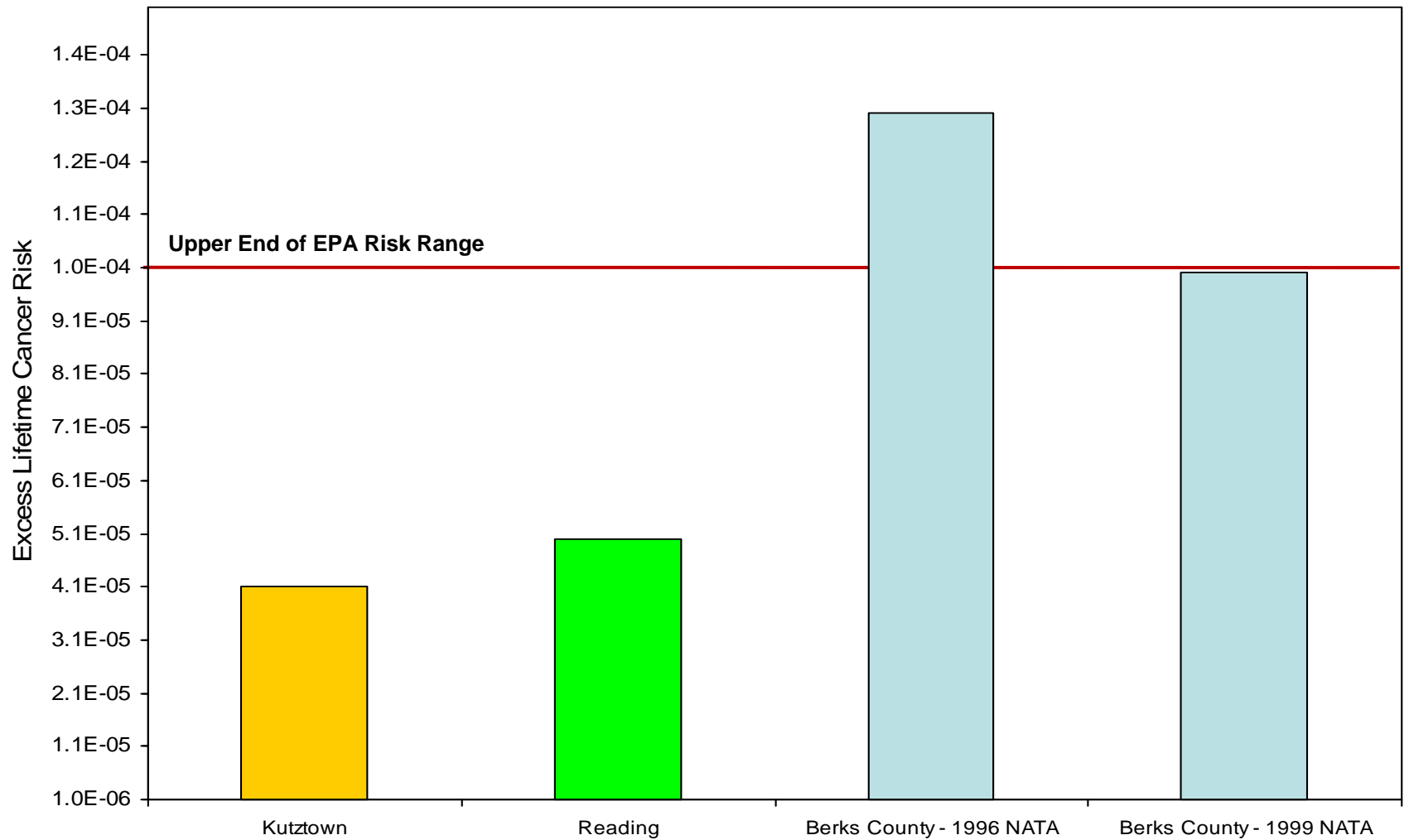


FIGURE 5-8
COMPARISON OF 2007/2008 HAZARD QUOTIENTS FROM BERKS COUNTY
WITH 1996 NATA BERKS COUNTY ESTIMATES

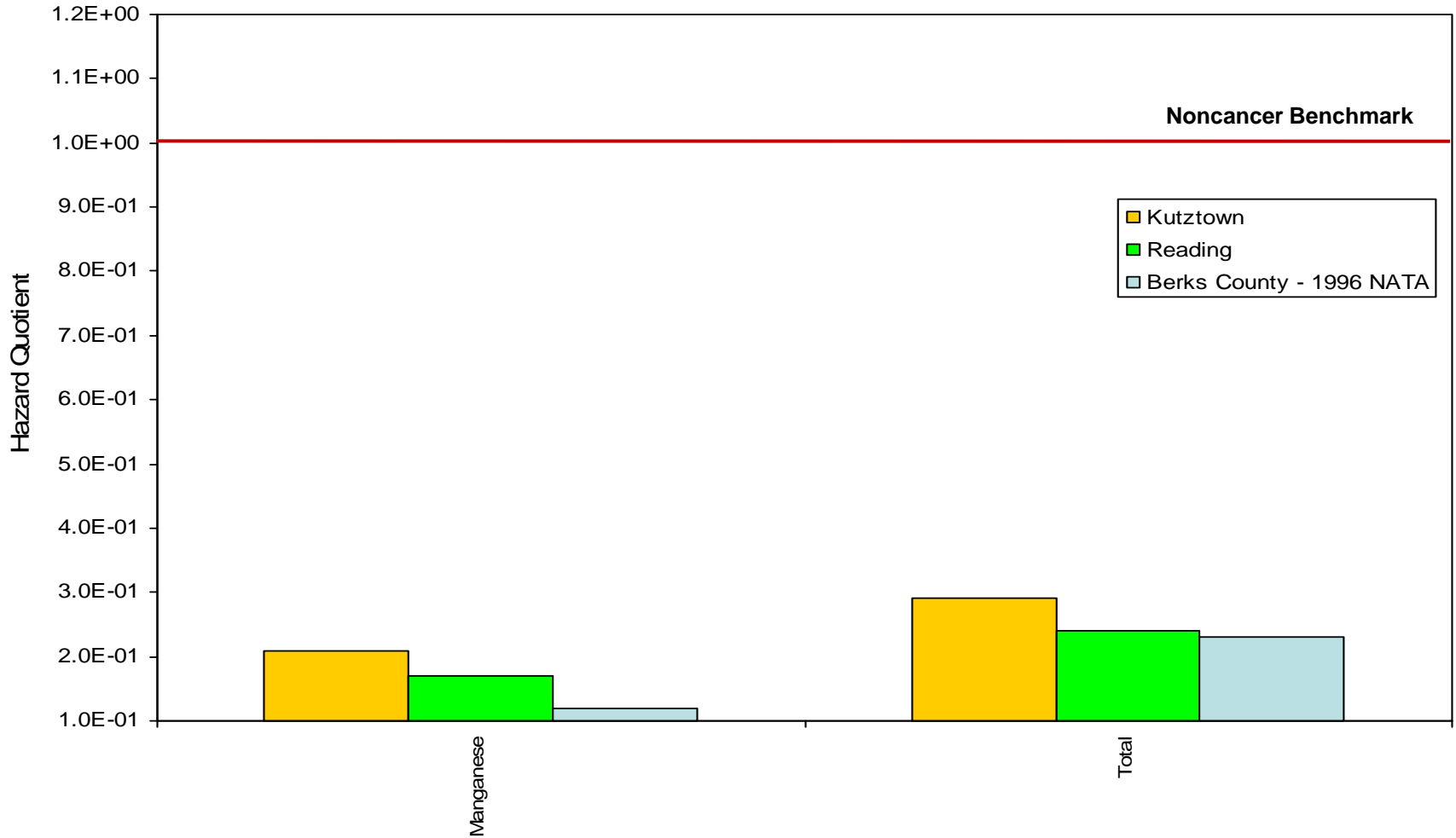


FIGURE 5-9
COMPARISON OF 2007/2008 HAZARD QUOTIENTS FROM BERKS COUNTY
WITH 1999 NATA BERKS COUNTY ESTIMATES

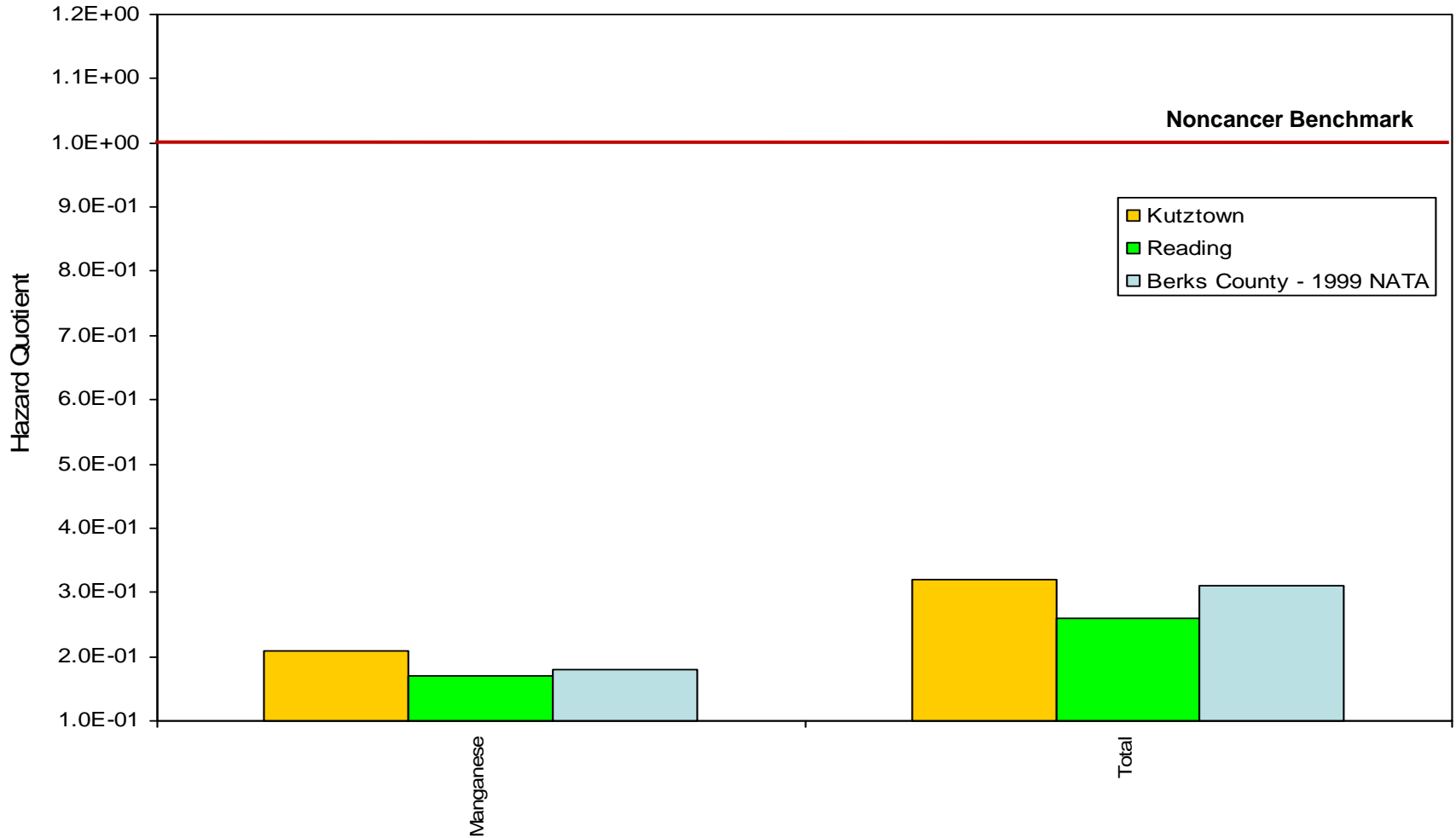
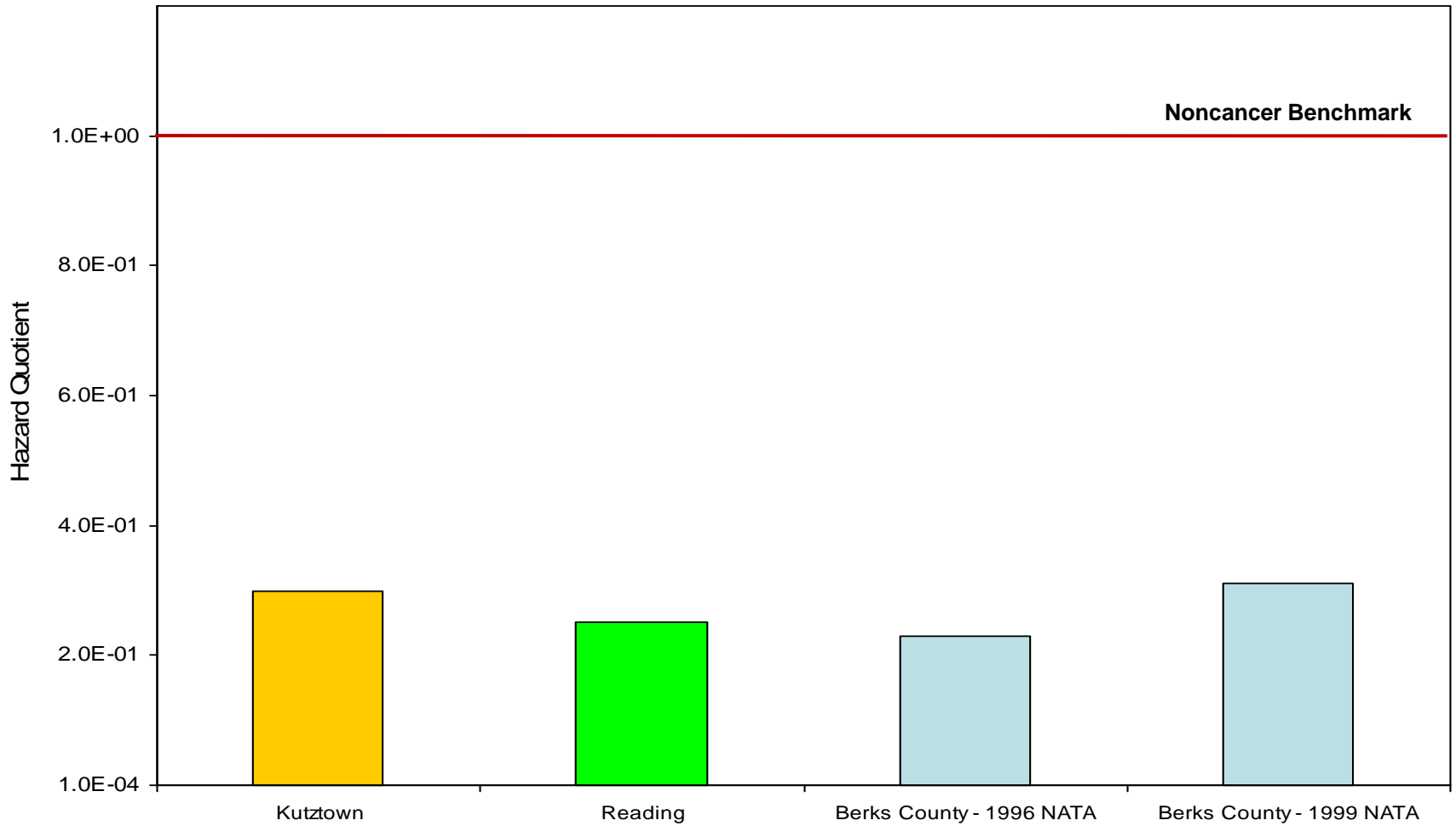


FIGURE 5-10
COMPARISON OF TOTAL 2007/2008 HAZARD INDICES FROM BERKS COUNTY
WITH TOTAL 1996 AND 1999 NATA BERKS COUNTY ESTIMATES



APPENDICES

APPENDIX A

Response to PADEP Comments

APPENDIX A

RESPONSE TO COMMENTS MATRIX

Number	Comment	Disposition of Comment
1	There should be a section in the report detailing the specifics of sample collection and analysis.	Additional information will be included in the report.
2	The dose estimate approach used to determine the amount of a particular pollutant taken in by a person exposed to a specific chemical concentration for the chronic risk assessment is consistent with that considered acceptable to the Department. Specifically for chronic risks the ambient concentration was multiplied by the appropriate unit risk factor which assumes a 70 year exposure for 365 days/year for 24 hours per day, for a person who weighs 70 kg and breathes 20m ³ per day.	No revisions necessary
3	The cancer risks for all compounds which had unit risk factors were then added together to quantify the cancer risk for a particular measuring site for that year. This summing of the cancer risks for each compound for which quantitative cancer endpoints are available is appropriate.	No revisions necessary
4	The non-cancer risk for each compound was quantified by calculating the hazard index by dividing the measured concentration by the appropriate reference concentration. The hazard indexes for each compound with a reference concentration were then added together to calculate the overall hazard quotient for that site. This summing of the non-cancer risks for each compound for which hazard indexes are available is appropriate.	No revisions necessary
5	To accurately assess the non-cancer risks the hazard indexes for each compound could have been subdivided into categories relating to the target organs affected by each set of compounds. This would give the most accurate estimate of the true non-cancer risks associated with the compounds measured at these sites.	No revisions necessary
6	<p>The hierarchy of toxicity data sources utilized in this risk assessment is similar to that used by the Department. However, the hierarchy of sources used in the chronic risk assessment portion is not formally the same as the Department's and thus may not match the hierarchy recommended by the US EPA. The hierarchy of toxicity sources recommended for use in risk assessments submitted to the Department is that presented in the US EPA's Region 6 Human Health Risk Assessment Protocol for Hazardous Waste Combustors. This source sets forth a formal selection process for cancer and non-cancer toxicity endpoints. This resource provides hierarchies for the selection of toxic endpoints for both acute and chronic risk assessments.</p> <p>Acute assessments submitted to the Department are required to compare hourly maximum concentrations to additional health risk benchmarks than those utilized in the Berks Assessment. These include comparing the maximum hourly concentration to the National Institute for Occupational Safety and Health (NIOSH) short term exposure level (STEL) divided by 40.</p>	<p>The hierarchy presented in the Region 6 combustor guidance will be followed. There are likely to be cases where toxicity values have changed. The most recent toxicity values will be used in the HHRA. Consideration will also be given to the toxicity values used in Department Air Toxics Study reports in an effort to achieve consistency among reports.</p> <p>A comparison with modified STELs will be performed against the maximum daily concentration since hourly data is not available.</p>

APPENDIX A

RESPONSE TO COMMENTS MATRIX

Number	Comment	Disposition of Comment
7	The data presented in the Berks County assessment which does not contain the non-detects is not suitable for comparison with the Department's risk numbers which do contain non-detected values.	Noted, no revision necessary
8	When MDLs vary greatly from one year to the next, as they did between '07 and '08 in this study, due to variability in laboratory analysis this can significantly affect the overall calculated risks when non-detects are assumed to be present.	Noted, no revision necessary.
9	Although the sources of air toxics emissions are not discussed in the risk assessment, Gavin mentioned in his e-mail to Joyce the association between benzene and vehicles. Since, as he mentions, carbon tetrachloride is also a leading organic driver for cancer risk, it might be pointed out that its use was essentially banned by the '96 Montreal Protocol.	Noted, no revision necessary.
10	The IRIS unit risk factor for chromium VI is 0.012 m ³ /ug. The unit risk factor for chromium VI presented in the EPA Region 3 RBC table is 0.084 m ³ /ug. Since IRIS is higher on the hierarchy of data toxicity sources, the Department concurs with the Berk's county risk assessment in its choice of the IRIS unit risk factor to represent the chromium VI cancer risk.	No revisions necessary
11	The proposed method to estimate the concentration of chromium VI present in the total chromium concentration as proposed in the Berks County risk assessment is reasonable based on the discussion in the uncertainty section in the chromium VI risk report found in IRIS. However, the actual percentage of chromium VI in the total chromium is based upon the nature of the source emitting the chromium, thus a speciated chromium sample is the only valid way to determine the amount of chromium VI measured at the study location.	No revisions necessary
12	Although the chromium monitoring technique used by DEP does not lend itself to accurate speciation for the determination of chromium VI, sampling techniques used in stack testing are capable of determining the concentration of chromium VI in gas samples.	No revisions necessary

APPENDIX A

RESPONSE TO COMMENTS MATRIX

Number	Comment	Disposition of Comment
13	<p>Out of the 63 compounds reviewed in the risk assessment there were two compounds for which the Department utilized a unit risk factor to assess cancer risk whereas the Berks County assessment did not. These were: tetrahydrofuran and lead.</p> <p>The Department used a more conservative unit risk factor for trichloroethylene (TCE) than was used in the Berks County assessment.</p> <p>The Berks County risk assessment utilized a unit risk factor for 2-methoxy-2-methyl propane (MTBE) whereas the Department used none.</p>	<p>The provisional tetrahydrofun toxicity value will be included in the final report. Per national guidance on the evaluation of lead, risks will not be estimated for lead using the CalEPA URF for lead. The lead risk associated with the URF will be qualitatively discussed in the report.</p> <p>EPA's draft TCE toxicity values will be included in the final report.</p> <p>The MTBE URF was obtained from CalEPA which is one of EPA's sources in its toxicity criteria hierarchy.</p>
14	<p>Out of the 63 compounds analyzed there were more discrepancies for the chronic non-cancer reference concentrations between the Berks County assessment and the Department's assessment. There were two compounds for which DEP had reference concentrations, but the Berks County Assessment did not. There were three compounds for which the Berks County Assessment had reference concentrations but the DEP's did not. Finally, for eight compounds the Department had different reference concentrations. In each of those eight cases the Department's reference concentration was more conservative than the value used in the Berks Assessment.</p>	<p>The final report will be revised to follow DEP's hierarchy. Any deviations from this will be noted in the report.</p>
15	<p>Comparing the Department's cancer risk values with the risk values in the Berks County Report, including both the detected and non-detected compounds, shows them to be essentially the same considering the uncertainties inherent in the risk assessment process.</p>	<p>No revisions necessary</p>
16	<p>The Department agrees with the risk assessment conclusion that the health risks shown by the monitoring at the Reading and Kutztown sites for 2007 and 2008 are approximately equal to, or below, those found at other PA air toxics monitoring sites.</p>	<p>No revisions necessary</p>

APPENDIX A

RESPONSE TO COMMENTS MATRIX

Number	Comment	Disposition of Comment
17	Although the risk assessment references NATA as an exercise in national-scale modeling, the discussion regarding the discrepancy between measured ambient concentrations of arsenic and cadmium and those provided by NATA modeling does not address the likelihood that the inventory used in the NATA modeling may have omitted or otherwise failed to account for the source(s) of these compounds. In a very real sense, ambient measurements such as those detailed in the study both validate NATA and demonstrate its shortcomings, and may ultimately serve as a means to improve the reality of the emission inventories and assumptions which it incorporates. But even with the higher risk level values in the risk assessment for arsenic and cadmium, the ambient concentrations of those metals fall well within the range considered acceptable by EPA.	No revisions necessary
18	“The 1999 national-scale assessment includes emissions and ambient concentrations for 177 air toxics plus diesel PM. It also includes an exposure and risk assessment (cancer risk and noncancer hazard) for 133 of these air toxics (this subset is identified in the list of 178 pollutants in the assessment), plus an exposure and noncancer hazard assessment for diesel PM. EPA was able to characterize the cancer risk and noncancer hazard from this subset of 133 air toxics and diesel PM since these pollutants have health data based on chronic exposure. It should be noted that in December 2005 the EPA removed Methyl Ethyl Ketone (MEK) from the Clean Air Act list of HAPs, However, NATA was conducted prior to this action, thus MEK was included in the assessment.” http://www.epa.gov/ttn/atw/nata1999/nata99faq.html#A4	No revisions necessary
19	DEP prefers to gather a years worth of data to factor out seasonal variability. Would you consider combining the 2007 and 2008 data that you have into one period (summer 2007 to summer 2008)? And then when the rest of 2008 data is available, switch to a calendar year period for future reports?	The data from 2007 and 2008 will be combined for both sites and carried forward in this inhalation risk assessment as such.
20	You may want to put a disclaimer that the lead data is from a method that uses quartz filters and ICP/MS analysis and is not the Federal Reference Method for lead sampling.	Additional information will be provided in the final report.
21	Technically, the metals data uses 1/2 the Reporting Limit for non-detects, whereas the VOC data uses 1/2 the Method Detection Limit for non-detects.	Noted, the final report will clearly state this.
22	Page 2 - Sect 1.2 - 2nd to last sentence - should be 8 metals instead of 7.	Revision will be made.
23	Page 5 - first sentence - 2000 should be 2008	Revision will be made.
24	Page 7 - Sect 3.1 - 3rd sentence - spell out or define COPC.	COPC will be replaced with contaminant.
25	Page 11 - Check the National Lifetime Cancer Risk value. The 2008 Cancer Facts & Figures has 1 in 3 for woman and 1 in 2 for men, meaning it's most likely closer to 1 in 2.5 (or 4 in 10).	Text will be revised to include 1 in 3 women and 1 in 2 men.

APPENDIX A

RESPONSE TO COMMENTS MATRIX

Number	Comment	Disposition of Comment
26	Table 3-1 - CalEPA has a URF for lead (1.2 E-5 m3/ug)(B2).	See response to comment #13

APPENDIX B

Air Toxic Sample Collection and Analysis Methodology

APPENDIX B

AIR TOXIC SAMPLE COLLECTION AND ANALYSIS METHODOLOGY

Organic Toxic Sampling and Analysis

Air samples for organic compound analysis are collected in evacuated stainless steel 6-liter canisters (Summa canisters). The canisters are cleaned and evacuated by the PADEP lab in batches. After each batch is cleaned, at least one canister is filled and retested as a blank to verify they are clean. Canisters are mailed from PADEP to PICEH via UPS and a PICEH technician transports the canister to the Kutztown monitoring site and connects the clean canister to an automated canister sampler, the Entech Instruments 1800 sampler. The sampler is housed in a temperature controlled shelter. A blower continuously draws ambient air into the shelter through a glass sampling cane and manifold. After the canister is connected to the Entech sampler, a leak check is performed and the sampler is set to operate over the next 24-hour sampling period. The Entech 1800 sampler uses a flow controller to fill the canister at a rate of 3 cc/min for 24 hours. The sampler datalogger logs the start and end vacuum pressure and flowrates during sampling. In the event of a canister connection leak, the sampler will abort sampling if the vacuum pressure in the canister is too low. The canisters are collected by a PICEH technician, and the sampling date, canister ID, sampling pressure data, and any sampler flags are logged on a chain of custody form and mailed back to the PADEP laboratory via UPS for analysis.

The summa canister samples are analyzed using gas chromatography/mass spectrometry (GC/MS) in accordance with EPA Compendium Method TO-15, "Determination of Volatile Organic Compounds in Air Collected in Specially-Prepared Canisters and Analyzed by GC/MS". The GC/MS instrument detects very low levels of pollutants at fractions of a part per billion, by concentrating the pollutants onto a trap cooled with liquid nitrogen. The GC/MS separates the chemical compounds and then detects and identifies compounds by matching ion fragment patterns and retention times to known chemical standards. The 55 target VOC compounds include 33 "hazardous air pollutants" listed in Title III of the 1990 Clean Air Act Amendments. The lab reports the

concentrations of VOCs in parts per billion volume (ppbv). The method detection limits (MDLs) are determined by a standard laboratory quality control procedure (40 CFR Part 136, Appendix B). The DEP laboratory also has a reporting limit for each compound, typically ten times the MDL, above which the measured concentrations meet the laboratory standard for accuracy. The GC/MS system is calibrated using working standards prepared from a 500 ppbv, 60-component commercial gas cylinder standard diluted with humidified nitrogen.

Metal Toxic Sampling and Analysis

Airborne particulate samples are collected on 8" x 10" quartz fiber filters using high-volume samplers. PICEH receives pre-weighed filters from the PADEP in the mail and a PICEH technician places one filter every 6 days in a Tisch total suspended particulate sampler that employs a critical volume control orifice and that operates at 40 actual cubic feet per minute. The Tisch sampler uses a manual timer to turn the sample blower on and off once every seven days. The timer is advanced 24 hours every time a filter is changed. The technician measures the pressure differential across the clean filter after it is placed and across the dirty filter before it is removed from the sampler using a U-tube water gauge. The pressure differential is used to calculate the volumetric flowrate through the filter. The Tisch sampler is equipped with a timer and a circular recording chart to measure flow during the sampling period to verify that sampling occurred over a 24-hour period without power interruption. The technician logs the begin and end times, the pressure readings, and includes the circular chart with the filter when it is collected and then sends the filter to the PADEP lab via the mail for analysis.

The PADEP laboratory conditions the filters to constant humidity and then weighs the filters. A one-inch strip of the filter is then extracted in an ultrasonic bath with mixed 2.2 M hydrochloric and 1M nitric acids. The extract is centrifuged and then analyzed by inductively coupled plasma/mass spectrometry (ICP/MS) for arsenic, beryllium, cadmium, chromium (total), lead, manganese, nickel, and zinc. The ICP/MS analysis follows the procedures in EPA Compendium Method IO-3.5, "Determination of Metals in Ambient Particulate Matter Using ICP/MS". Particulate and metals data are reported

in micrograms per cubic meter. Duplicate filter strips are analyzed on at least 10% of the filters for quality control.

It should be noted that compliance with the National Ambient Air Quality Standard for lead requires the use of a Federal Reference Method (FRM) or a Federal Equivalency Method (FEM) to measure lead concentrations in filters. The FEMs typically require the use of glass fiber filters instead of quartz fiber filters. In addition, the FEMs require the use of other analytical methods for identifying lead including atomic absorption spectrometry, XRF, ICP-optical emission spectrometry, etc. For these reasons, the lead concentrations measured at the Kutztown and Reading air toxics monitoring stations may not be directly comparable with lead concentrations measured using the FRM or an FEM.

APPENDIX C

Analytical Data

Appendix C

**Table C-1
2007 Volatile Organic Compounds Sample Results
Kutztown Site**

Notes:

Units: ppbv

MDL - Method Detection Limit

NUM - Number of Valid Samples

Compounds	MDL	NUM	12/8	12/14	12/20	12/26
1,1,1-Trichloroethane	0.04	4	< 0.04	< 0.04	< 0.04	< 0.04
1,1,2,2-Tetrachloroethane	0.04	4	< 0.04	< 0.04	< 0.04	< 0.04
1,1,2-Trichloro-1,2,2-trifluoroethane	0.04	4	0.066	0.064	0.066	0.072
1,1,2-Trichloroethane	0.06	4	< 0.06	< 0.06	< 0.06	< 0.06
1,1-Dichloroethane	0.04	4	< 0.04	< 0.04	< 0.04	< 0.04
1,1-Dichloroethene	0.06	4	< 0.06	< 0.06	< 0.06	< 0.06
1,2,4-Trichlorobenzene	0.06	4	< 0.06	< 0.06	< 0.06	< 0.06
1,2,4-Trimethylbenzene	0.04	4	0.04	< 0.04	< 0.04	< 0.04
1,2-Dibromoethane	0.06	4	< 0.06	< 0.06	< 0.06	< 0.06
1,2-Dichloro-1,1,2,2,tetrafluoroethane	0.04	4	< 0.04	< 0.04	< 0.04	< 0.04
1,2-Dichlorobenzene	0.04	4	< 0.04	< 0.04	< 0.04	< 0.04
1,2-Dichloroethane	0.06	4	< 0.06	< 0.06	< 0.06	< 0.06
1,2-Dichloropropane	0.06	4	< 0.06	< 0.06	< 0.06	< 0.06
1,3,5-Trimethylbenzene	0.04	4	< 0.04	< 0.04	< 0.04	< 0.04
1,3-Butadiene	0.18	4	< 0.18	< 0.18	< 0.18	< 0.18
1,3-Dichlorobenzene	0.04	4	< 0.04	< 0.04	< 0.04	< 0.04
1,4-Dichlorobenzene	0.04	4	< 0.04	< 0.04	< 0.04	< 0.04
1-Ethyl-4-methyl benzene	0.04	4	< 0.04	< 0.04	< 0.04	< 0.04
2-Butanone (MEK)	0.14	4	0.36	0.28	0.48	0.42
2-Hexanone	0.14	4	< 0.14	< 0.14	< 0.14	< 0.14
2-Methoxy-2-methyl propane (MTBE)	0.04	4	< 0.04	< 0.04	< 0.04	< 0.04
4-Methyl-2-pentanone (MIBK)	0.18	4	< 0.18	< 0.18	< 0.18	< 0.18
Acetone	0.14	4	2	1.5	2	1.9
Benzene	0.06	4	0.33	0.22	0.31	0.37
Bromodichloromethane	0.06	4	< 0.06	< 0.06	< 0.06	< 0.06
Bromoform	0.04	4	< 0.04	< 0.04	< 0.04	< 0.04
Bromomethane	0.06	4	< 0.06	< 0.06	< 0.06	< 0.06
Carbon disulfide	0.08	4	0.2	0.22	0.2	0.22
Carbon tetrachloride	0.04	4	0.069	0.072	0.073	0.076
Chlorobenzene	0.06	4	< 0.06	< 0.06	< 0.06	< 0.06
Chloroethane	0.06	4	< 0.06	< 0.06	< 0.06	< 0.06
Chloroethene	0.06	4	< 0.06	< 0.06	< 0.06	< 0.06
Chloroform	0.06	4	< 0.06	< 0.06	< 0.06	< 0.06
Chloromethane	0.06	4	0.4	0.43	0.43	0.46
cis-1,2-Dichloroethene	0.06	4	< 0.06	< 0.06	< 0.06	< 0.06
cis-1,3-Dichloro-1-propene	0.04	4	< 0.04	< 0.04	< 0.04	< 0.04
Cyclohexane	0.04	4	< 0.04	< 0.04	< 0.04	< 0.04
Dibromochloromethane	0.06	4	< 0.06	< 0.06	< 0.06	< 0.06
Dichlorodifluoromethane	0.04	4	0.42	0.42	0.43	0.46
Ethylbenzene	0.04	4	0.059	< 0.04	0.041	0.06
Hexachloro-1,3-butadiene	0.04	4	< 0.04	< 0.04	< 0.04	< 0.04
m & p- Xylene	0.10	4	0.17	0.12	0.12	0.17
Methylene chloride	0.08	4	< 0.08	< 0.08	0.09	0.089
n-Heptane	0.04	4	0.061	< 0.04	0.079	0.064
n-Hexane	0.04	4	0.14	0.093	0.16	0.2
o-Xylene	0.04	4	0.059	< 0.04	0.042	0.06
Propene	0.06	4	1.2	0.71	1.1	1.5
Styrene	0.04	4	< 0.04	< 0.04	< 0.04	< 0.04
Tetrachloroethene	0.06	4	< 0.06	< 0.06	< 0.06	< 0.06
Tetrahydrofuran	0.04	4	< 0.04	< 0.04	0.18	< 0.04
Toluene	0.06	4	0.41	0.26	0.33	0.44
trans-1,2-Dichloroethene	0.10	4	< 0.1	< 0.1	< 0.1	< 0.1
trans-1,3-Dichloro-1-propene	0.04	4	< 0.04	< 0.04	< 0.04	< 0.04
Trichloroethylene (TCE)	0.06	4	< 0.06	< 0.06	< 0.06	< 0.06
Trichlorofluoromethane	0.04	4	0.22	0.23	0.23	0.24

Appendix C

**Table C-2
2007 Metals Sample Results
Kutztown Site**

Notes:

Units: µg/m³

NUM - Number of Valid Samples

Metals	NUM	10/27/07	11/02/07	11/08/07	11/14/07	11/20/07	11/26/07	12/02/07	12/08/07	12/14/07	12/20/07	12/26/07
Arsenic	9	< 0.00078	< 0.00084	< 0.00084	0.0016	0.0010			0.0028	0.0007	0.0006	0.0012
Beryllium	9	< 0.00020	< 0.00021	< 0.00021	< 0.00021	< 0.00021			< 0.00020	< 0.00020	< 0.00020	< 0.00020
Cadmium	9	0.0001	0.0002	0.0004	0.0006	0.0004			0.0003	0.0002	0.0003	0.0004
Chromium	9	< 0.0039	< 0.0042	0.0046	0.0058	0.0044			0.0049	0.0047	0.0050	< 0.0040
Lead	9	< 0.0039	0.0050	0.0054	0.0173	0.0085			0.0135	0.0071	0.0077	0.0098
Manganese	9	0.0021	0.0145	0.0073	0.0223	0.0075			0.0054	0.0042	0.0056	0.0043
Nickel	9	< 0.0020	0.0024	< 0.0021	0.0030	< 0.0021			< 0.0020	< 0.0020	< 0.0020	< 0.0020
Zinc	9	0.0098	0.0176	0.0206	0.0489	0.0370			0.0431	0.0331	0.0519	0.0429

Appendix C

Table C-3
2008 Volatile Organic Compounds Sample Results
Kutztown Site

Notes:

Units: ppbv

MDL - Method Detection Limit

NUM - Number of Valid Samples

Shaded dates indicates sample was not collected.

Compounds	MDL	NUM	1/1	1/7	1/13	1/19	1/25	1/31	2/6	2/12	2/18	2/24	3/1
1,1,1-Trichloroethane	0.02	20	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02			< 0.02	< 0.02
1,1,2,2-Tetrachloroethane	0.02	20	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02			< 0.02	< 0.02
1,1,2-Trichloro-1,2,2-trifluoroethane	0.02	20	0.075	0.079	0.068		0.062	0.082	0.062			0.055	0.057
1,1,2-Trichloroethane	0.04	20	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04			< 0.04	< 0.04
1,1-Dichloroethane	0.02	20	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02			< 0.02	< 0.02
1,1-Dichloroethene	0.04	20	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04			< 0.04	< 0.04
1,2,4-Trichlorobenzene	0.02	20	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02			< 0.02	< 0.02
1,2,4-Trimethylbenzene	0.02	20	< 0.02	0.11	< 0.02		< 0.02	< 0.02	0.046			< 0.02	< 0.02
1,2-Dibromoethane	0.04	20	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04			< 0.04	< 0.04
1,2-Dichloro-1,1,2,2,tetrafluoroethane	0.02	20	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02			< 0.02	< 0.02
1,2-Dichlorobenzene	0.02	20	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02			< 0.02	< 0.02
1,2-Dichloroethane	0.02	20	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02			0.055	< 0.02
1,2-Dichloropropane	0.04	20	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04			< 0.04	< 0.04
1,3,5-Trimethylbenzene	0.02	20	< 0.02	0.07	< 0.02		< 0.02	< 0.02	< 0.02			< 0.02	< 0.02
1,3-Butadiene	0.08	20	< 0.08	< 0.08	< 0.08		< 0.08	< 0.08	< 0.08			< 0.08	< 0.08
1,3-Dichlorobenzene	0.02	20	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02			< 0.02	< 0.02
1,4-Dichlorobenzene	0.02	20	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02			< 0.02	< 0.02
1-Ethyl-4-methyl benzene	0.02	20	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02			< 0.02	< 0.02
2-Butanone (MEK)	0.22	20	0.39	0.66	0.25		0.17	0.3	0.48			0.58	0.26
2-Hexanone	0.20	20	< 0.2036	< 0.2036	< 0.2036		< 0.2036	< 0.2036	< 0.2036			< 0.2036	< 0.2036
2-Methoxy-2-methyl propane (MTBE)	0.02	20	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02			< 0.02	< 0.02
4-Methyl-2-pentanone (MIBK)	0.22	20	< 0.2208	< 0.2208	< 0.2208		< 0.2208	< 0.2208	< 0.2208			< 0.2208	< 0.2208
Acetone	0.21	20	2.8	3.2	1.2		0.87	2.1	2.2			2.1	1.2
Benzene	0.04	20	0.24	0.77	0.26		0.15	0.29	0.31			0.2	0.12
Bromodichloromethane	0.04	20	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04			< 0.04	< 0.04
Bromoform	0.02	20	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02			< 0.02	< 0.02
Bromomethane	0.04	20	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04			< 0.04	< 0.04
Carbon disulfide	0.20	20	0.21	0.14	< 0.2		0.19	0.36	0.28			< 0.2	< 0.2
Carbon tetrachloride	0.02	20	0.081	0.12	0.068		0.067	0.09	0.073			0.066	0.067
Chlorobenzene	0.04	20	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04			< 0.04	< 0.04
Chloroethane	0.04	20	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04			< 0.04	< 0.04
Chloroethene	0.04	20	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04			< 0.04	< 0.04
Chloroform	0.02	20	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02			< 0.02	< 0.02
Chloromethane	0.04	20	0.46	0.46	0.41		0.38	0.62	0.44			0.45	0.4
cis-1,2-Dichloroethene	0.04	20	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04			< 0.04	< 0.04
cis-1,3-Dichloro-1-propene	0.04	20	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04			< 0.04	< 0.04
Cyclohexane	0.02	20	< 0.02	0.049	< 0.02		< 0.02	< 0.02	< 0.02			0.033	< 0.02
Dibromochloromethane	0.04	20	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04			< 0.04	< 0.04
Dichlorodifluoromethane	0.02	20	0.47	0.49	0.42		0.38	0.56	0.4			0.37	0.38
Ethylbenzene	0.04	20	< 0.04	0.12	< 0.04		< 0.04	0.044	0.059			< 0.04	< 0.04
Hexachloro-1,3-butadiene	0.02	20	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02			< 0.02	< 0.02
m & p- Xylene	0.06	20	< 0.06	0.37	0.1		< 0.06	0.13	0.18			0.083	< 0.06
Methylene chloride	0.04	20	< 0.04	0.1	0.1		< 0.04	0.18	0.087			0.1	< 0.04
n-Heptane	0.02	20	0.052	0.12	< 0.02		< 0.02	0.052	0.069			0.12	< 0.02
n-Hexane	0.02	20	0.12	0.27	0.096		< 0.02	0.1	0.2			0.23	< 0.02
o-Xylene	0.04	20	< 0.04	0.14	< 0.04		< 0.04	0.044	0.062			< 0.04	< 0.04
Propene	0.20	20	1	2	0.89		0.36	< 0.2032	1.3			0.67	0.45
Styrene	0.02	20	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02			< 0.02	< 0.02
Tetrachloroethene	0.04	20	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04			0.82	< 0.04
Tetrahydrofuran	0.02	20	< 0.02	0.62	< 0.02		< 0.02	< 0.02	< 0.02			< 0.02	< 0.02
Toluene	0.04	20	0.2	0.97	0.27		0.092	0.29	0.51			0.61	0.07
trans-1,2-Dichloroethene	0.04	20	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04			< 0.04	< 0.04
trans-1,3-Dichloro-1-propene	0.04	20	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04			< 0.04	< 0.04
Trichloroethylene (TCE)	0.02	20	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02			< 0.02	< 0.02
Trichlorofluoromethane	0.02	20	0.25	0.27	0.22		0.21	0.29	0.22			0.2	0.2

Appendix C

Table C-3
2008 Volatile Organic Compounds Sample Results
Kutztown Site

Notes:

Units: ppbv

MDL - Method Detection Limit

NUM - Number of Valid Samples

Shaded dates indicates sample was not collected.

Compounds	MDL	NUM	3/7	3/13	3/19	3/25	3/31	4/6	4/12	4/18	4/24	4/30	5/6
1,1,1-Trichloroethane	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				< 0.02		< 0.02
1,1,2,2-Tetrachloroethane	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				< 0.02		< 0.02
1,1,2-Trichloro-1,2,2-trifluoroethane	0.02	20	0.063	0.064	0.064	0.058	0.058				0.064		0.081
1,1,2-Trichloroethane	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				< 0.04		< 0.04
1,1-Dichloroethane	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				< 0.02		< 0.02
1,1-Dichloroethene	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				< 0.04		< 0.04
1,2,4-Trichlorobenzene	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				< 0.02		< 0.02
1,2,4-Trimethylbenzene	0.02	20	< 0.02	< 0.02	0.055	< 0.02	< 0.02				< 0.02		< 0.02
1,2-Dibromoethane	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				< 0.04		< 0.04
1,2-Dichloro-1,1,2,2,tetrafluoroethane	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				< 0.02		< 0.02
1,2-Dichlorobenzene	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				< 0.02		< 0.02
1,2-Dichloroethane	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				0.13		< 0.02
1,2-Dichloropropane	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				< 0.04		< 0.04
1,3,5-Trimethylbenzene	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				< 0.02		< 0.02
1,3-Butadiene	0.08	20	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08				< 0.08		< 0.08
1,3-Dichlorobenzene	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				< 0.02		< 0.02
1,4-Dichlorobenzene	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				< 0.02		< 0.02
1-Ethyl-4-methyl benzene	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				< 0.02		< 0.02
2-Butanone (MEK)	0.22	20	0.36	0.42	0.51	0.26	0.35				1.6		0.83
2-Hexanone	0.20	20	< 0.2036	< 0.2036	< 0.2036	< 0.2036	< 0.2036				< 0.2036		< 0.2036
2-Methoxy-2-methyl propane (MTBE)	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				< 0.02		< 0.02
4-Methyl-2-pentanone (MIBK)	0.22	20	< 0.2208	< 0.2208	< 0.2208	< 0.2208	< 0.2208				< 0.2208		< 0.2208
Acetone	0.21	20	1.8	1.7	2.4	1.8	1.8				4.4		5
Benzene	0.04	20	0.3	0.16	0.26	0.12	0.22				0.14		0.19
Bromodichloromethane	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				< 0.04		< 0.04
Bromoform	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				< 0.02		< 0.02
Bromomethane	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				< 0.04		< 0.04
Carbon disulfide	0.20	20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2				0.38		< 0.2
Carbon tetrachloride	0.02	20	0.076	0.076	0.079	0.068	0.072				0.075		0.069
Chlorobenzene	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				< 0.04		< 0.04
Chloroethane	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				< 0.04		< 0.04
Chloroethene	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				< 0.04		< 0.04
Chloroform	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				0.1		< 0.02
Chloromethane	0.04	20	0.46	0.45	0.48	0.42	0.41				0.52		0.6
cis-1,2-Dichloroethene	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				< 0.04		< 0.04
cis-1,3-Dichloro-1-propene	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				< 0.04		< 0.04
Cyclohexane	0.02	20	0.021	< 0.02	< 0.02	< 0.02	< 0.02				0.15		< 0.02
Dibromochloromethane	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				< 0.04		< 0.04
Dichlorodifluoromethane	0.02	20	0.42	0.42	0.42	0.39	0.39				0.43		0.55
Ethylbenzene	0.04	20	0.058	< 0.04	0.056	< 0.04	< 0.04				0.17		0.069
Hexachloro-1,3-butadiene	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				< 0.02		< 0.02
m & p- Xylene	0.06	20	0.18	0.078	0.19	< 0.06	0.14				0.4		0.21
Methylene chloride	0.04	20	0.13	0.05	0.17	0.042	0.059				0.1		0.075
n-Heptane	0.02	20	0.072	0.038	0.07	< 0.02	0.038				0.18		0.077
n-Hexane	0.02	20	0.2	0.079	0.18	0.046	0.12				0.24		0.098
o-Xylene	0.04	20	0.062	< 0.04	0.066	< 0.04	0.042				0.14		0.074
Propene	0.20	20	0.95	0.56	0.92	0.37	0.74				0.57		0.61
Styrene	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				0.033		< 0.02
Tetrachloroethene	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				< 0.04		< 0.04
Tetrahydrofuran	0.02	20	< 0.02	0.042	0.1	< 0.02	0.031				0.05		0.063
Toluene	0.04	20	0.49	0.16	0.48	0.081	0.29				6		0.33
trans-1,2-Dichloroethene	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				< 0.04		< 0.04
trans-1,3-Dichloro-1-propene	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				< 0.04		< 0.04
Trichloroethylene (TCE)	0.02	20	< 0.02	< 0.02	0.032	< 0.02	< 0.02				< 0.02		< 0.02
Trichlorofluoromethane	0.02	20	0.23	0.22	0.22	0.2	0.2				0.23		0.28

Appendix C

Table C-3
2008 Volatile Organic Compounds Sample Resu
Kutztown Site

Notes:

Units: ppbv

MDL - Method Detection Limit

NUM - Number of Valid Samples

Shaded dates indicates sample was not collected.

Compounds	MDL	NUM	5/12	5/18	5/24	5/30	6/5	6/11	6/17	6/23	6/29
1,1,1-Trichloroethane	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02			< 0.02		
1,1,2,2-Tetrachloroethane	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02			< 0.02		
1,1,2-Trichloro-1,2,2-trifluoroethane	0.02	20	0.079	0.078	0.078	0.04			0.043		
1,1,2-Trichloroethane	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04			< 0.04		
1,1-Dichloroethane	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02			< 0.02		
1,1-Dichloroethene	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04			< 0.04		
1,2,4-Trichlorobenzene	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02			< 0.02		
1,2,4-Trimethylbenzene	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02			< 0.02		
1,2-Dibromoethane	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04			< 0.04		
1,2-Dichloro-1,1,2,2,tetrafluoroethane	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02			< 0.02		
1,2-Dichlorobenzene	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02			< 0.02		
1,2-Dichloroethane	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02			< 0.02		
1,2-Dichloropropane	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04			< 0.04		
1,3,5-Trimethylbenzene	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02			< 0.02		
1,3-Butadiene	0.08	20	< 0.08	< 0.08	< 0.08	< 0.08			< 0.08		
1,3-Dichlorobenzene	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02			< 0.02		
1,4-Dichlorobenzene	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02			< 0.02		
1-Ethyl-4-methyl benzene	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02			< 0.02		
2-Butanone (MEK)	0.22	20	0.44	0.56	0.43	0.32			0.7		
2-Hexanone	0.20	20	< 0.2036	< 0.2036	< 0.2036	< 0.2036			< 0.2036		
2-Methoxy-2-methyl propane (MTBE)	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02			< 0.02		
4-Methyl-2-pentanone (MIBK)	0.22	20	< 0.2208	< 0.2208	< 0.2208	< 0.2208			< 0.2208		
Acetone	0.21	20	2.6	3.2	3.4	1.9			1.9		
Benzene	0.04	20	0.074	0.1	0.069	0.097			< 0.04		
Bromodichloromethane	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04			< 0.04		
Bromoform	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02			< 0.02		
Bromomethane	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04			< 0.04		
Carbon disulfide	0.20	20	< 0.2	< 0.2	< 0.2	< 0.2			< 0.2		
Carbon tetrachloride	0.02	20	0.069	0.072	0.072	0.044			0.047		
Chlorobenzene	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04			< 0.04		
Chloroethane	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04			< 0.04		
Chloroethene	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04			< 0.04		
Chloroform	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02			< 0.02		
Chloromethane	0.04	20	0.61	0.62	0.61	0.32			0.4		
cis-1,2-Dichloroethene	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04			< 0.04		
cis-1,3-Dichloro-1-propene	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04			< 0.04		
Cyclohexane	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02			< 0.02		
Dibromochloromethane	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04			< 0.04		
Dichlorodifluoromethane	0.02	20	0.55	0.56	0.55	0.37			0.41		
Ethylbenzene	0.04	20	< 0.04	< 0.04	< 0.04	0.054			< 0.04		
Hexachloro-1,3-butadiene	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02			< 0.02		
m & p- Xylene	0.06	20	0.07	< 0.06	< 0.06	0.15			< 0.06		
Methylene chloride	0.04	20	0.055	0.06	0.06	< 0.04			< 0.04		
n-Heptane	0.02	20	0.031	0.03	0.032	0.023			0.026		
n-Hexane	0.02	20	0.033	0.046	0.031	0.037			< 0.02		
o-Xylene	0.04	20	< 0.04	< 0.04	< 0.04	0.054			< 0.04		
Propene	0.20	20	0.27	0.42	0.26	0.38			0.32		
Styrene	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02			< 0.02		
Tetrachloroethene	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04			< 0.04		
Tetrahydrofuran	0.02	20	0.055	< 0.02	< 0.02	0.029			< 0.02		
Toluene	0.04	20	0.1	0.12	0.1	0.071			0.13		
trans-1,2-Dichloroethene	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04			< 0.04		
trans-1,3-Dichloro-1-propene	0.04	20	< 0.04	< 0.04	< 0.04	< 0.04			< 0.04		
Trichloroethylene (TCE)	0.02	20	< 0.02	< 0.02	< 0.02	< 0.02			< 0.02		
Trichlorofluoromethane	0.02	20	0.28	0.29	0.28	0.18			0.19		

Appendix C

**Table C-4
2008 Metals Sample Results
Kutztown Site**

Notes:

Units: $\mu\text{g}/\text{m}^3$

NUM - Number of Valid Samples

Metals	NUM	01/01/08	01/07/08	01/13/08	01/19/08	01/25/08	01/31/08	02/06/08	02/12/08	02/18/08	02/24/08	03/01/08	03/07/08	03/13/08	03/19/08
Arsenic	28	0.0012	0.0049	0.0007	0.0007	< 0.00060	< 0.00060	0.0017	0.0006	< 0.00060	0.0006	< 0.00060	< 0.00060	0.0007	0.0006
Beryllium	28	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020
Cadmium	28	0.0002	0.0014	0.0003	0.0003	0.0002	0.0003	0.0010	0.0004	0.0003	0.0003	0.0003	0.0002	0.0003	0.0002
Chromium	28	< 0.0040	0.0043	< 0.0040	< 0.0040	< 0.0040	< 0.0040	0.0042	< 0.0040	< 0.0040	< 0.0040	< 0.0041	< 0.0041	0.0046	< 0.0041
Lead	28	0.0047	0.0590	0.0136	0.0047	0.0041	0.0057	0.0191	0.0060	0.0031	0.0074	0.0048	0.0063	0.0082	0.0068
Manganese	28	0.0024	0.0117	0.0035	0.0060	0.0054	0.0083	0.0088	0.0035	0.0026	0.0032	0.0022	0.0069	0.0435	0.0032
Nickel	28	< 0.0020	0.0021	< 0.0020	< 0.0020	< 0.0020	< 0.0020	0.0032	< 0.0020	< 0.0020	< 0.0020	< 0.0021	< 0.0021	< 0.0021	< 0.0021
Zinc	28	0.0163	0.0596	0.0305	0.0198	0.0167	0.0295	0.0985	0.0229	0.0163	0.0225	0.0343	0.0291	0.0261	0.0168

Appendix C

**Table C-4
2008 Metals Sample Results
Kutztown Site**

Notes:

Units: $\mu\text{g}/\text{m}^3$

NUM - Number of Valid Samples

Metals	NUM	03/25/08	03/31/08	04/06/08	04/12/08	04/18/08	04/24/08	04/30/08	05/06/08	05/12/08	05/18/08	05/24/08	05/30/08	06/05/08	06/11/08
Arsenic	28	0.0007	< 0.00060	< 0.00060	0.0013	0.0019	< 0.00060		0.0016	< 0.00060		< 0.00060	0.0016	0.0029	0.0122
Beryllium	28	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020		< 0.00020	< 0.00020		< 0.00020	< 0.00020	< 0.00020	< 0.00020
Cadmium	28	0.0003	0.0002	0.0003	0.0003	0.0006	0.0003		0.0004	0.0001		0.0002	0.0003	0.0003	0.0006
Chromium	28	< 0.0041	< 0.0041	< 0.0042	< 0.0042	0.0050	< 0.0041		0.0044	< 0.0041		< 0.0041	0.0045	0.0053	0.0073
Lead	28	0.0084	0.0118	0.0039	0.0034	0.0173	0.0055		0.0121	0.0039		0.0035	0.0171	0.0224	0.0540
Manganese	28	0.0139	0.0030	0.0029	0.0033	0.0466	0.0182		0.0231	0.0062		0.0056	0.0247	0.0180	0.0160
Nickel	28	< 0.0021	< 0.0021	< 0.0021	< 0.0021	< 0.0021	< 0.0021		< 0.0021	< 0.0021		< 0.0021	< 0.0021	0.0024	0.0050
Zinc	28	0.0165	0.0289	0.0205	0.0124	0.0473	0.0222		0.0332	0.0236		0.0101	0.0924	0.1575	0.6306

Appendix C

Table C-4
2008 Metals Sample Results
Kutztown Site

Notes:

Units: $\mu\text{g}/\text{m}^3$

NUM - Number of Valid Samples

Metals	NUM	06/17/08	06/23/08
Arsenic	28	0.0018	0.0029
Beryllium	28	< 0.00020	< 0.00020
Cadmium	28	0.0006	0.0003
Chromium	28	< 0.0043	0.0050
Lead	28	0.0085	0.0161
Manganese	28	0.0065	0.0178
Nickel	28	< 0.0021	< 0.0022
Zinc	28	0.0721	0.1575

Appendix C

**Table C-5
2007 Volatile Organic Compounds Sample Results
Reading Site**

Notes:

Units: ppbv

MDL - Method Detection Limit

NUM - Number of Valid Samples

Shaded dates indicates sample was not collected.

Compounds	MDL	NUM	6/17	6/23	6/29	7/5	7/11	7/17	7/23	7/29	8/4	8/10	8/16
1,1,1-Trichloroethane	0.04	25	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
1,1,2,2-Tetrachloroethane	0.04	25	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
1,1,2-Trichloro-1,2,2-trifluoroethane	0.04	25	0.069	0.068	0.071	0.067	0.086	0.062	0.076		0.066	0.067	0.062
1,1,2-Trichloroethane	0.06	25	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06
1,1-Dichloroethane	0.04	25	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
1,1-Dichloroethene	0.06	25	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06
1,2,4-Trichlorobenzene	0.06	25	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06
1,2,4-Trimethylbenzene	0.04	25	0.051	< 0.04	< 0.04	0.04	0.057	0.044	< 0.04		0.056	< 0.04	0.058
1,2-Dibromoethane	0.06	25	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06
1,2-Dichloro-1,1,2,2,tetrafluoroethane	0.04	25	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
1,2-Dichlorobenzene	0.04	25	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
1,2-Dichloroethane	0.06	25	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06
1,2-Dichloropropane	0.06	25	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06
1,3,5-Trimethylbenzene	0.04	25	< 0.04	< 0.04	< 0.04	< 0.04	0.078	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
1,3-Butadiene	0.18	25	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18		< 0.18	< 0.18	< 0.18
1,3-Dichlorobenzene	0.04	25	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
1,4-Dichlorobenzene	0.04	25	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
1-Ethyl-4-methyl benzene	0.04	25	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
2-Butanone (MEK)	0.14	25	2.3	1.6	3.3	2.2	0.75	0.49	3.2		1	0.57	0.78
2-Hexanone	0.14	25	< 0.14	< 0.14	0.98	0.39	< 0.14	< 0.14	0.2		< 0.14	< 0.14	< 0.14
2-Methoxy-2-methyl propane (MTBE)	0.04	25	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
4-Methyl-2-pentanone (MIBK)	0.18	25	0.08	0.19	0.3	0.31	< 0.18	< 0.18	0.12		< 0.18	< 0.18	< 0.18
Acetone	0.14	25	16	11	23	12	5.6	4.1	14		12	3.9	5.6
Benzene	0.06	25	0.17	0.088	0.15	0.14	0.13	0.12	0.11		0.18	0.091	0.21
Bromodichloromethane	0.06	25	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06
Bromofom	0.04	25	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
Bromomethane	0.06	25	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06
Carbon disulfide	0.08	25	< 0.08	< 0.08	0.1	< 0.08	< 0.08	0.29	0.15		< 0.08	0.39	< 0.08
Carbon tetrachloride	0.04	25	0.072	0.072	0.075	0.073	0.072	0.065	0.11		0.071	0.074	0.067
Chlorobenzene	0.06	25	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06
Chloroethane	0.06	25	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06
Chloroethene	0.06	25	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06
Chloroform	0.06	25	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06
Chloromethane	0.06	25	0.57	0.48	0.51	0.49	0.55	0.49	0.38		0.47	0.57	0.46
cis-1,2-Dichloroethene	0.06	25	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06
cis-1,3-Dichloro-1-propene	0.04	25	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
Cyclohexane	0.04	25	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
Dibromochloromethane	0.06	25	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06
Dichlorodifluoromethane	0.04	25	0.51	0.47	0.47	0.45	0.47	0.4	0.45		0.46	0.48	0.43
Ethylbenzene	0.04	25	0.056	< 0.04	0.045	0.047	0.042	0.041	< 0.04		0.053	< 0.04	0.068
Hexachloro-1,3-butadiene	0.04	25	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
m & p- Xylene	0.10	25	0.17	0.092	0.11	0.12	0.11	0.11	< 0.10		0.16	< 0.10	0.2
Methylene chloride	0.08	25	0.06	0.05	0.23	0.073	0.068	0.058	< 0.08		0.28	< 0.08	0.08
n-Heptane	0.04	25	0.072	0.086	0.15	0.16	0.094	0.15	< 0.04		0.069	0.21	0.089
n-Hexane	0.04	25	< 0.04	0.068	< 0.04	0.12	0.078	0.1	0.042		0.13	0.11	0.15
o-Xylene	0.04	25	0.064	< 0.04	0.052	0.056	0.043	0.042	< 0.04		0.071	< 0.04	0.068
Propene	0.06	25	1.1	1.3	1.3	1.4	0.69	1	1.1		1.6	0.5	1
Styrene	0.04	25	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	0.084	< 0.04
Tetrachloroethene	0.06	25	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06
Tetrahydrofuran	0.04	25	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
Toluene	0.06	25	0.45	0.27	0.44	0.51	0.4	0.4	0.14		0.46	0.57	0.7
trans-1,2-Dichloroethene	0.10	25	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		< 0.10	< 0.10	< 0.10
trans-1,3-Dichloro-1-propene	0.04	25	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
Trichloroethylene (TCE)	0.06	25	< 0.06	< 0.06	< 0.06	0.22	0.05	< 0.06	0.053		< 0.06	< 0.06	0.068
Trichlorofluoromethane	0.04	25	0.25	0.24	0.25	0.24	0.31	0.22	0.26		0.24	0.26	0.23

Appendix C

Table C-5
2007 Volatile Organic Compounds Sample Resu
Reading Site

Notes:

Units: ppbv

MDL - Method Detection Limit

NUM - Number of Valid Samples

Shaded dates indicates sample was not collected.

Compounds	MDL	NUM	8/22	8/28	9/3	9/9	9/15	9/21	9/27	10/3	10/9	10/15	10/21
1,1,1-Trichloroethane	0.04	25	< 0.04	< 0.04	< 0.04		< 0.04		< 0.04			< 0.04	
1,1,2,2-Tetrachloroethane	0.04	25	< 0.04	< 0.04	< 0.04		< 0.04		< 0.04			< 0.04	
1,1,2-Trichloro-1,2,2-trifluoroethane	0.04	25	0.063	0.06	0.06		0.055		0.08			0.089	
1,1,2-Trichloroethane	0.06	25	< 0.06	< 0.06	< 0.06		< 0.06		< 0.06			< 0.06	
1,1-Dichloroethane	0.04	25	< 0.04	< 0.04	< 0.04		< 0.04		< 0.04			< 0.04	
1,1-Dichloroethene	0.06	25	< 0.06	< 0.06	< 0.06		< 0.06		< 0.06			< 0.06	
1,2,4-Trichlorobenzene	0.06	25	< 0.06	< 0.06	< 0.06		< 0.06		< 0.06			< 0.06	
1,2,4-Trimethylbenzene	0.04	25	< 0.04	0.11	0.057		< 0.04		< 0.04			0.051	
1,2-Dibromoethane	0.06	25	< 0.06	< 0.06	< 0.06		< 0.06		< 0.06			< 0.06	
1,2-Dichloro-1,1,2,2,tetrafluoroethane	0.04	25	< 0.04	< 0.04	< 0.04		< 0.04		< 0.04			< 0.04	
1,2-Dichlorobenzene	0.04	25	< 0.04	< 0.04	< 0.04		< 0.04		< 0.04			< 0.04	
1,2-Dichloroethane	0.06	25	< 0.06	< 0.06	< 0.06		< 0.06		< 0.06			< 0.06	
1,2-Dichloropropane	0.06	25	< 0.06	< 0.06	< 0.06		< 0.06		< 0.06			< 0.06	
1,3,5-Trimethylbenzene	0.04	25	< 0.04	0.11	< 0.04		< 0.04		< 0.04			< 0.04	
1,3-Butadiene	0.18	25	< 0.18	< 0.18	< 0.18		< 0.18		< 0.18			< 0.18	
1,3-Dichlorobenzene	0.04	25	< 0.04	< 0.04	< 0.04		< 0.04		< 0.04			< 0.04	
1,4-Dichlorobenzene	0.04	25	< 0.04	< 0.04	< 0.04		< 0.04		< 0.04			< 0.04	
1-Ethyl-4-methyl benzene	0.04	25	< 0.04	0.046	< 0.04		< 0.04		< 0.04			< 0.04	
2-Butanone (MEK)	0.14	25	0.34	0.48	0.59		0.75		0.64			0.35	
2-Hexanone	0.14	25	< 0.14	< 0.14	< 0.14		< 0.14		< 0.14			< 0.14	
2-Methoxy-2-methyl propane (MTBE)	0.04	25	< 0.04	< 0.04	< 0.04		< 0.04		< 0.04			< 0.04	
4-Methyl-2-pentanone (MIBK)	0.18	25	< 0.18	< 0.18	< 0.18		< 0.18		< 0.18			< 0.18	
Acetone	0.14	25	2.4	4	4.6		3.8		5.2			2.8	
Benzene	0.06	25	0.1	0.18	0.18		< 0.06		0.23			0.18	
Bromodichloromethane	0.06	25	< 0.06	< 0.06	< 0.06		< 0.06		< 0.06			< 0.06	
Bromofom	0.04	25	< 0.04	< 0.04	< 0.04		< 0.04		< 0.04			< 0.04	
Bromomethane	0.06	25	< 0.06	< 0.06	< 0.06		< 0.06		< 0.06			< 0.06	
Carbon disulfide	0.08	25	0.32	< 0.08	0.77		< 0.08		< 0.08			< 0.08	
Carbon tetrachloride	0.04	25	0.067	0.068	0.069		0.064		0.13			0.12	
Chlorobenzene	0.06	25	< 0.06	< 0.06	< 0.06		< 0.06		< 0.06			< 0.06	
Chloroethane	0.06	25	< 0.06	< 0.06	< 0.06		< 0.06		< 0.06			< 0.06	
Chloroethene	0.06	25	< 0.06	< 0.06	< 0.06		< 0.06		< 0.06			< 0.06	
Chloroform	0.06	25	< 0.06	< 0.06	< 0.06		< 0.06		< 0.06			< 0.06	
Chloromethane	0.06	25	0.46	0.4	0.38		0.37		0.48			0.37	
cis-1,2-Dichloroethene	0.06	25	< 0.06	< 0.06	< 0.06		< 0.06		< 0.06			< 0.06	
cis-1,3-Dichloro-1-propene	0.04	25	< 0.04	< 0.04	< 0.04		< 0.04		< 0.04			< 0.04	
Cyclohexane	0.04	25	< 0.04	< 0.04	< 0.04		< 0.04		< 0.04			< 0.04	
Dibromochloromethane	0.06	25	< 0.06	< 0.06	< 0.06		< 0.06		< 0.06			< 0.06	
Dichlorodifluoromethane	0.04	25	0.44	0.48	0.42		0.39		0.45			0.46	
Ethylbenzene	0.04	25	< 0.04	0.062	0.056		< 0.04		0.052			< 0.04	
Hexachloro-1,3-butadiene	0.04	25	< 0.04	< 0.04	< 0.04		< 0.04		< 0.04			< 0.04	
m & p- Xylene	0.10	25	< 0.10	0.2	0.18		< 0.10		0.16			< 0.10	
Methylene chloride	0.08	25	< 0.08	0.08	< 0.08		< 0.08		< 0.08			0.083	
n-Heptane	0.04	25	0.058	0.066	0.043		< 0.04		0.051			0.052	
n-Hexane	0.04	25	0.08	0.14	0.1		< 0.04		0.11			0.083	
o-Xylene	0.04	25	< 0.04	0.071	0.059		< 0.04		0.054			< 0.04	
Propene	0.06	25	0.47	0.81	0.72		0.4		0.73			0.94	
Styrene	0.04	25	< 0.04	< 0.04	< 0.04		< 0.04		< 0.04			< 0.04	
Tetrachloroethene	0.06	25	< 0.06	< 0.06	< 0.06		< 0.06		< 0.06			< 0.06	
Tetrahydrofuran	0.04	25	< 0.04	< 0.04	< 0.04		< 0.04		< 0.04			< 0.04	
Toluene	0.06	25	0.29	0.64	0.58		0.09		0.47			0.3	
trans-1,2-Dichloroethene	0.10	25	< 0.10	< 0.10	< 0.10		< 0.10		< 0.10			< 0.10	
trans-1,3-Dichloro-1-propene	0.04	25	< 0.04	< 0.04	< 0.04		< 0.04		< 0.04			< 0.04	
Trichloroethylene (TCE)	0.06	25	< 0.06	0.06	< 0.06		< 0.06		< 0.06			< 0.06	
Trichlorofluoromethane	0.04	25	0.28	0.22	0.22		0.2		0.3			0.31	

Appendix C

**Table C-5
2007 Volatile Organic Compounds Sample Resu
Reading Site**

Notes:

Units: ppbv

MDL - Method Detection Limit

NUM - Number of Valid Samples

Shaded dates indicates sample was not collected.

Compounds	MDL	NUM	10/27	11/2	11/8	11/14	11/20	11/26	12/2	12/8	12/14	12/20	12/26
1,1,1-Trichloroethane	0.04	25	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04	< 0.04
1,1,2,2-Tetrachloroethane	0.04	25	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04	< 0.04
1,1,2-Trichloro-1,2,2-trifluoroethane	0.04	25	0.057	0.05		0.073	0.07	0.073		0.058	0.063	0.068	0.07
1,1,2-Trichloroethane	0.06	25	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06	< 0.06
1,1-Dichloroethane	0.04	25	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04	< 0.04
1,1-Dichloroethene	0.06	25	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06	< 0.06
1,2,4-Trichlorobenzene	0.06	25	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06	< 0.06
1,2,4-Trimethylbenzene	0.04	25	< 0.04	< 0.04		0.12	0.084	0.054		0.056	< 0.04	< 0.04	0.044
1,2-Dibromoethane	0.06	25	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06	< 0.06
1,2-Dichloro-1,1,2,2,tetrafluoroethane	0.04	25	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04	< 0.04
1,2-Dichlorobenzene	0.04	25	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04	< 0.04
1,2-Dichloroethane	0.06	25	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06	< 0.06
1,2-Dichloropropane	0.06	25	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06	< 0.06
1,3,5-Trimethylbenzene	0.04	25	< 0.04	< 0.04		0.048	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04	< 0.04
1,3-Butadiene	0.18	25	< 0.18	< 0.18		< 0.18	< 0.18	< 0.18		< 0.18	< 0.18	< 0.18	< 0.18
1,3-Dichlorobenzene	0.04	25	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04	< 0.04
1,4-Dichlorobenzene	0.04	25	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04	< 0.04
1-Ethyl-4-methyl benzene	0.04	25	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04	< 0.04
2-Butanone (MEK)	0.14	25	1.2	0.82		1.6	0.41	0.37		0.48	0.56	1.2	0.36
2-Hexanone	0.14	25	< 0.14	< 0.14		< 0.14	< 0.14	< 0.14		< 0.14	< 0.14	< 0.14	< 0.14
2-Methoxy-2-methyl propane (MTBE)	0.04	25	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04	< 0.04
4-Methyl-2-pentanone (MIBK)	0.18	25	< 0.18	< 0.18		< 0.18	< 0.18	< 0.18		< 0.18	< 0.18	< 0.18	< 0.18
Acetone	0.14	25	5.8	5.7		10	3	2.3		2.9	1.7	7.9	2.2
Benzene	0.06	25	0.12	0.15		0.45	0.41	0.3		0.4	0.22	0.29	0.39
Bromodichloromethane	0.06	25	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06	< 0.06
Bromofrom	0.04	25	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04	< 0.04
Bromomethane	0.06	25	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06	< 0.06
Carbon disulfide	0.08	25	< 0.08	< 0.08		0.18	< 0.08	< 0.08		< 0.08	0.1	< 0.08	< 0.08
Carbon tetrachloride	0.04	25	0.073	0.063		0.073	0.075	0.078		0.067	0.07	0.067	0.074
Chlorobenzene	0.06	25	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06	< 0.06
Chloroethane	0.06	25	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06	< 0.06
Chloroethene	0.06	25	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06	< 0.06
Chloroform	0.06	25	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06	< 0.06
Chloromethane	0.06	25	0.37	0.31		0.41	0.45	0.56		0.36	0.41	0.43	0.48
cis-1,2-Dichloroethene	0.06	25	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06	< 0.06
cis-1,3-Dichloro-1-propene	0.04	25	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04	< 0.04
Cyclohexane	0.04	25	< 0.04	< 0.04		0.046	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04	< 0.04
Dibromochloromethane	0.06	25	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06	< 0.06
Dichlorodifluoromethane	0.04	25	0.36	0.34		0.48	0.44	0.48		0.39	0.41	0.44	0.46
Ethylbenzene	0.04	25	< 0.04	< 0.04		0.13	0.093	0.052		0.069	< 0.04	< 0.04	0.047
Hexachloro-1,3-butadiene	0.04	25	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04	< 0.04
m & p- Xylene	0.10	25	< 0.10	0.13		0.41	0.28	0.16		0.22	< 0.10	0.12	0.13
Methylene chloride	0.08	25	< 0.08	0.13		0.12	0.1	< 0.08		0.093	< 0.08	< 0.08	< 0.08
n-Heptane	0.04	25	0.083	0.05		0.14	0.13	0.062		0.069	< 0.04	0.062	0.14
n-Hexane	0.04	25	0.084	0.1		0.26	0.19	0.16		0.18	0.1	0.13	0.16
o-Xylene	0.04	25	< 0.04	< 0.04		0.14	0.1	0.061		0.077	< 0.04	0.043	0.048
Propene	0.06	25	1.2	0.7		2.5	1.8	1.4		1.7	1.1	1.6	1.9
Styrene	0.04	25	< 0.04	< 0.04		< 0.04	0.074	< 0.04		< 0.04	< 0.04	< 0.04	< 0.04
Tetrachloroethene	0.06	25	< 0.06	< 0.06		0.062	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06	< 0.06
Tetrahydrofuran	0.04	25	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04	< 0.04
Toluene	0.06	25	0.24	0.41		1	0.86	0.52		0.84	0.42	0.45	0.49
trans-1,2-Dichloroethene	0.10	25	< 0.10	< 0.10		< 0.10	< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10
trans-1,3-Dichloro-1-propene	0.04	25	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04	< 0.04
Trichloroethylene (TCE)	0.06	25	< 0.06	< 0.06		0.18	0.066	0.16		< 0.06	< 0.06	< 0.06	< 0.06
Trichlorofluoromethane	0.04	25	0.2	0.19		0.28	0.25	0.28		0.22	0.23	0.24	0.25

Appendix C

**Table C-6
2007 Metals Sample Results
Reading Site**

Notes:

Units: $\mu\text{g}/\text{m}^3$

NUM - Number of Valid Samples

Shaded dates indicates sample was not collected.

Metals	NUM	06/17/07	06/23/07	06/29/07	07/05/07	07/11/07	07/17/07	07/23/07	07/29/07	08/04/07	08/10/07	08/16/07	08/22/07	08/28/07
Arsenic	32	0.00133	0.00126	0.00121	0.00125	0.00116	0.00168	0.00113	0.00206	0.00153	0.00109	0.00181	0.00162	0.00129
Beryllium	32	< 0.00021	< 0.00021	< 0.00021	< 0.00021	< 0.00021	< 0.00021	< 0.00021	< 0.00021	< 0.00021	< 0.00021	< 0.00021	< 0.00021	< 0.00021
Cadmium	32	0.00037	0.00011	0.00013	0.00021	0.00011	0.00019	0.00023	0.00179	0.00015	0.00011	0.00021	0.00088	0.00060
Chromium	32	0.00451	< 0.0040	0.00469	0.00517	0.00494	0.00567	0.00519	0.00666	0.00498	0.00601	0.00596	0.00414	0.00594
Lead	32	0.00769	0.00525	0.01063	0.00691	0.00840	0.01435	0.00864	0.00893	0.00752	0.00785	0.01467	0.06300	0.04671
Manganese	32	0.00784	0.00676	0.00729	0.00480	0.00666	0.00819	0.00907	0.00544	0.01103	0.00458	0.01475	0.00496	0.00810
Nickel	32	0.00273	< 0.002	< 0.002	< 0.002	0.00286	0.00301	< 0.002	0.00601	0.00265	0.00233	0.00317	< 0.002	0.00579
Zinc	32	0.02688	0.01670	0.02221	0.01912	0.01956	0.03298	0.03718	0.01979	0.02542	0.01704	0.02899	0.06669	0.02159

Appendix C

Table C-6
2007 Metals Sample Resi
Reading Site

Notes:

Units: µg/m³

NUM - Number of Valid Samples

Shaded dates indicates sample was not

Metals	NUM	09/03/07	09/09/07	09/15/07	09/21/07	09/27/07	10/03/07	10/09/07	10/15/07	10/21/07	10/27/07	11/02/07	11/08/07	11/14/07
Arsenic	32	0.00238	< 0.00080	< 0.00080	0.00173	< 0.00080	< 0.00080	0.00082	0.00293	< 0.00080	< 0.00080	0.00149	< 0.00080	0.00235
Beryllium	32	< 0.00021	< 0.00021	< 0.00021	< 0.00021	< 0.00021	< 0.00021	< 0.00021	< 0.00021	< 0.00021	< 0.00021	< 0.00021	< 0.00021	< 0.00021
Cadmium	32	0.00019	0.00011	< 0.00010	0.00038	0.00017	0.00024	0.00038	0.00056	0.00024	< 0.00010	0.00018	0.00050	0.00091
Chromium	32	0.00490	0.00545	0.00558	0.00604	0.00764	0.00435	0.00628	0.00447	0.00504	< 0.0040	0.00588	0.00602	0.00855
Lead	32	0.00649	0.00562	< 0.0040	0.01456	0.04612	0.01311	0.01241	0.02386	0.01073	< 0.0040	0.01139	0.00939	0.03770
Manganese	32	0.00609	0.00599	0.00335	0.01877	0.01520	0.00945	0.02086	0.00959	0.00900	0.00231	0.00872	0.00694	0.01488
Nickel	32	< 0.002	< 0.002	< 0.002	0.00407	0.00696	0.00399	0.00654	0.00233	0.00429	< 0.002	0.00217	0.00333	0.00935
Zinc	32	0.01393	0.00866	0.00648	0.03329	0.02747	0.02146	0.02848	0.03048	0.01468	0.00878	0.02326	0.02767	0.05595

Appendix C

**Table C-6
2007 Metals Sample Res
Reading Site**

Notes:

Units: $\mu\text{g}/\text{m}^3$

NUM - Number of Valid Samples

Shaded dates indicates sample was not

Metals	NUM	11/20/07	11/26/07	12/02/07	12/08/07	12/14/07	12/20/07	12/26/07
Arsenic	32	0.00159	0.00177	0.00088		0.00075	0.00096	0.00131
Beryllium	32	< 0.00021	< 0.00021	< 0.00021		< 0.00021	< 0.00021	< 0.00021
Cadmium	32	0.00059	0.00074	0.00029		0.00020	0.00020	0.00053
Chromium	32	0.00606	0.00578	< 0.0040		< 0.0040	< 0.0040	< 0.0040
Lead	32	0.03088	0.02487	0.01592		0.01912	0.02784	0.03392
Manganese	32	0.00473	0.00437	0.00355		0.00445	0.00655	0.00435
Nickel	32	0.00309	0.00204	0.00245		0.00220	< 0.002	< 0.002
Zinc	32	0.06698	0.04171	0.03961		0.02980	0.03235	0.07118

Appendix C

**Table C-7
2008 Volatile Organic Compounds Sample Results
Reading Site**

Notes:

Units: ppbv

MDL - Method Detection Limit

NUM - Number of Valid Samples

Shaded dates indicates sample was not collected.

Compounds	MDL	NUM	1/1	1/7	1/13	1/19	1/25	1/31	2/6	2/12	2/18	2/24	3/1
1,1,1-Trichloroethane	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
1,1,2,2-Tetrachloroethane	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
1,1,2-Trichloro-1,2,2-trifluoroethane	0.02	24	0.068	0.076	0.076	0.067	0.07	0.083	0.071		0.059	0.054	0.058
1,1,2-Trichloroethane	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
1,1-Dichloroethane	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
1,1-Dichloroethene	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
1,2,4-Trichlorobenzene	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
1,2,4-Trimethylbenzene	0.02	24	< 0.02	0.12	0.053	< 0.02	< 0.02	< 0.02	0.086		< 0.02	< 0.02	< 0.02
1,2-Dibromoethane	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
1,2-Dichloro-1,1,2,2,tetrafluoroethane	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
1,2-Dichlorobenzene	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
1,2-Dichloroethane	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
1,2-Dichloropropane	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
1,3,5-Trimethylbenzene	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.041		< 0.02	< 0.02	< 0.02
1,3-Butadiene	0.08	24	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08		< 0.08	< 0.08	< 0.08
1,3-Dichlorobenzene	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
1,4-Dichlorobenzene	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
1-Ethyl-4-methyl benzene	0.02	24	< 0.02	0.044	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
2-Butanone (MEK)	0.22	24	0.3	0.69	2.3	0.21	0.26	0.28	0.47		0.3	0.28	0.36
2-Hexanone	0.20	24	< 0.20	< 0.20	0.24	< 0.20	< 0.20	< 0.20	< 0.20		< 0.20	< 0.20	< 0.20
2-Methoxy-2-methyl propane (MTBE)	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
4-Methyl-2-pentanone (MIBK)	0.22	24	< 0.22	< 0.22	< 0.22	< 0.22	< 0.22	< 0.22	< 0.22		< 0.22	< 0.22	< 0.22
Acetone	0.21	24	1.8	4.7	8.7	1.4	2.1	2.2	4.3		1.8	2.2	2.5
Benzene	0.04	24	0.2	0.79	0.42	0.19	0.17	0.26	0.44		0.11	0.17	0.12
Bromodichloromethane	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
Bromoform	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
Bromomethane	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
Carbon disulfide	0.20	24	< 0.20	0.15	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20		< 0.20	< 0.20	< 0.20
Carbon tetrachloride	0.02	24	0.07	0.082	0.098	0.065	0.071	0.083	0.083		0.074	0.056	0.068
Chlorobenzene	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
Chloroethane	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
Chloroethene	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
Chloroform	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
Chloromethane	0.04	24	0.45	0.44	0.43	0.42	0.44	0.62	0.57		0.48	0.39	0.39
cis-1,2-Dichloroethene	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
cis-1,3-Dichloro-1-propene	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
Cyclohexane	0.02	24	< 0.02	0.047	< 0.02	< 0.02	< 0.02	< 0.02	0.035		< 0.02	< 0.02	< 0.02
Dibromochloromethane	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
Dichlorodifluoromethane	0.02	24	0.42	0.48	0.47	0.42	0.43	0.55	0.46		0.4	0.36	0.38
Ethylbenzene	0.04	24	< 0.04	0.16	0.057	< 0.04	< 0.04	< 0.04	0.09		< 0.04	< 0.04	< 0.04
Hexachloro-1,3-butadiene	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
m & p- Xylene	0.06	24	< 0.06	0.49	0.14	< 0.06	< 0.06	< 0.06	0.28		< 0.06	< 0.06	< 0.06
Methylene chloride	0.04	24	< 0.04	0.1	0.086	< 0.04	< 0.04	< 0.04	0.15		0.048	0.048	< 0.04
n-Heptane	0.02	24	< 0.02	0.12	0.068	< 0.02	< 0.02	< 0.02	0.1		< 0.02	< 0.02	< 0.02
n-Hexane	0.02	24	0.11	0.29	0.12	0.081	0.046	0.081	0.24		0.05	0.04	< 0.02
o-Xylene	0.04	24	< 0.04	0.17	0.054	< 0.04	< 0.04	< 0.04	0.1		< 0.04	< 0.04	< 0.04
Propene	0.20	24	1	2.9	1.8	0.83	0.54	1.2	1.8		0.53	0.78	0.52
Styrene	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.023		< 0.02	< 0.02	< 0.02
Tetrachloroethene	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	0.055		< 0.04	< 0.04	< 0.04
Tetrahydrofuran	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
Toluene	0.04	24	0.25	1.3	0.47	0.28	0.11	0.31	0.92		0.19	0.18	0.064
trans-1,2-Dichloroethene	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
trans-1,3-Dichloro-1-propene	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
Trichloroethylene (TCE)	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.078		< 0.02	< 0.02	< 0.02
Trichlorofluoromethane	0.02	24	0.23	0.27	0.26	0.24	0.23	0.29	0.25		0.21	0.19	0.2

Appendix C

Table C-7
2008 Volatile Organic Compounds Sample Res:
Reading Site

Notes:

Units: ppbv

MDL - Method Detection Limit

NUM - Number of Valid Samples

Shaded dates indicates sample was not collected.

Compounds	MDL	NUM	3/7	3/13	3/19	3/25	3/31	4/6	4/12	4/18	4/24	4/30	5/6
1,1,1-Trichloroethane	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
1,1,2,2-Tetrachloroethane	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
1,1,2-Trichloro-1,2,2-trifluoroethane	0.02	24	0.066	0.058	0.063	0.084		0.063	0.066		0.078	0.058	0.058
1,1,2-Trichloroethane	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
1,1-Dichloroethane	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
1,1-Dichloroethene	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
1,2,4-Trichlorobenzene	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
1,2,4-Trimethylbenzene	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
1,2-Dibromoethane	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
1,2-Dichloro-1,1,2,2-tetrafluoroethane	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
1,2-Dichlorobenzene	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
1,2-Dichloroethane	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
1,2-Dichloropropane	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
1,3,5-Trimethylbenzene	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
1,3-Butadiene	0.08	24	< 0.08	< 0.08	< 0.08	< 0.08		< 0.08	< 0.08		< 0.08	< 0.08	< 0.08
1,3-Dichlorobenzene	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
1,4-Dichlorobenzene	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
1-Ethyl-4-methyl benzene	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
2-Butanone (MEK)	0.22	24	0.45	0.29	0.51	1		0.38	3.3		0.77	0.28	0.69
2-Hexanone	0.20	24	< 0.20	< 0.20	< 0.20	< 0.20		< 0.20	< 0.20		< 0.20	< 0.20	< 0.20
2-Methoxy-2-methyl propane (MTBE)	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
4-Methyl-2-pentanone (MIBK)	0.22	24	< 0.22	< 0.22	< 0.22	< 0.22		< 0.22	< 0.22		< 0.22	< 0.22	< 0.22
Acetone	0.21	24	2.7	2	3.4	6.1		2.7	15		3.6	2.2	3.9
Benzene	0.04	24	0.28	0.19	0.17	0.2		0.14	0.11		0.15	0.093	0.14
Bromodichloromethane	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
Bromoform	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
Bromomethane	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
Carbon disulfide	0.20	24	< 0.20	< 0.20	< 0.20	< 0.20		< 0.20	< 0.20		< 0.20	< 0.20	< 0.20
Carbon tetrachloride	0.02	24	0.076	0.068	0.076	0.093		0.076	0.08		0.11	0.066	0.067
Chlorobenzene	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
Chloroethane	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
Chloroethene	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
Chloroform	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
Chloromethane	0.04	24	0.45	0.46	0.45	0.58		0.46	0.51		0.46	0.39	0.38
cis-1,2-Dichloroethene	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
cis-1,3-Dichloro-1-propene	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
Cyclohexane	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
Dibromochloromethane	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
Dichlorodifluoromethane	0.02	24	0.43	0.38	0.46	0.54		0.41	0.44		0.48	0.38	0.38
Ethylbenzene	0.04	24	0.047	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
Hexachloro-1,3-butadiene	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
m & p- Xylene	0.06	24	0.16	< 0.06	0.07	0.062		< 0.06	< 0.06		0.092	< 0.06	0.11
Methylene chloride	0.04	24	0.1	0.55	0.09	0.076		0.052	0.065		0.06	0.1	0.064
n-Heptane	0.02	24	0.068	0.094	0.12	0.041		< 0.02	0.048		0.031	< 0.02	0.04
n-Hexane	0.02	24	0.13	0.084	0.091	0.056		0.05	0.072		0.074	< 0.02	0.11
o-Xylene	0.04	24	0.048	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
Propene	0.20	24	1.5	1	0.7	0.8		0.43	1		0.9	0.55	1.3
Styrene	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
Tetrachloroethene	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
Tetrahydrofuran	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02		< 0.02	< 0.02		< 0.02	< 0.02	< 0.02
Toluene	0.04	24	0.43	0.46	0.23	0.2		0.092	0.32		0.18	0.17	0.36
trans-1,2-Dichloroethene	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
trans-1,3-Dichloro-1-propene	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04		< 0.04	< 0.04		< 0.04	< 0.04	< 0.04
Trichloroethylene (TCE)	0.02	24	< 0.02	0.055	0.041	0.04		< 0.02	0.024		< 0.02	< 0.02	< 0.02
Trichlorofluoromethane	0.02	24	0.24	0.2	0.23	0.31		0.22	0.23		0.27	0.2	0.2

Appendix C

Table C-7
2008 Volatile Organic Compounds Sample Resi
Reading Site

Notes:

Units: ppbv

MDL - Method Detection Limit

NUM - Number of Valid Samples

Shaded dates indicates sample was not collected.

Compounds	MDL	NUM	5/12	5/18	5/24	5/30	6/5	6/11	6/17	6/23	6/29
1,1,1-Trichloroethane	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				
1,1,2,2-Tetrachloroethane	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				
1,1,2-Trichloro-1,2,2-trifluoroethane	0.02	24	0.077	0.076	0.08	0.064	0.058				
1,1,2-Trichloroethane	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				
1,1-Dichloroethane	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				
1,1-Dichloroethene	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				
1,2,4-Trichlorobenzene	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				
1,2,4-Trimethylbenzene	0.02	24	< 0.02	< 0.02	< 0.02	0.048	0.056				
1,2-Dibromoethane	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				
1,2-Dichloro-1,1,2,2,tetrafluoroethane	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				
1,2-Dichlorobenzene	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				
1,2-Dichloroethane	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				
1,2-Dichloropropane	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				
1,3,5-Trimethylbenzene	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				
1,3-Butadiene	0.08	24	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08				
1,3-Dichlorobenzene	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				
1,4-Dichlorobenzene	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				
1-Ethyl-4-methyl benzene	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				
2-Butanone (MEK)	0.22	24	1.6	4.8	0.64	2.7	0.77				
2-Hexanone	0.20	24	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20				
2-Methoxy-2-methyl propane (MTBE)	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				
4-Methyl-2-pentanone (MIBK)	0.22	24	< 0.22	0.4	< 0.22	0.23	< 0.22				
Acetone	0.21	24	15	24	5.3	13	5.5				
Benzene	0.04	24	0.076	0.12	0.12	0.16	0.23				
Bromodichloromethane	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				
Bromoform	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				
Bromomethane	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				
Carbon disulfide	0.20	24	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20				
Carbon tetrachloride	0.02	24	0.065	0.068	0.071	0.075	0.067				
Chlorobenzene	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				
Chloroethane	0.04	24	< 0.04	< 0.04	0.063	< 0.04	< 0.04				
Chloroethene	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				
Chloroform	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				
Chloromethane	0.04	24	0.64	0.62	0.74	0.48	0.45				
cis-1,2-Dichloroethene	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				
cis-1,3-Dichloro-1-propene	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				
Cyclohexane	0.02	24	< 0.02	< 0.02	< 0.02	0.026	0.038				
Dibromochloromethane	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				
Dichlorodifluoromethane	0.02	24	0.56	0.55	0.56	0.44	0.41				
Ethylbenzene	0.04	24	< 0.04	< 0.04	< 0.04	0.057	0.062				
Hexachloro-1,3-butadiene	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				
m & p- Xylene	0.06	24	< 0.06	0.072	0.091	0.17	0.18				
Methylene chloride	0.04	24	0.071	0.08	0.13	0.1	0.075				
n-Heptane	0.02	24	< 0.02	0.084	0.041	0.13	0.081				
n-Hexane	0.02	24	0.035	0.058	0.064	0.14	0.14				
o-Xylene	0.04	24	< 0.04	< 0.04	< 0.04	0.057	0.07				
Propene	0.20	24	0.63	1.5	0.65	1.5	0.7				
Styrene	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				
Tetrachloroethene	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				
Tetrahydrofuran	0.02	24	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02				
Toluene	0.04	24	0.05	0.43	0.28	0.44	0.56				
trans-1,2-Dichloroethene	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				
trans-1,3-Dichloro-1-propene	0.04	24	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04				
Trichloroethylene (TCE)	0.02	24	< 0.02	< 0.02	< 0.02	0.024	0.022				
Trichlorofluoromethane	0.02	24	0.29	0.29	0.29	0.23	0.24				

Appendix C

**Table C-8
2008 Metals Sample Results
Reading Site**

Notes:

Units: µg/m³

NUM - Number of Valid Samples

Shaded dates indicates sample was not collected.

Metals	NUM	03/07/08	03/13/08	03/19/08	03/25/08	03/31/08	04/06/08	04/12/08	04/18/08	04/24/08	04/30/08	05/06/08	05/12/08	05/18/08
Arsenic	18	< 0.00060	0.00110	0.00082		0.00088	0.00080	0.00106	0.00263		0.00061	0.00087	< 0.00060	0.00105
Beryllium	18	< 0.00020	< 0.00020	< 0.00020		< 0.00020	< 0.00020	< 0.00020	< 0.00020		< 0.00020	< 0.00020	< 0.00020	< 0.00020
Cadmium	18	0.00016	0.00024	0.00024		0.00048	0.00018	0.00016	0.00158		0.00026	0.00023	0.00025	0.00019
Chromium	18	< 0.0040	< 0.0040	0.00672		0.00427	< 0.0040	< 0.0040	< 0.0040		< 0.0040	< 0.0040	< 0.0040	< 0.0040
Lead	18	0.01249	0.02286	0.01544		0.01602	0.02106	0.00599	0.02406		0.00994	0.00838	0.00550	0.00735
Manganese	18	0.00337	0.00890	0.00595		0.00521	0.00323	0.00680	0.02507		0.00673	0.01584	0.00653	0.00567
Nickel	18	< 0.0020	0.00273	0.00626		0.00389	< 0.0020	0.00281	0.00273		< 0.0020	< 0.0020	< 0.0020	< 0.0020
Zinc	18	0.02146	0.03570	0.02447		0.02687	0.01989	0.01316	0.05134		0.01598	0.02333	0.01650	0.01361

Appendix C

Table C-8
2008 Metals Sample R
Reading Site

Notes:

Units: $\mu\text{g}/\text{m}^3$

NUM - Number of Valid Samples

Shaded dates indicates sample wa

Metals	NUM	05/24/08	05/30/08	06/05/08	06/11/08	06/17/08	06/23/08	06/29/08
Arsenic	18	0.00080	0.00128	0.00095	< 0.00060	< 0.00060	< 0.00060	< 0.00060
Beryllium	18	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020
Cadmium	18	< 0.00010	0.00048	0.00044	< 0.00010	0.00017	0.00011	< 0.00010
Chromium	18	< 0.0040	0.00674	0.00413	< 0.0040	< 0.0040	< 0.0040	< 0.0040
Lead	18	0.01043	0.02968	0.02934	0.00253	0.00413	0.00811	0.00277
Manganese	18	0.00575	0.02025	0.00700	0.00724	0.00766	0.01514	0.00609
Nickel	18	< 0.0020	0.00528	0.00332	< 0.0020	< 0.0020	< 0.0020	< 0.0020
Zinc	18	0.01063	0.03570	0.02606	0.01188	0.01192	0.01556	0.01227