# Norlite Corporation
## Cohoes, New York

# 2002 Update Report
# Multipathway Risk Assessment
# Light-Weight Aggregate Kilns

## Volume I
## Technical Report

**ENSR Corporation**
**April 2002 – revised October 2002**
**Document Number 09514-046-501**

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# 1.0 INTRODUCTION

This Multipathway Risk Assessment (MRA) Final Report for the Norlite Light-Weight Aggregate Kiln facility at 628 South Saratoga Street, Cohoes, New York 12047 revises expands and updates the previous version of the MRA report that was submitted to the New York State Department of Environmental Conservation in October 2001. It includes new information, as well as a number of minor corrections. These were developed in response to comments on the previous version provided to Norlite in a January 29, 2002 letter from William J. Clarke, Regional Permit Administrator for Region 4 of New York State Department of Environmental Conservation (NYSDEC). The letter included the several sets of comments and questions developed by the NYSDEC in cooperation with the New York State Dept. of Health (NYSDOH) and the United States Environmental Protection Agency (U.S. EPA). These comments addressed with updated and supplemental information provided for both the human health risk assessment (HHRA) and the preliminary screening level ecological risk assessment (SLERA) of the MRA.

## 1.1 Background

On February 22, 2002, Norlite provided NYSDEC with a set of written responses to the majority of the comments and questions presented by the three agencies. Data and findings previously submitted with the February 27 letter to NYSDEC have been integrated into the current report and its attachments to assure convenient reference for each of the agencies and other interested members of the public. In general, new topics were added as supplemental subsections in a manner consistent with the original 2001 report. This should make it easier to interpret the meaning of the changes regardless of whether they are inserted as supplements or revisions to the original version.

U.S. EPA comments stated that they considered the SLERA to be incomplete without inclusion of at least two additional types of receptor habitat and a representative selection of "indicator species" that would more fully portray the range of ecological exposures and potential risks that might exist. The original scope of the SLERA, presented in 1999 through 2001 reports, was restricted to a preliminary examination of the projected effects of Norlite emissions upon the aquatic habitats and the diets of predatory species, such as osprey and heron, in the areas around the confluence of the Mohawk and Hudson Rivers. Also considered initially were maximum concentrations for emitted chemicals that might reach fish living in Wright/Bradley Lakes in Troy, NY, across the Hudson River from the Norlite facilities. Past experience with ecological screening studies at other New York facilities burning hazardous waste-derived fuels indicated that evaluation of potential effects on avian species at or near the top of the local foodchain could provide a reasonable index of whether other habitats and species would be challenged by airborne emissions. However, to be responsive to the U.S. EPA comments, the previous ecological analysis was expanded and revamped. The full analysis and discussion of results and conclusions are presented in a newly expanded Chapter 8 and its associated appendices.

## 1.2 Facility Emissions

The emission rates assumed for the updated risk analyses provided in this report are a composite of the previously reported maximum emission rates for organic constituents and slightly adjusted maximum rates for metals. This latest set of emission rates was derived from the metals permit limits now being requested for the Norlite Kilns and the measurements of various targeted organic chemical species obtained from "Trial Burn" and "Risk Burn" data, as briefly explained below. The objective is to present credible maximum hourly emission rates that would represent an upper limit for risk assessment purposes, even if the individual rates of various constituents may vary somewhat during individual hours of the year. This risk assessment includes analysis of both short-term and long-term emission rates to ensure that, regardless of such variation, maximum risk estimates generally remain within acceptable ranges for protection of public health, as specified by the RCRA permitting process.

All risk analyses are based upon estimated maximum emission rates derived from a sequence of trial burn and risk burn measurement tests. The first of these was the complete RCRA Trial Burn Test conducted on April 28-30, 1999. The data from those tests were analyzed and submitted to the New York State Department of Environmental Conservation (NYSDEC) on August 23, 1999 (ENSR Doc. No. 9514-040-400). Two more recent "risk burn" update testing programs have been conducted. The first was conducted between May 22 and 26, 2000 and results were reported to NYSDEC on August 25, 2000 (ENSR Doc. No. 9514-049-400). The second was the most recent supplementary "risk burn" testing performed between July 23 and 26, 2001 and reported to NYSDEC on September 12, 2001 (ENSR Doc. No. 09514-051-400). Data obtained in these latest tests were limited to measurements of all metals and dioxins and furans emitted from Kiln #1 during "maximal" normal operations. Finally, as part of Norlite's Part 373 Permit, last modified in January 1997, metals feed rates and system removal efficiencies (SREs) determined from the July 2001 "risk burn" data were utilized to produce maximum estimated emission rates for metals. These rates reflect both the normal variation in the shale processed by the kilns and the trace levels present in the waste-derived fuels. It is anticipated that long-term normal operations will have annual emission rates lower than the short-term rates measured in this series of tests.

The purpose of the current risk assessment is to determine whether the facility is now expected to be in compliance with NYSDEC and the New York State Department of Health (NYSDOH) and U.S. EPA health protection guidelines, while operating under the maximal emission conditions of the trial burn testing. Volume 1 of this updated report presents the complete risk assessment, in that it also includes previous background information on analysis methods and assumptions. It reiterates the primary steps of the risk analysis performed and presents a comprehensive update of results so that conclusions can be drawn about the latest estimates of potential long term and short-term risks. Volume 2 of the report consists of a new set of technical appendices containing intermediate and supplementary results that supported the primary analyses.

During normal operations, both lightweight aggregate kilns at Norlite efficiently destroy virtually all organic materials present in the low-grade fuel they utilize. During the trial burn tests, however, the single representative kiln tested is operated under "stressed conditions," simulating the maximum emissions for all constituent chemicals, to ensure that the measured emission rates represent the maximum values that could be produced within the entire range of permitted operation. In all cases, the majority of any trace chemicals not destroyed, principally metals, are generally trapped in the aggregate solid materials. The trial burn tests are performed to verify that more than 99.99% of the organic materials present in the feed, including those in the fuel or any waste derived fuel, are completely destroyed and/or removed by the air cleaning systems under all possible operating conditions. The test results also determine the levels of residual emissions that need to be evaluated in a risk assessment to confirm the long-term safety of plant operations.

The original Trial Burn Plan (TBP) for this project, prepared by ENSR International of Westford, MA, received agency approval in January 1999 and formed the basis for the trial burn tests completed in April 1999. The final report for the trial burn was issued to the regulatory agencies in August 1999. Due to the fact that emissions of PCDDs/PCDFs and mercury were much higher than anticipated (and subsequently drove risk calculations to unacceptable levels), Norlite embarked on a corrective program to lower these emission parameters. A "Supplemental Risk Burn Protocol", Revision 2, dated April 19, 2000 was subsequently prepared and approved by NYSDEC on April 28, 2000. The Risk Burn Protocol (RBP) formed the basis for further emissions testing conducted in May 2000 along with relevant sections of the original TBP. Again, emissions of PCDDs/PCDFs were higher than expected and it was believed that the manner in which metals had been spiked into the LLGF interfered with the combustion process. Accordingly, Norlite embarked on preparations for a second risk burn, but with a different approach to be followed for increasing waste feed metals concentrations to desired levels. For this program, Norlite added seven (7) metal solutions to the feed tanks to achieve the desired target metal loadings. These materials included arsenic acid, beryllium acetate, cadmium acetate, mercury acetate, nickel acetate, copper acetate and zinc acetate. Because a solution of chromium could not be found that would be completely miscible in the LLGF, a solution of sodium bichromate was spiked into the LLGF feed line in the same manner as done during the original trial burn and the Phase 1 risk burn. The "Supplemental Risk Burn II Protocol" dated June 28, 2001 and revised July 3, 2001 was approved by NYSDEC on July 6, 2001 and formed the basis for the overall test program.

The primary purpose of the latest (July 2001) supplemental risk burn was to collect data on carcinogenic metals (As, Be, Cd, Cr and Ni), mercury, and PCDD/PCDF emissions under adverse, worst-case operating conditions for the kiln. Thus, the supplemental data have been used to update the human health risk assessment, previously performed using data from the original trial burn conducted in April 1999 as well as the risk burn conducted in May 2000. Those emissions data obtained during the Phase 2 "Risk burn" have replaced the previous data for the same parameters in the risk assessment and the total risk has been recalculated.

As established by the most recent test protocol approved by the NYSDEC, Kiln No. 1 was operated in a similar manner as described for Test Condition B in the previously approved TBP used to conduct the original April 1999 test. This means that the original data on feed organics and those resulting as products of incomplete combustion could be used without repetition of all of the original testing. Only data on PCDDs/PCDFs and metals needed updating due to the sensitivity of their emission rates to the renovations in the Norlite operating conditions.

In order to ensure a high probability for success regarding future operation of the facility, three test condition variations were evaluated (i.e., each represented a variation on the operating parameters originally specified to represent the original Test Condition B). The target operating parameters for each test condition evaluated were as follows:

- Test Condition B represented metal feed rate limits equivalent to permitted levels dated January 8, 1997. A target chlorine loading of 115 lb/hr (or 2.4% in the LLGF) was also established for Condition B along with a baghouse inlet temperature of 400°F.
- Test Condition C represented metal feed rate limits equivalent to the NYSDEC initiated permit modification dated June 23, 2001. A target chlorine loading of 75 lb/hr (or 1.5% in the LLGF) was also established for Condition C and a baghouse inlet temperature of 400°F was planned.
- Test Condition D was planned to be identical to Condition B except that the target baghouse inlet temperature was 375°F.

As explained in the companion report describing the full results of the new testing program (ENSR Doc. No. 09514-051-400), no solid low-grade fuel (SLGF) or water injection was fed to the kiln during any of the test runs. Each test condition consisted of three runs of varying lengths, depending on the parameters being tested. Stack emissions were characterized for polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDDs/PCDFs) (3-hr runs) and metals (2-hr runs). Based on the operating parameters established for each test, Condition D was completed first, followed by Conditions B and C.

A summary of process operating data for the overall program is provided in Table 1-1. An overview of emission results are summarized in Table 1-2; the specific values for "Condition B" were used for this MRA update except for metals. Metals emission rates were updated to represent requested permit conditions for future operations. Table 1-3 presents the latest feed rates assumed in calculating the emission rates for use in this MRA. The final emission rates and for the selected chemicals of potential concern, including the lates values for all of the metals are presented and described in Section 4.

## 1.3 Guidance for Risk Assessment

The risk assessment was conducted in accordance with applicable U.S. EPA and New York State Department of Health (NYSDOH) guidance. The continuously changing science of risk assessment has led to a series of guidance documents, which include:

- Guidance for Exposure Assessment of Municipal Solid Waste and Hospital Waste Incinerator Emissions. New York State Department of Health, 6/27/91 (NYSDOH, 1991).

- Methodology for Assessing Health Risks Associated with Indirect Exposure to Combustor Emissions, Interim Final (EPA/600/6-90/003) Jan. 1990 (U.S. EPA, 1990), and the External Review Draft Addendum, (EPA/600/AP-93/003) Nov. 1993 (U.S. EPA, 1993a).

- (Draft) Implementation Guidance for Conducting Indirect Exposure Analysis at RCRA Combustion Facilities. OSWER. April 22, 1994. Errata dated Oct. 4, 1994. Attachment C dated December 14, 1994 (U.S. EPA 1994a, b, c).

- North Carolina Protocol for Performing Indirect Exposure Risk Assessments for Hazardous Waste Combustion Units. January 1997 (NCDEHNR, 1997).

The last of these documents served as the primary basis for the risk assessment modeling algorithms utilized for this report, since that document built upon and supplemented or corrected a number of the algorithms developed in the previous documents. Since the submission of the original risk assessment protocol, however, the U.S. EPA has proposed additional guidance for the performance of multipathway risk assessments for facilities that burn hazardous waste-derived fuels. The latest draft published for public comment (and recommended for interim use by the U.S. EPA) presents supplemental information which was also frequently considered for the current assessment:

- Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities [Peer Review Draft] (U.S. EPA July 1998 and Errata, August 1999).

For the "Base Case" of the current risk assessment, to maximize consistency with previous analyses performed for Norlite's New York facility, the equations established by the previous series of guidance documents and the risk modeling exposure assumptions recommended by the NYSDOH were considered as the primary guidance. For the most part, the equations recommended in the latest U.S. EPA guidance are identical to those recommended in the North Carolina guidance and utilized for the risk assessment calculations provided by Norlite in 1999, 2000, and 2001. In all of these cases, and in the present case, this newest U.S. EPA (1998 and 1999) documentation was also consulted. There were several instances in which this newest guidance provided more representative, or more accurate alternatives for assumptions originally recommended in the predecessors to the North Carolina guidance for modeling fate and transport of chemicals. These were the methods for: (1) air dispersion modeling; (2) mercury fate and transport modeling methodology; and (3) transport and fate modeling of dioxins and furans.

In the first of these listed situations, the newest air modeling methods applied were derived from the latest U.S. EPA guidance on use of its Industrial Source Complex Short-Term Model (ISCST3, Version 99155) for risk assessment applications (see Section 3, below). In the second, the methods applied here are based upon the 1999 Errata update to the U.S. EPA 1998 guidance identified above and generally represent the latest scientific information available, much adopted from the Mercury Study Report to Congress, Vol. I – VIII. (U.S. EPA, 1997a).

For the third issue, the fate and transport of each of the 17 congeners of toxicological concern were individually modeled based on data provided in the latest U.S. EPA 1998/9 guidance cited above. This approach has been used most recently by U.S. EPA Region 6 in its own risk assessments (U.S. EPA, 2001).

There were some elements of this latest guidance that differed significantly from the previous references. When the difference involved the choice of a "default" value for a modeling parameter, choices were biased to represent what were understood to be values most appropriate to local conditions. (This recognized that U.S. EPA recommendations for "default values are generally intended to be conservatively high enough to represent the adverse conditions in the entire country). There were, however, also several instances in which the default data and the recommended choices for model input values presented in the newer guidance (and pointed out in U.S. EPA Comments on the previous MRA) contrasted with experience gained in previous modeling of similar situations in New York State. The occurrence of those situations led to the definition of an alternative to the "Base Case" evaluated in this risk assessment. That case is referred to as the "EPA Alternative Case". Results for that case are discussed in the Risk Uncertainty section of the main report, and detailed calculation results are included as an appendix.

For the "EPA Alternative Case", EPA default alternative exposure and diet parameters, recommended in the 1998 guidance are utilized, regardless of their apparent applicability limitations, with one exception, the deposition rate of mercury vapor under non-precipitating conditions. For precipitating conditions, there is no difference. The mercury "dry" deposition rates used throughout this study are based on long-term measurement values obtained in from more than a decade of research at an Oak Ridge, TN, forest research station. Because the assumptions made in modeling deposition of mercury vapor have potentially important effects upon the risk assessment results for this and all other combustion facilities, special attention is given to the uncertainties associated with this aspect of the modeling. These differences are discussed in more detail in Section 7.4 of this report, and in Appendix H, which includes a very recent paper examining the effects of these uncertainties upon risk management decision-making.

In accordance with these guidance documents, this risk assessment is organized into the following steps:

- Site description
- Air dispersion and deposition modeling
- Hazard identification
- Toxicity assessment
- Exposure assessment
- Risk characterization

- Screening ecological evaluation

## 1.4 Risk Assessment Approach

Predictions derived about current and future risks, consistent with NYSDEC and U.S. EPA conventions, use recognized mathematical models to calculate the anticipated effects from atmospheric transport and dispersion, as well as subsequent chemical fate and transport in the aquatic or soil environment for deposited materials emitted from the subject facility. As outlined below, these models determine the expected concentrations in the various environmental media at a specified set of geographical points called receptors. For mathematical convenience these receptors are usually specified as a symmetric geometric array of points surrounding the facility, but the analysis then relates these results to either actual or hypothetical exposures to individuals or groups residing, working,'or engaging in recreational activities in the areas covered. When the local land use information is considered, the exposure calculations can also be related to typical behavior of the individuals at particular receptor locations. This combination of exposure and activity pattern assigned to a particular location is referred to by risk assessors as an exposure "receptor."

Historically, risks were often analyzed for a hypothetical Maximum Exposed Individual (MEI) receptor. It was assumed that the MEI receptor was located at the spot receiving maximum emissions from the facility, and would engage in all activities that would maximize their absorbed dose over a lifetime theoretically spent at that same location. More recent U.S. EPA guidance (EPA, 1993a; 1994a) suggested that the risk assessment should consider more realistic receptors that are still at the high end of the range of possible exposures. This is referred to as a "Reasonable Maximum Exposure" (or RME). This protocol assumes use of this newer approach to update the assessment of potential risks associated with the Norlite plant.

This new multipathway risk assessment includes both direct and indirect pathways of exposure to process effluents that are associated with the normal range of operations over long periods of time (i.e., 30 years). As noted in previous Norlite multipathway risk assessments, it is assumed that the principal "direct" exposure pathway is the inhalation of any trace chemicals that escape the Norlite air pollution control systems. Also, as before, analysis of "indirect" pathways includes exposures to trace materials deposited on the soil, plants or waterbodies, eventually ingested by way of the food chain or inadvertently. In contrast to the previous analysis, however, wet deposition of airborne particulates, as well as deposition of vaporous forms of mercury, and dioxins/furans (and similar organics) is now explicitly addressed in the deposition modeling.

Consistent with the NYSDOH recommendations, and continuing revisions to U.S. EPA Guidance, the types of receptors that are likely to face the highest potential risks from exposure to emissions from the facility consist of adults and children, which may be classified as residents, subsistence farmers and subsistence fishers. Both direct inhalation exposures, as well as appropriate indirect exposures, such as vegetable produce, beef, dairy milk, and fish ingestion, are evaluated for these receptors. In accordance with U.S. EPA guidance, site-specific land use information has been reviewed to determine specific locations of these receptors. For example, a subsistence farmer receptor location has been identified in an area that could be used for the specified agricultural purposes, considering both the present and the future life of the facility. This approach is conservative in nature to ensure that the actual risks posed by the facility, **if any**, are much less than those estimated by the risk assessment. Thus if no significant risks are found in the proposed analysis, the results would demonstrate that actual receptor individuals in the vicinity of the facility are not likely to face any significant risks.

Many of the comments received on previous Norlite risk analyses concerned dose-response factors that were previously negotiated as satisfactory to NYSDOH. In the intervening period, many of the NYSDOH values that were supplementary to listings of EPA-approved values have now been addressed in the U.S. EPA Integrated Risk Information System (IRIS) database. In this risk assessment, NYSDOH values are utilized whenever they haven't been supplanted by new IRIS-listed values. If no value is available from NYSDOH or U.S. EPA references, "NA" is used to represent that no further quantitative calculation of the contribution of that chemical to the effect in question has been performed.

The Risk Characterization step of the assessment combines the results of the Exposure Assessment with the results of the Toxicity Assessment to derive quantitative estimates of risk. The potential for both noncarcinogenic and carcinogenic effects is estimated for each receptor for each potential exposure pathway identified in the Exposure Assessment. These estimated risk levels are compared against risk levels considered to be insignificant by U.S. EPA. NAS/U.S. EPA have recommended $10^{-6}$ to $10^{-4}$ as an acceptable range of carcinogenic risk and 1.0 as a value for a total Hazard Index not expected to produce any significant health consequences. Realistically, given the inherent margin of uncertainty in the risk assessment process, calculated values within a factor of 2 to 3 higher or are not expected to produce any noticeable adverse health or ecological effects. However, U.S. EPA (1994a) suggests comparing noncancer risks against a noncancer Hazard Index of 0.25, and cancer risks against a cancer risk level of $1 \times 10^{-5}$. If site risks are less than these levels, then it is assumed that the risks are quite generally inconsequential and no further analysis is required. If calculated risks are slightly higher than these benchmarks, the U.S. EPA guidance (U.S. EPA, 1998) clearly states that there is not necessarily any expectation of any adverse effect, but that the projected risks are high enough to warrant further investigation as to whether there are potential improvements readily available, such as further control of source emissions.

Finally, in characterizing any risks associated with long term operations of the Norlite facility, the sources and relative degrees of uncertainty are reviewed in the final section of this report. Since there have also been additional modifications in federal guidance which will be published over the next year, it may be necessary for Norlite to review these changes and their potential impact upon the current analysis to determine whether it is appropriate to further revise any of the analyses presented herein.

The conclusions presented with the current report also indicate that, consistent with the newest MACT (Maximum Achievable Control Technology) requirements, Norlite has made significant improvements in the air pollution control systems servicing its two rotary kilns at this facility. Those changes, as demonstrated by the most recent testing, have reduced the emissions of the primary chemical species found to dominate the current risk estimates. Furthermore, the risk estimates provided in this report tend to represent "stressed" operations of the current units and thus should not be considered to represent the long term expectation of risk for this facility. Those long-term risks are expected to be lower than the results presented herein.

### 1.5 Screening Ecological Assessment

As established by the previously submitted and accepted Protocol for a Multipathway Risk Assessment (ENSR Doc. No. 9514-039 May 1996, Section 2.5), a preliminary Screening Level Ecological Risk Assessment (SLERA) has been included with this MHRA. The SLERA identifies examples of critical ecological resources in the site vicinity and reflects the potential for concern about adverse effects, including those that could affect any endangered or threatened species that may be present. As an initial step, predicted kiln-related compound concentrations in surface water and sediment are compared against relevant New York State (NYS) Water Quality Standards and NYS Sediment Guidance Values, respectively. Comments received from the U.S. EPA resulted in expanding the screening-level ecological risk analysis (SLERA) in March 2002 to include potential effects on species inhabiting wetlands and terrestrial uplands, in addition to those comprising the food chains dependent primarily upon water and sediment quality. Therefore, the current SLERA report includes in Section 8 the results of an parallel assessment of the environmental media concentrations determined from the air modeling the human health risk assessment, but with concentration estimates in media separately calculated to represent the several types of ecological receptors selected for evaluation. These include the original avian predators, but now also several additional species resident in the identified wetlands and terrestrial upland areas. Selections of species were based upon results of an experienced field biologist's visit to the Green Island sites and two other more remote terrestrial upland areas in the vicinity, to determine representative ecological impacts for species considered to be potentially sensitive.

## Table 1-1
## July 2001 Risk Burn Process Operations Summary

| Operating | Units | Parameter Test Condition B | C | D |
|---|---|---|---|---|
| **Kiln Parameters –** | | | | |
| LLGF Feed Rate | gpm | **10.21** | 10.00 | 9.27 |
| Shale Feed Rate | tph | **21.78** | 21.86 | 22.02 |
| Back-end Temperature | °F | **1,032** | 1,035 | 1,018 |
| **APCS Parameters -** | | | | |
| Baghouse Inlet | °F | **400** | 399 | 375 |
| Baghouse Pressure | in. w.c. | **5.12** | 5.17 | 5.17 |
| Scrubber Recirculation | gpm | **176.6** | 178.7 | 177.5 |
| Scrubber Blowdown | gpm | **13.8** | 13.9 | 14.1 |
| Recirculation Tank | -- | **7.99** | 7.99 | 7.99 |
| Venturi Pressure | in. w.c. | **6.46** | 6.70 | 6.63 |
| Ducon Pressure | in. w.c. | **2.20** | 2.33 | 2.32 |
| **Constituent Feed Data -** | | | | |
| Total Chlorine | lb/hr | **97.0** | 64.9 | 86.7 |
| Arsenic | lb/hr | **0.537** | 0.531 | 0.565 |
| Beryllium | lb/hr | **0.049** | 0.053 | 0.057 |
| Cadmium | lb/hr | **0.181** | 0.123 | 0.157 |
| Chromium | lb/hr | **4.20** | 4.25 | 4.24 |
| Mercury | lb/hr | **0.0052** | 0.0039 | 0.0041 |
| Antimony | lb/hr | **0.155** | 0.186 | 0.142 |
| Barium | lb/hr | **7.59** | 14.6 | 9.80 |
| Lead | lb/hr | **3.18** | 3.47 | 2.57 |
| Silver | lb/hr | **0.089** | 0.098 | 0.082 |
| Thallium | lb/hr | **0.175** | 0.209 | 0.158 |
| Copper | lb/hr | **7.33** | 4.66 | 6.79 |
| Nickel | lb/hr | **4.93** | 2.76 | 4.49 |
| Selenium | lb/hr | **0.312** | 0.309 | 0.305 |
| Zinc | lb/hr | **12.8** | 8.73 | 8.86 |

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## Table 1-2
## Risk Burn Stack Emissions Summary

| Emission Parameter | Units | Emission Test Condition B | C | D |
|---|---|---|---|---|
| **Metals (M 0060) –** | | | | |
| Arsenic (LVM) | µg/m³ | **0.88** | 1.13 | 1.02 |
| Beryllium (LVM) | µg/m³ | **< 0.09** | < 0.08 | < 0.09 |
| Chromium (LVM) | µg/m³ | **1.03** | 0.78 | 1.49 |
| LVM Total | **µg/m³** | **2.00** | **1.99** | **2.59** |
| Cadmium (SVM) | µg/m³ | **0.35** | 0.33 | 1.23 |
| Lead (SVM) | µg/m³ | **0.60** | 0.52 | 1.30 |
| SVM Total | **µg/m³** | **0.95** | **0.85** | **2.53** |
| Mercury | µg/m³ | **19.8** | 10.7 | 15.7 |
| Antimony | µg/m³ | **< 0.35** | < 0.32 | < 0.40 |
| Barium | µg/m³ | **0.99** | 0.91 | 1.88 |
| Silver | µg/m³ | **< 0.19** | < 0.16 | < 0.18 |
| Thallium | µg/m³ | **< 0.44** | < 0.40 | < 0.44 |
| Copper | µg/m³ | **3.56** | 2.04 | 5.37 |
| Nickel | µg/m³ | **11.8** | 23.1 | 8.53 |
| Selenium | µg/m³ | **< 0.44** | < 0.40 | < 0.44 |
| Zinc | µg/m³ | **21.2** | 18.1 | 25.7 |
| **PCDDs / PCDFs (M 0023A)** | | | | |
| Toxic Equivalencies | ng/m³ | **0.287** | 0.023 | 0.083 |

(a) All emissions are corrected to 7% oxygen.

Note: LVM = Low Volatile Metals; SVM = Semivolatile Metals

**Table 1-3**

**Projections of Future Metals Emission Rate per kiln**

| Metal | Emission Limit (lb/hr/kiln) | Shale (22T/hr) | | LLGF+Used Oil/Waste Fuel A | |
|---|---|---|---|---|---|
| | | Metal Conc. (mg/kg) | Metal Feed Rate (lb/hr) | Metal Feed Rate (lb/hr) | Metal Conc./ kiln (mg/kg) |
| Antimony | 4.81E-05 | 2.96 | 0.13 | 0.24 | 49 |
| Arsenic | 2.45E-04 | 53 | 2.35 | 0.104 | 21 |
| Barium | 8.52E-05 | 260 | 11.45 | 0.72 | 147 |
| Beryllium | 1.38E-05 | 3 | 0.132 | 0.0058 | 1.18 |
| Cadmium | 5.32E-05 | 7.73 | 0.34 | 0.144 | 29.4 |
| Chromium (T) | 7.78E-05 | 127.7 | 5.62 | 2.16 | 441 |
| Chromium (VI) | 2.02E-05 | - | - | - | - |
| Copper | 3.94E-04 | 190.5 | 8.38 | 4.74 | 968 |
| Lead | 6.53E-05 | 87.3 | 3.84 | 2.69 | 549 |
| Mercury | 1.69E-03 | 0.1 | 0.0044 | 0.0037 | 0.75 |
| Nickel | 9.88E-04 | 95 | 4.18 | 2.88 | 588 |
| Selenium | 1.38E-05 | 1.2 | 0.0528 | 0.12 | 24 |
| Silver | 1.82E-04 | 39.1 | 1.72 | 0.096 | 19.6 |
| Thallium | 7.98E-05 | 7.5 | 0.33 | 0.24 | 49 |
| Zinc | 2.39E-03 | 498.6 | 21.77 | 4.8 | 1000 |
| | | | | | |

# 2.0 SITE DESCRIPTION

## 2.1 General Site Information

The Norlite Lightweight Aggregate plant site consists of facilities for crushing screening and conveying both shale and the aggregate product. Two rotary kilns, utilizing a combination of high and low grade fuels, are used to fire the shale feed material and turn it into the aggregate product. The processing system is supported by a fuel tank farm, product storage areas, waste water treatment equipment and product storage areas. Other facilities include a laboratory for analysis of fuels, feed material and products, as well as a maintenance shop and office space. The map in Figure 2-1 shows the 10-km radius study area for this MRA. Figure 2-2 shows the immediate vicinity of the plant site within approximately a mile (1.6 km) of the facility's property boundary. The majority of the 220-acre site is occupied by the associated shale quarry and a buffer area of undeveloped. Of this area, most of the manufacturing-related facilities are located on 40 acres that is incorporated into the City of Cohoes.

As shown in Figures 2-1 and 2-2, the Norlite plant facility is located about 1½ km (1 mi.) west of the Hudson River and about the same distance south of the Mohawk River, where it joins the Hudson River. The plant site is bounded on the north by the City of Cohoes, which consists of residential and commercial districts. On the East it is bounded immediately by a railroad track, a small residential area, and the New York Highway 32. Further to the east, on extending from the far shore of the Hudson River is the City of Troy. On the west, it's undeveloped land is bounded by agricultural land and a small newer subdivision of residences. On the southeastern corner, residential and commercial areas close to the highway become a combination of residential and undeveloped property toward the southwestern corner. Further to the south is the City of Watervliet; and to the south of that city, the study area is bounded by Interstate 90 and the northern suburbs of Albany.

The general nature of the immediate surrounding area is one of general/light industry and commercial districts interspersed with residential neighborhoods. Approximately 1 ½ km (1 mile) west of the facility site is a farm reported to have about 30 dairy cattle. At a similar distance, but to the north of this farm is another farm which is assumed to have beef cattle and vegetable crops sufficient to support a "subsistence" lifestyle. Although there are several municipalities nearby, the land use classification within a three-mile radius of the plant is predominantly rural. Figure 2-3 provides a preview of the locations of the key risk evaluation "receptor locations" considered in this MRA (as described in Section 6).

## 2.2 Topographic Setting

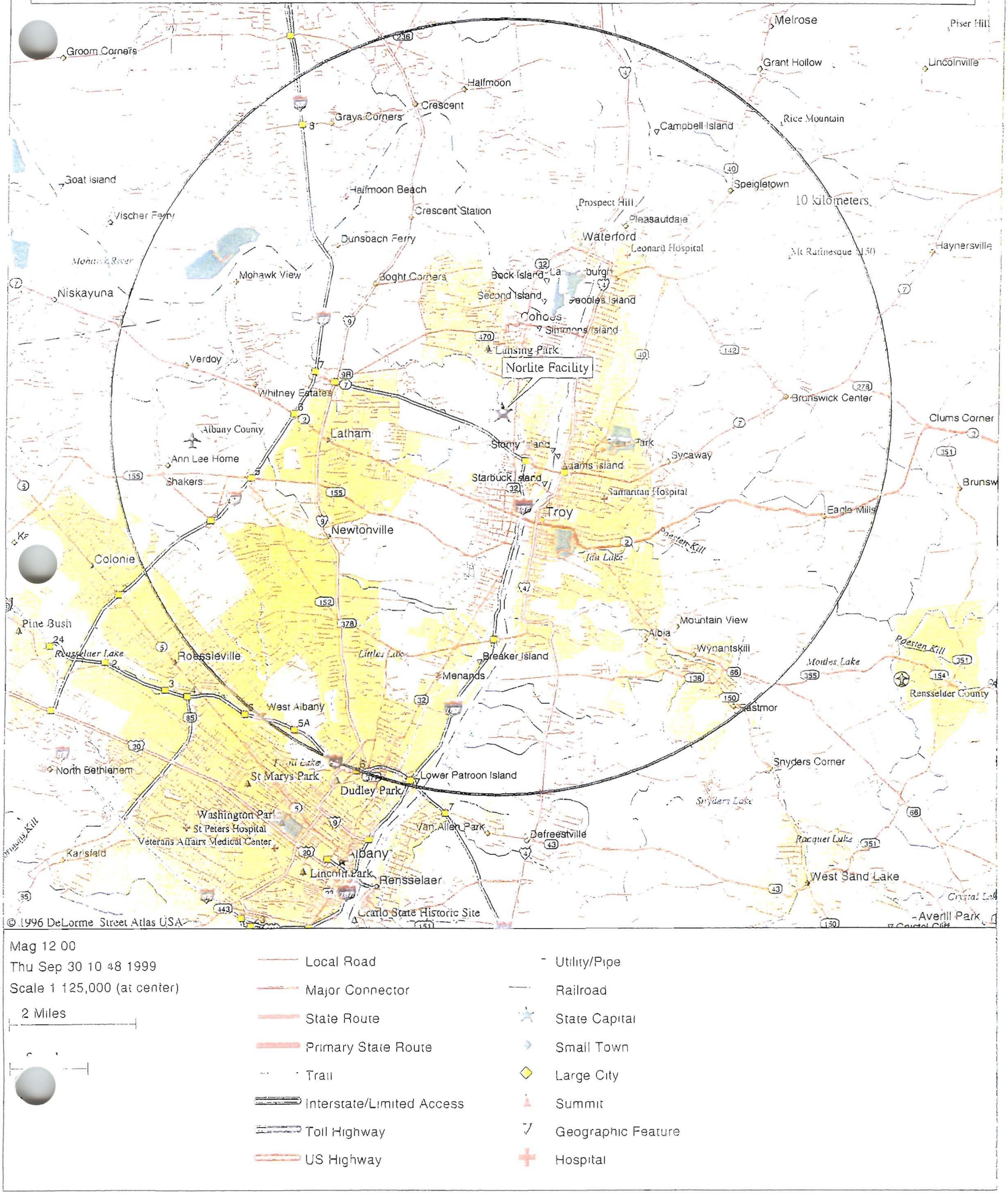
As illustrated by the USGS base maps utilized for Figure 2-2 (and Figures 2-5 and 2-6), the topography around the plant site is characterized by the several small hills to the north and west, the relatively flat shoreline area near the Hudson River, and the gently rising terrain to the east of the river. Small hills and ridges occur on both sides of the Hudson and Mohawk Rivers. Ground elevations generally range between 15 and 90m (50 to 300 feet) above sea level within 1 to 3 km from the plant site. At a distance of 8 km (5 mi) to the northwest, the elevations rise to 180-215 m (600-700 ft) above sea level. Air dispersion modeling performed to support this risk assessment explicitly includes the effects of the surrounding terrain. (Special modeling was also performed to verify that elevated floors of nearby schools or hospitals would be adequately simulated by the model calculations).

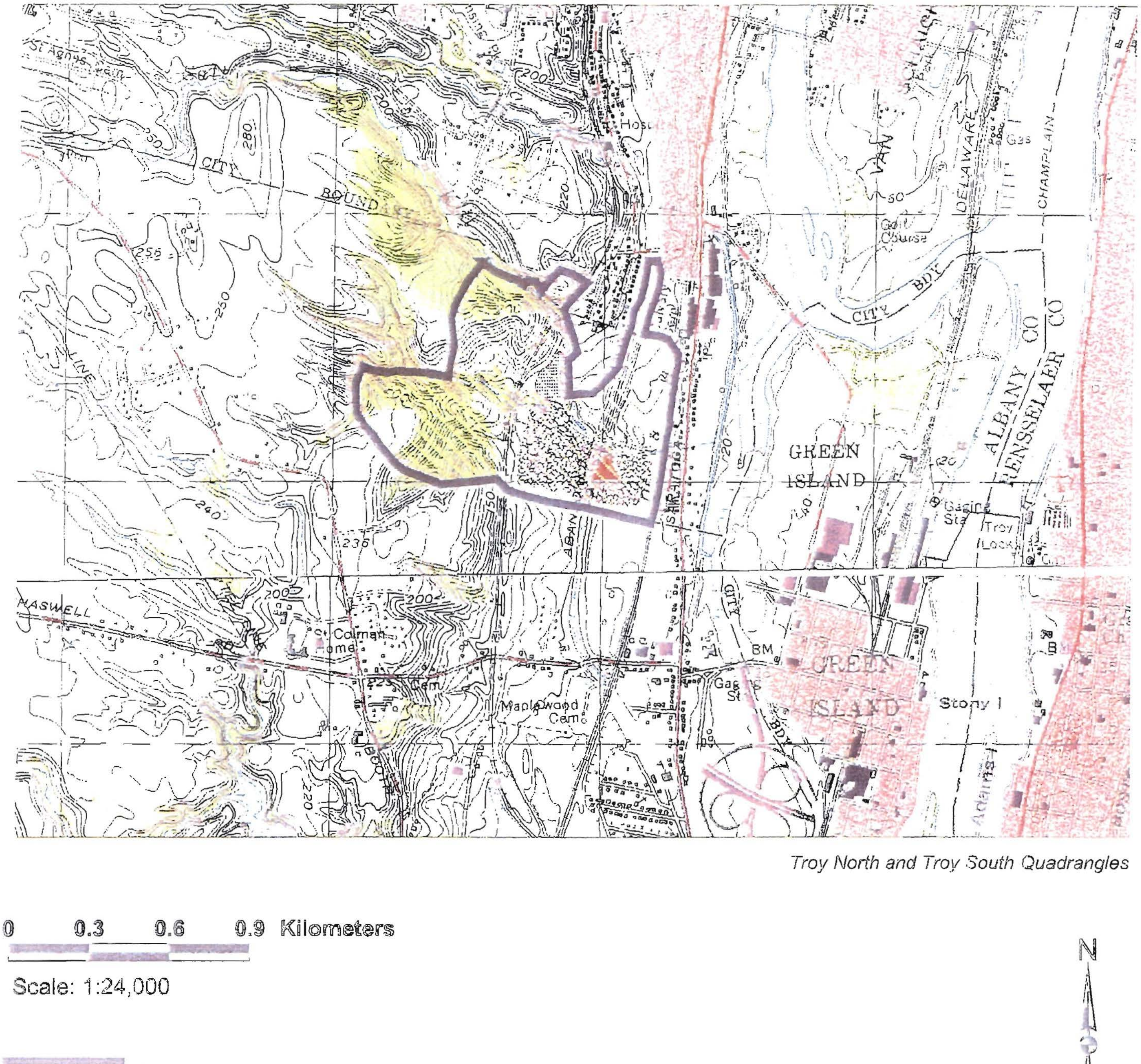
It is apparent that the Hudson River and Mohawk River are the principal water bodies closest to the Norlite site. The Mohawk River has a large watershed, extending over much of northeastern New York; and then it becomes part of the larger Hudson River watershed (see Figure 2-4). The catchment area of the Mohawk River, upstream of its junction with the Hudson River, is well above the 272 $km^2$ found within 20 km of the Norlite kiln stacks. However, this neighboring area is most affected by deposition and inclusion of a larger area would have the effect of diluting the potential impact of the effluent on this body of water and the fishing and drinking water areas it supplies. Mean annual flows of the Mohawk River at Cohoes, NY equal 3 billion cubic meters, or an average of 3,440 cubic feet per second (cfs). The Approximately 2 % of this flow is diverted through the canals at Canal State Park which has provisions for recreational, and possibly subsistence, fishing. There is no significant recreational or other fishing is carried out in the Hudson River in this area. Therefore, the Canal State Park area is assumed for the purposes of this MRA to be the designated fishing area most exposed to facility emissions that could also serve as the site of "subsistence" fishing (see Figure 2-5).

On the Troy side of the Hudson River there are several lakes that are stocked by the state fisheries department, to encourage recreational fishing. Due to their smaller size and the limits posted for allowable catch size, it is considered unlikely that any of these lakes would be locations for "subsistence" fishing. Wright and Bradley Lake are adjacent to each other and are in an area close enough to the Norlite site to experience some deposition of effluent constituents. As illustrated in Figure 2-5, these were included in the current study to represent the maximal exposure from recreational fishing.

As noted in Section 1, comments received from the U.S. EPA resulted in expanding in March 2002 the screening-level ecological risk analysis (SLERA) to include potential effects on species inhabiting wetlands and terrestrial uplands, in addition to those comprising the food chains dependent primarily upon water and sediment quality. Figure 2-6 illustrates the location of the closest wetlands, the watershed affecting that area, and the nearby terrestrial upland area for which this analysis was undertaken. Although there are similar (more elevated) terrestrial uplands to the west, the long-term air dispersion patterns and the expected similarity of target species in all of these nearby areas led to the Green Island locations for both portions of the supplemental analyses.

# Figure 2-1 Study Area






Troy North and Troy South Quadrangles

0 0.3 0.6 0.9 Kilometers

Scale: 1:24,000

N

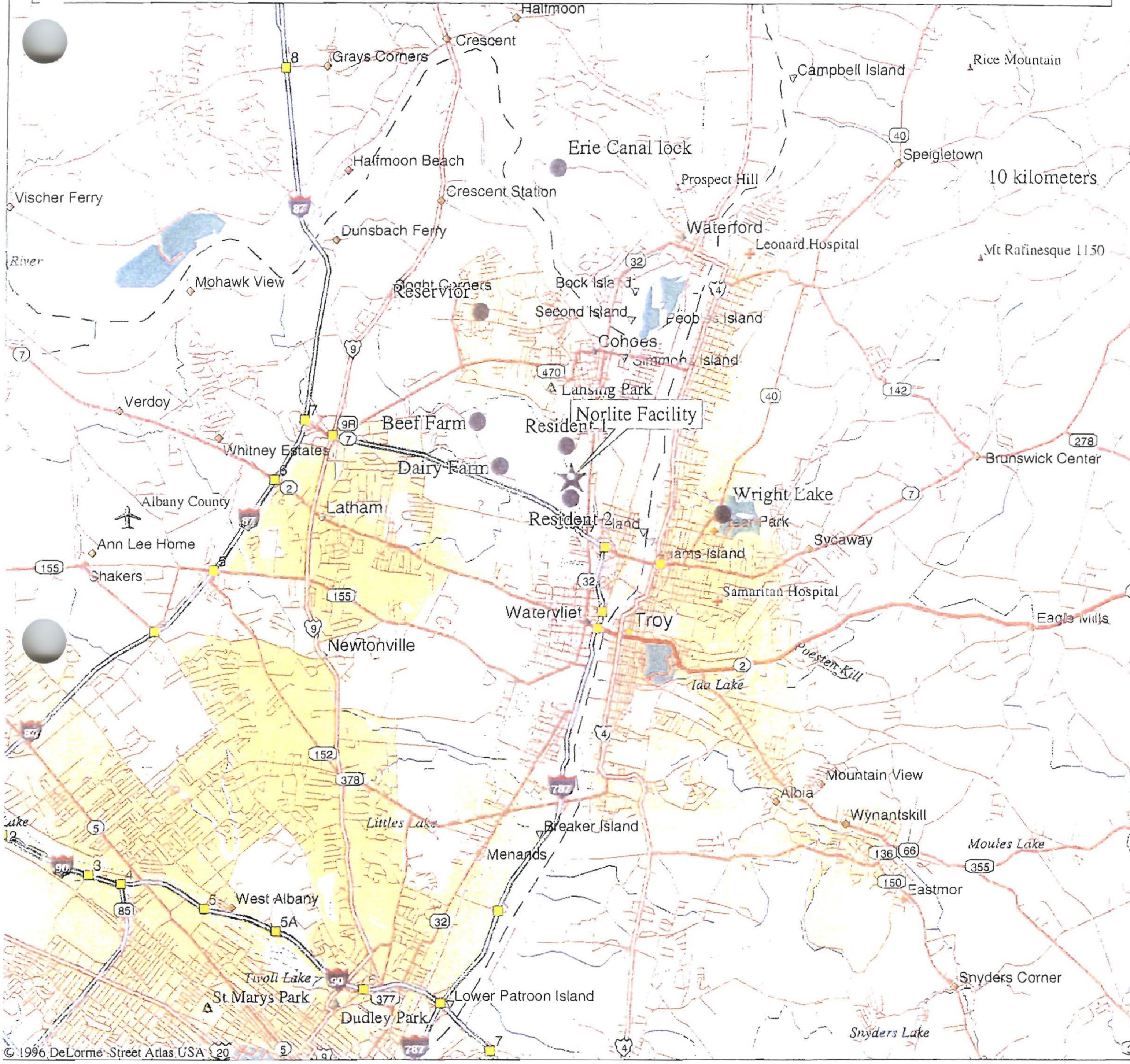
Site

Norlite Stacks

Figure 2-2

Norlite Facility Location

# Figure 2-3 Key Receptor Locations




Mag 12.00
Thu Sep 30 12:05 1999
Scale 1:100,000 (at center)
2 Miles

| | |
|---|---|
| Local Road | Utility/Pipe |
| Major Connector | Railroad |
| State Route | Small Town |
| Primary State Route | Large City |
| Trail | Summit |
| Interstate/Limited Access | Geographic Feature |
| Toll Highway | Hospital |
| US Highway | Park/Reservation |

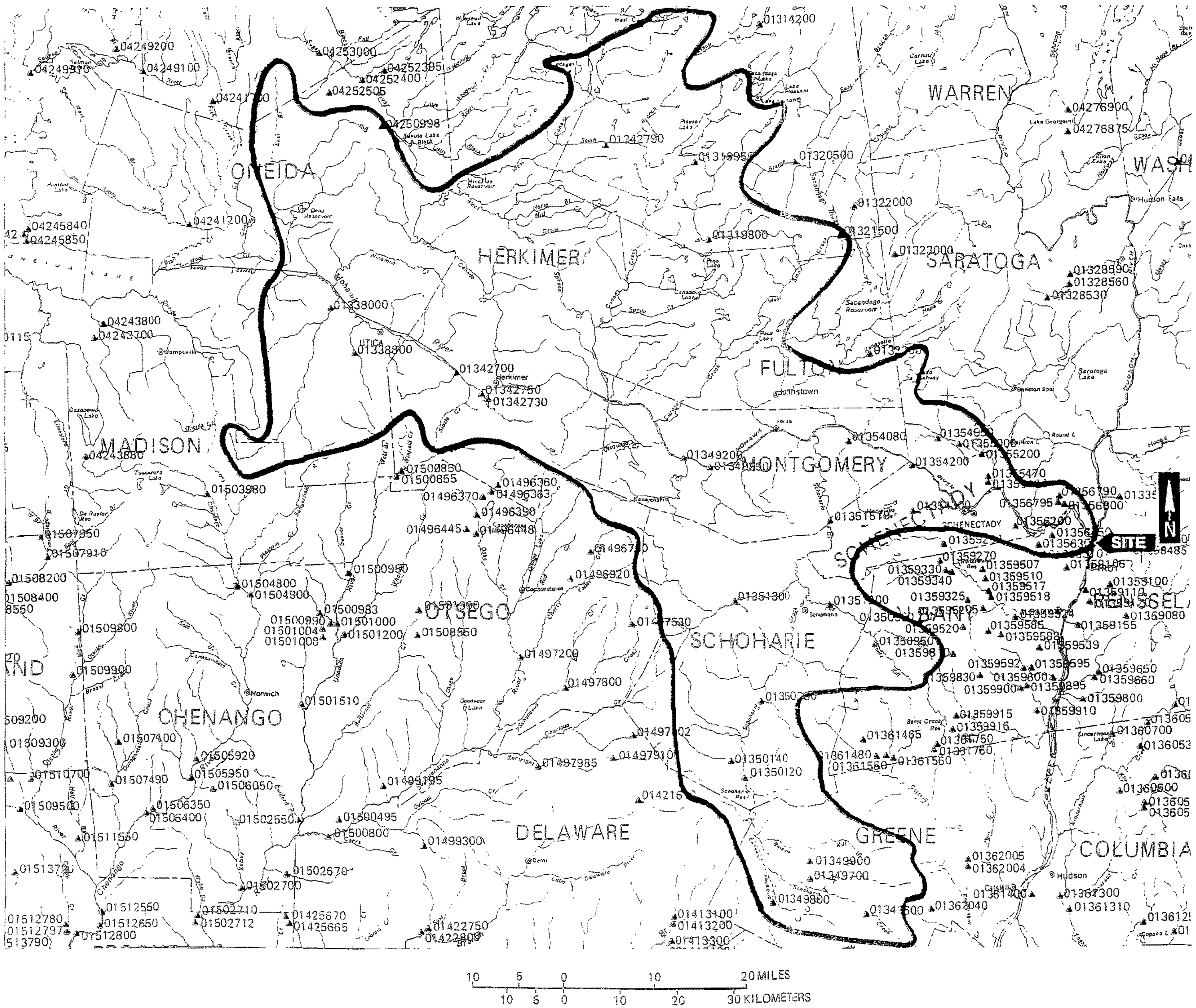
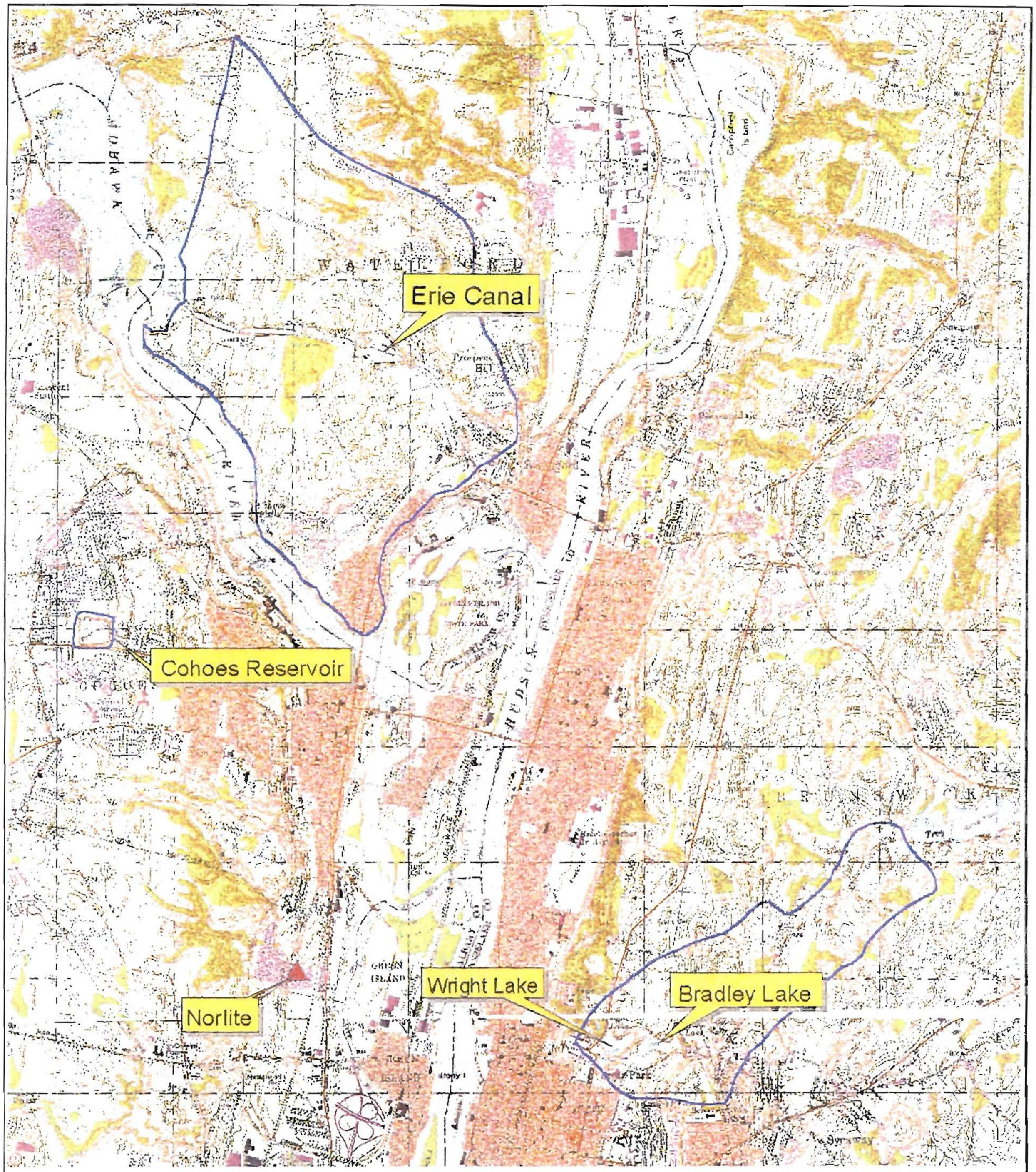
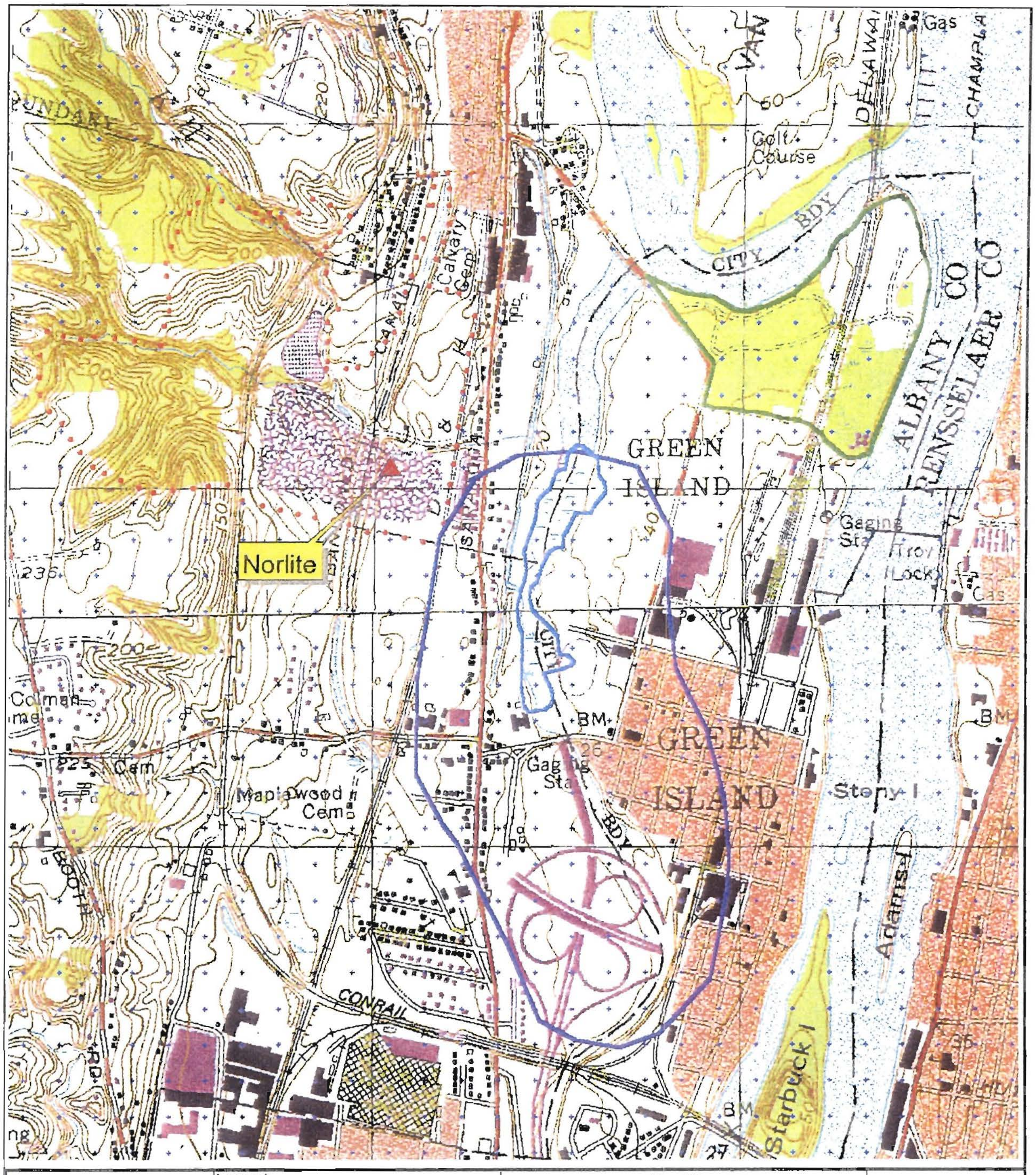


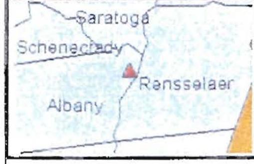

FIGURE 2-4
Mohawk River Watershed Area




| Locus Map | Legend: | Norlite | |
|---|---|---|---|
| Saratoga Schenectady Rensselaer Albany | ▲ Norlite<br>USGS 1 : 24,000 QUADRANGLES: Troy North, NY (North), Troy South, NY (South) | Figure 2-5<br>Cohoes Reservoir, Erie Canal Lock and Wright Lake/Bradley Lake Watershed with Respect to Norlite Facility | ENSR INTERNATIONAL |
| March 2002 | Scale 1: 50,000 0 0.5 1 1.5 2 Kilometers | | Project Number 09514-046 |




Locus Map




Legend:
- ▲ Norlite
- ▪ Fenceline Receptors
- + Receptor Locations
- Terrestrial Upland
- Watershed for Wetland Area
- Wetland Area

USGS 1 : 24,000 QUADRANGLES:
Troy North, NY (North), Troy South, NY (South)

N

Norlite

Figure 2-6
Locations of Watershed, Wetlands, and Terrestrial Uplands

ENSR INTERNATIONAL

March 2002

Scale 1 : 16,000 — 0 0.2 0.4 0.6 0.8 1 Kilometers

Project Number 09514-046

# 3.0 AIR DISPERSION AND DEPOSITION MODELING

## 3.1 Modeling Approach

Air dispersion and deposition modeling was performed for this risk assessment to quantify the level of compounds of potential concern (COPCs) in ambient air and other environmental media to which potential receptors may be exposed as a result of emissions from the facility. COPCs in ambient air, predicted using air quality dispersion models, are used to evaluate potential human exposures via inhalation. Deposition algorithms estimate the magnitude of deposition onto water, soil and vegetation surfaces. This information can then be used to evaluate potential human exposures via direct and indirect pathways. To evaluate risks from chronic exposure, long-term average air concentrations and deposition rates will be used. In addition, acute exposures will also be evaluated using the maximum one-hour concentrations. The dispersion and deposition modeling was performed in accordance with the recommendations and prescribed methods in the U.S. EPA human health risk protocol (U.S. EPA 1998). The following sections describe the methodologies used in the dispersion and deposition modeling.

### 3.1.1 Model Selection

An evaluation of the model selection criteria for the kiln stacks reveals that the dispersion model must be able to simulate: (1) stack point source, (2) dispersion in a rural area, and (3) terrain below stack top (simple terrain) and terrain above stack-top (complex terrain). The Industrial Source Complex Short-term Model, (ISCST3 Version 99155), meets all of these criteria and the U.S. EPA recommended model for this application (U.S. EPA, 1998). The U.S. EPA's COMPLEX I screening model for complex terrain has been incorporated into ISCST3. For locations above stack top but below plume centerline (intermediate terrain), ISCST3 follows the *Guideline on Air Quality Models* (U.S. EPA, 1986) by using the higher prediction of simple terrain and complex terrain algorithms. As a result, ISCST3 has the ability to handle simple, intermediate, and complex terrain in addition to simulating both dry and wet deposition required for the multi-pathway human-health risk assessment.

### 3.1.2 Model Options

The ISCST3 dispersion model was applied in accordance with the recommendations made in the U.S. EPA guidance document (U.S. EPA, 1998). The DFAULT option was employed in the application of ISCST3. In addition, options for air concentrations, dry deposition, wet deposition, and plume depletion were used.

Air concentrations accounting for plume depletion, as well as long-term average wet and dry deposition rates, have been calculated. The two kilns are identical units each serviced by an identical stack. A single stack, located centrally with respect to the two stacks, was modeled in ISCST3 with a unit emission rate (i.e., 1 g/sec). The predicted air concentrations and deposition rates are then scaled by the total emissions for both units for each chemical species. The risk assessment calculations require dry and wet deposition for both particle and vapor components. Therefore, model iterations were performed utilizing the model options for wet and dry deposition of particles and wet deposition of vapor. The ISCST3 model does not compute dry deposition of vaporous chemicals. In accordance with the risk assessment guidance (U.S. EPA, 1998), dry deposition of vapor was calculated as the product of the undepleted air concentrations (obtained through an additional model run) and a U.S. EPA recommended default deposition velocity (i.e., 3 cm/sec).

In summary, the modeling performed included separate runs made for:

1. wet and dry deposition of particles based on mass-weighted particle distribution, including plume depletion and air concentrations;

2. wet and dry deposition of particles based on area-weighted particle size distribution including plume depletion and air concentrations;

3. wet deposition of vaporous gases; and

4. undepleted air concentrations.

As described in greater detail below, the ISCST3 modeling was performed with a comprehensive cartesian receptor grid with terrain elevations developed from Digital Elevation Model (DEM) files developed by the United States Geographical Survey (USGS). The "Terrain Grid" file is an optional file used by ISCST3 to determine the terrain elevation at various distances along the plume path for the calculation of plume depletion. Noting the significant increase in run-time and nominal benefits of including the "Terrain Grid" file, the "Terrain Grid" file is not recommended by U.S. EPA (see Section 3.8, U.S. EPA 1998). Therefore, a "Terrain Grid" file was not used.

### 3.1.3 Land Use for Dispersion Coefficients

The application of the ISCST3 requires characterization of the local (within 3 km) dispersion environment as either "urban" or "rural" based on prevalent land use. As described in the guidance document (U.S. EPA 1998) land use categories of "rural" and "urban" are taken from the methods of Auer (Auer, 1978). In this scheme, areas of industrial, commercial and compact residential land use are designated urban. According to U.S. EPA guidelines, if more than 50 percent of an area within a 3-kilometer radius of the source location is classified as rural, then rural dispersion coefficients are used in the dispersion modeling analysis. Land-use surveys based on the Auer method has been previously conducted for this site in support of the original health risk assessment performed in 1991 and determined the site to be rural. This is consistent with a review of the USGS topographical maps including the Troy north and Troy south quadrangles which indicates that the land-use within three kilometers of the facility is predominantly rural. Consequently, rural dispersion coefficients were used in the application of ISCST3.

### 3.1.4 Source Data

The Norlite kiln stacks (2) are identical stacks each 120 feet (ft) high with a stack exit diameter of 4.0 ft. The base elevation of the stacks is 30 feet above mean sea level. Recent stack test results (April 1999) were analyzed to determine the average exhaust characteristics (exit temperature and exit velocity) from the stack tests. The resulting exhaust velocity of 57.6 ft/sec and exhaust temperature of 140°F were used in the dispersion/deposition modeling. As described above, a single kiln stack was modeled in ISCST3 with a unit emission rate (i.e., 1 g/sec) and then the estimated air concentrations and deposition rates were scaled by the total emissions for both kilns for each chemical species.

In addition to the physical stack parameters and exhaust stack parameters, particle size data on stack emission are required to perform deposition modeling. Based on the engineering design of the air pollution control system and the nature of the fuel, the particle size distribution for the Waste Technologies, Inc. (WTI) incinerator was selected to represent the particle size distribution for the Norlite Kilns. No independent measurements of particle size distribution was included in the trial burn plan for the April 1999 testing.

Two size distributions, one according to particle mass and another according to particle surface area, were utilized. (The surface area distribution was derived from the mass distribution by assuming particles are spherical). This accounts for COPCs which may be distributed by particle mass (most metals) and others that are more likely to be vaporized during combustion and thereafter condense on the surface of particles in the exhaust stream (e.g., semi-volatile organics, and low melting point metals, such as lead, arsenic and mercury).

ISCST3 requires the user to specify scavenging coefficients for each particle size for both liquid and frozen precipitation. Scavenging coefficients by Jindal and Heinold (1991) will be used, as recommended in Volume II of the ISCST3 Users Manual.

Table 3-1 lists the selected particle size distributions and the scavenging coefficients.

For modeling wet deposition of vapor, a single scavenging coefficient for gases is input to ISCST3. The value of 1.7E-04 hr/min-sec recommended by U.S. EPA will be used (i.e., the scavenging coefficient recommended by Jindal and Heinold (1991) for the smallest particle size considered).

### 3.1.5 Good Engineering Practice Stack Height Analysis

Good Engineering Practice (GEP) stack height is defined as the height necessary to avoid excessive ground-level pollutant concentrations due to aerodynamic downwash of a plume caused by nearby structures or ground effects.

In the presence of "nearby" structures, GEP is determined by the following equation:

$$H_{GEP} = H_B + 1.5 \min (H_B, W_B)$$

where:

$H_B$ is the building height

$W_B$ is the effective building width normal to the wind direction.

The maximum height determined from applying this equation to all "nearby" structures is defined as the GEP height. A "nearby" structure is defined as any structure for which the stack is located within a distance of 5 times the lesser of the structure's height or width. In the absence of any significant structures, U.S. EPA stack height regulations define GEP height as 65 meters (213 ft). In air quality modeling, a source cannot take credit for a stack height greater than GEP.

The Norlite thermal treatment kiln stacks are each 120 feet which is a GEP stack height as determined by ENSR. This is consistent with the previous GEP analysis for these stacks conducted in support of the 1994 update of the risk assessment for this plant. The controlling structure that maximizes the GEP formula height for both kiln stacks was found to be the primary screen house. This structure has a height of 46 feet, a width of 15 feet and a length of 35 feet. Since the maximum projected width of the structure, the diagonal dimension (38 feet), is less than its height, the structure is considered tall for GEP purposes. The GEP formula height for each kiln stack is:

$$H_{GEP} = 46 + 1.5\ (38) = 103 \text{ feet}$$

Since the kiln stack height is greater than the GEP formula height, building downwash in ISCST3 was not considered for either stack.

### 3.1.6 Meteorological Input Data

Five years of meteorological data from the nearest representative National Weather Service station in Albany, NY was used in the dispersion/deposition modeling analysis. Onsite meteorological data are not available. Five years, 1987-1991 (consistent with the latest 5-years available on the EPA SCRAM website), of concurrent data were used including:

- Hourly surface data (NCDC CD-144 format) from Albany, NY;
- Hourly precipitation (NCDC TD-3240 format) data from Albany, NY; and
- Mixing heights (SCRAM) from Albany, NY.

These data are the closest available data sources with respect to the Norlite facility. These data files contain the meteorological variables required to perform the air dispersion and deposition modeling.

U.S. EPA's PCRAMMET model was used to consolidate the hourly precipitation data, the mixing heights, surface data, and site specific parameters (see discussion below) required for deposition modeling for each year of meteorological data. The 5 years of processed meteorological data were combined into a single meteorological data file for input to ISCST3 to compute five-year averages of air concentrations and deposition rates.

The following parameters, required for meteorological data processing and for input to ISCST3, were developed as recommended by the U.S. EPA in their human health risk protocol (U.S. EPA 1998).

- Minimum Monin-Obukhov length
- Anemometer height
- Measurement site roughness length
- Application site roughness length
- Bowen ratio
- Noon-time albedo
- Anthropogenic heat flux
- Fraction of net radiation absorbed by ground

PCRAMMET does not allow for parameters to be varied seasonally; rather, a constant value representing average conditions is used throughout the year. The recommended minimum Monin-Obukhov length of 2 meters for rural areas was used. The anemometer height at the National Weather Service (NWS) station in Albany for the period of record, 1987-1991, is 6.1 meters. For surface meteorological data from a NWS station, a value of 0.10 meters is recommended by the EPA guidance for the "measurement site". The surface roughness for the "application site" was set to 0.54 meters. This value was developed following the area/wind-rose weighting procedure outlined in Section 3.2.2.2 of the EPA guidance document. Land use information provided on USGS topographical maps was used for this analysis. The Bowen ratio and noon-time albedo, 1.0 and 0.2, respectively, were developed following the same procedure and utilized the references provided in the guidance document which contain recommended values of bowen ratio and albedo for different land use types. The fraction of net radiation absorbed at the ground is the flux of heat into the ground during daytime hours, expressed as a fraction of the net radiation. The recommended value of 0.15 for rural areas was used. As recommended for rural areas, a value of 0 W/m2 for the anthropogenic heat flux was used.

### 3.1.7 Receptor Grids

A comprehensive cartesian receptor grid following the recommendations in the EPA protocol was used in the modeling analysis. The primary cartesian receptor grid extends to 10 kilometers from the location of the kiln stacks. Additional receptors beyond 10 kilometers were utilized to compute water shed and water body deposition rates (see Figures 2-5 to 2-7). For the principal study area, however, the cartesian receptors were spaced at 100 meter increments out to 3 kilometers and spaced at 500 meters beyond 3 kilometers out to 10 kilometers. Terrain elevations for the receptors were developed from USGS Digital Elevation Model (DEM) data files (30-meter resolution obtained from an appropriate vendor). A computerized procedure was applied to automatically select the highest terrain in the vicinity of each receptor location for use in the model. The immediate vicinity is defined as the area about each receptor extending half-way to adjacent receptors. This was achieved by employing the ISCVIEW program by Lakes Environmental Software, Co. The near-field receptors including cartesian grid receptors out to 3 kilometers and the fence-line receptors are shown in Figures 3-1a and 3-1b. The far-field cartesian grid receptors (beyond 3 kilometers out to 10 kilometers) are featured in Figure 3-1b.

Except for watershed calculations, receptors located within the Norlite property boundary were not included in the modeling analysis. Discrete receptors were located along the fenced property boundary at 50 meter increments to resolve maximum impacts used for both long-term exposure and acute impacts.

For the Hudson River watershed, a simplified estimate for deposition was provided by averaging over the entire 10 km by 10 km grid. For the Cohoes Reservoir and the Wright /Bradley Lakes watersheds, the only the air modeling receptors within the areas bounded in Figure 2-6 were used. Similarly, for the Green Island wetlands watershed and the Green Island terrestrial upland area, only the receptor values within the areas plotted in Figure 2-7 were included.

A special watershed receptor grid was used to characterize the impacts to the Mohawk River watershed to including the area beyond 10 km, because water from this river is also drawn into the Cohoes reservoir at a location remote from the reservoir. This supplemental receptor grid consisted of 500 meter spaced cartesian receptors located within the watershed to a distance of 20 kilometers from the Norlite facility. The model results were averaged over these receptors to compute the deposition values appropriate for the watershed. Water quality in the Cohoes reservoir and the Erie Canal Park included both direct deposition to the surface of these water bodies and the integrated contributions from the upstream Mohawk River and its entire watershed.

### 3.1.8 Evaluation of Elevated Receptors

As indicated in Section 2, a review of the area within 2 kilometers of the facility was conducted to identify any several story schools, hospitals, and nursing homes. Shown in Figure 3-1c are a number of schools identified within 2 kilometers, but the closest hospital and nursing home (actually a single facility) was beyond 2 kilometers. A list of the schools and hospitals is provided in Table 3-2 and lists the distance, the UTM coordinates, number of stories, and approximate elevation (assumed 12 feet per story) for each building.

## 3.2 Modeling Results

### 3.2.1 Long-Term Exposure

Five years of hourly meteorological data were used in the modeling analysis to estimate annual average air concentrations and dry and wet deposition rates at all receptor locations. These annual values were averaged over the five years to represent long-term exposure. Note that the modeling was performed for a **single kiln stack** assuming a 1 g/sec emission rate; thus, the results presented in this section are normalized values of air concentration and deposition. To obtain chemical specific values, these normalized values were multiplied by the total maximum emission rate (g/sec) for both kilns for each chemical constituent.

The ISCST3 modeling results for long-term exposure are provided in Tables 3-3 (particle) and 3-4 (vapor) for all key receptor locations, including the results of the watershed analysis for the Hudson River, the Mohawk River, and the Canal State Park, Wright Bradley Lake, and the wetlands evaluated in the SLERA (Section 8). Table 3-3 provides a summary of the air concentrations (plume-depleted) and particle deposition rates for each receptor location and watershed for both the area-weighted and mass-weighted particle size distributions. Table 3-4 provides a summary of the undepleted air concentrations and vapor deposition rates for each receptor location and watershed. The tables include results for the location of the residents, the location of the maximum predicted air concentration, the location of the maximum predicted total deposition flux, and the nearest farms. Each table lists the receptor location (UTM coordinate) and the five-year annual average values of air concentrations and deposition rates (wet and dry components, as well as total). Note that the locations of the maximum air concentration and maximum total deposition are predicted to occur at or just beyond the fenced property of the Norlite plant.

The average deposition rates for the Mohawk River watershed were calculated as an average of the modeling results for the special set of extended area watershed receptors. The Mohawk River watershed is very large and therefore, the deposition rates was evaluated only for the 20 km stretch upstream of the Cohoes Falls to conservatively estimate the value for the area having the most immediate impact upon the fishing at the Canal State Park. Although, the watershed area for the Hudson River is even larger than that for the Mohawk, a simplifying assumption that included all of the

10 km by 10 km study area was used, because that is the area most important in determining local water concentrations.

### 3.2.2 Elevated Receptors Results

After the initial dispersion modeling for ground level concentrations was completed, a special set of ISCST3 runs were made to check the concentration levels predicted for these elevated receptors identified in Table 3-2. Flagpole receptors for each building were located every 20 feet, up to and including the roof elevation, for input to ISCST3. The gradual plume rise option was used in the application of ISCST3 for the elevated receptors.

The maximum annual air concentrations (normalized values based on a 1 g/sec emission rate) at the elevated receptors are summarized in Table 3-5 for each year of meteorology. For comparison, the maximum annual normalized ground-level air concentrations from the risk assessment previously modeled with the Cartesian receptor grid for the same locations are also listed. As shown in Table 3-5, the maximum annual air concentrations at elevated receptors are just slightly lower than the maximum ground-level concentrations at the same receptor location. Since the maximally affected receptor was one of the closest, the differences in concentrations with height will be even smaller for elevated receptors at greater dictances. Furthermore, all of the maxumum annual concentrations are between one third and one fourth of the maximum five-year averages found for the RME residents and utilized to calculate exposures to children at those locations. Therefore, the worst-case impacts for all of these "sensitive receptor locations" are clearly less than those calculated for the maximum ground-level receptors evaluated fully in the MRA.

### 3.2.3 Short-Term Exposure Assessment

To address short-term health effects, predicted short-term air concentrations were compared with the short-term guideline concentrations (SGCs) contained or, when not otherwise updated in that document, in the latest federally developed health benchmarks when they were available, and NYS DAR-1 benchmarks when federal guideline values were missing--following the hierarch recommended by the U.S. EPA 1998 (see section 5.6). For that analysis ISCST3 1-hour average results are considered.

In addition, per DAR-1 and the previous NYSDEC Air Guide-1, a 24-hour average particulate matter (PM-10) impact is required. The maximum 1-hour and 24-hour average normalized air concentrations are 69.0 $\mu g/m^3$ per g/sec and 16.56 $\mu g/m^3$ per g/sec, respectively. These concentrations were the maximum 1-hour and 24-hour values predicted at a maximally-impacted fence-line location over the five-year modeling period. Maximum short-term concentrations were calculated assuming undepleted plume conditions. This is a conservative approach since deposition effectively removes matter from the plume, thereby reducing contaminant concentrations within the plume. (As noted above, long-term average concentrations and deposition rate calculations used in the screening health risk assessment already account for plume depletion, with the exception of vapor dry deposition). Section 7.0 presents the results of this short-term air concentration screening analysis, in accord with both NYSDEC and U.S. EPA 1998 guidance.

The NYS DAR-1 document also includes a related request for screening information for long-term (annual) exposures. That screening analysis is also included in Section 7. However, the primary multipathway risk assessment is expected to provide a much more comprehensive analysis of the potential risks and hazard indices associated with long-term continuous emissions of target COPCs.

# TABLE 3-1

## Particle Size Distributions and Scavenging Coefficients
## Norlite Kiln Stacks

| Particle Diameter (µm) | % Mass | Mass Fraction | Surface Area Fraction | Scavenging Coef. (hr/mm-s) | |
|---|---|---|---|---|---|
| | | | | Liquid | Frozen |
| 0.030 | 1 | 0.01 | 0.096 | 1.7E-04 | 5.7E-05 |
| 0.062 | 4 | 0.04 | 0.186 | 1.7E-04 | 5.7E-05 |
| 0.120 | 5 | 0.05 | 0.120 | 1.6E-04 | 5.3E-05 |
| 0.180 | 10 | 0.10 | 0.161 | 1.4E-04 | 4.7E-05 |
| 0.270 | 12 | 0.12 | 0.128 | 9.0E-05 | 3.0E-05 |
| 0.400 | 19 | 0.19 | 0.137 | 6.0E-05 | 2.0E-05 |
| 0.550 | 19 | 0.19 | 0.100 | 5.0E-05 | 1.7E-05 |
| 0.930 | 17 | 0.17 | 0.053 | 5.0E-05 | 1.7E-05 |
| 1.890 | 9 | 0.09 | 0.014 | 1.2E-04 | 4.0E-05 |
| 2.970 | 4 | 0.04 | 0.004 | 2.1E-04 | 7.0E-05 |
| **Sum** | **100.00** | **1.00** | **1.00** | | |
| **Particle Density = 1.0 g/cm$^3$** | | | | | |
| **Vapor scavenging coefficient = 1.7e-04 hr/mm-s** | | | | | |

**Source: WTI distribution.**

**Table 3-2 Potentially Sensitive Elevated Receptors within 1.8 Miles of Norlite**

| Building | UTM Coordinate (m) East | UTM Coordinate (m) North | Distance From Norlite (km) | Number of Stories[1] | Elevation (Feet)[2] |
|---|---|---|---|---|---|
| Abram Lansing School | 605627 | 4735687 | 1.7 | 2 | 24 |
| Cohoes Middle School | 605515 | 4735911 | 1.9 | 3 | 36 |
| Heatly School – Green Island | 607185 | 4733234 | 1.4 | 3 | 36 |
| Watervliet Elementary | 605723 | 4731987 | 2.1 | 3 | 36 |
| Alternative Learning Center – Troy | 607780 | 4733336 | 1.9 | 3 | 36 |
| St. Patrick School – Troy | 607807 | 4733506 | 1.8 | 3 | 36 |
| St. Colman's School – Watervliet | 604915 | 4733364 | 1.3 | 3 | 36 |
| Maplewood School – Watervliet | 606249 | 4732893 | 1.2 | 2 | 24 |
| Cohoes Hospital and Nursing Home[3] | 604500 | 4736240 | 2.7 | 3 | 36 |

(1) Number of stories determined from calling facility directly and/or estimated from aerial photographs.

(2) Estimated assuming 12 feet per story.

(3) Although Cohoes Hospital/Rehabilitation Center/Nursing Home is beyond 2 km from the Norlite facility (2.7 km), it was included in the analysis since it is the closest hospital/nursing home.

TABLE 3-3

## ISCST3 Modeling Results

**Maximum Particle Deposition Fluxes and Plume Depleted Air Concentrations - 5 Year Averages**

**Based on 1 g/sec Emission Rate**

**Norlite Facility**

| Receptor Description | Receptor Location UTM coordinate (m) | | Area Weighted Particle Size Distribution | | | | Mass Weighted Particle Size Distribution | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Depl. Air Conc. | Particle Depostion Rate ($g/m^2$) | | | Depl. Air Conc. | Particle Depostion Rate ($g/m^2$) | | |
| | East | North | ($\mu g/m^3$) | Dry | Wet | Total | ($\mu g/m^3$) | Dry | Wet | Total |
| Resident 1/Location of Max Air Conc. | 605950 | 4734750 | 2.54E+00 | 5.75E-02 | 2.88E-02 | 8.63E-02 | 2.55E+00 | 3.50E-02 | 2.19E-02 | 5.70E-02 |
| Resident 2/Location of Max Total Particle Depos. | 606039 | 4733870 | 7.64E-03 | 1.50E-04 | 1.88E-01 | 1.88E-01 | 7.66E-03 | 7.00E-05 | 1.42E-01 | 1.42E-01 |
| Beef Farm | 604350 | 4734950 | 1.03E-01 | 1.59E-03 | 4.65E-03 | 6.24E-03 | 1.04E-01 | 9.10E-04 | 3.61E-03 | 4.52E-03 |
| Dairy Farm | 604650 | 4734150 | 9.20E-02 | 1.17E-03 | 4.68E-03 | 5.85E-03 | 9.27E-02 | 6.50E-04 | 3.65E-03 | 4.30E-03 |
| Reservoir | 604350 | 4736950 | 1.61E-01 | 3.23E-03 | 3.58E-03 | 6.81E-03 | 1.62E-01 | 1.99E-03 | 2.83E-03 | 4.82E-03 |
| Wright Lake | 608750 | 4733450 | 1.82E-01 | 4.69E-03 | 2.07E-03 | 6.76E-03 | 1.84E-01 | 3.74E-03 | 1.64E-03 | 5.38E-03 |
| Erie Canal Lock | 605550 | 4739550 | 1.64E-01 | 2.99E-03 | 2.56E-03 | 5.55E-03 | 1.66E-01 | 1.75E-03 | 2.09E-03 | 3.84E-03 |
| Mohawk River | Watershed out to 20 km | | 2.97E-02 | 5.48E-04 | 1.07E-03 | 1.61E-03 | 3.01E-02 | 3.30E-04 | 8.59E-04 | 1.19E-03 |
| Hudson River/Mohawk River Confluence | 607750 | 4737850 | 3.57E-02 | 7.70E-04 | 1.40E-03 | 2.17E-03 | 3.59E-02 | 4.60E-04 | 1.08E-03 | 1.54E-03 |
| Hudson River Watershed | Watershed out to 10 km | | 3.92E-02 | 7.56E-04 | 1.33E-03 | 2.09E-03 | 3.97E-02 | 4.77E-04 | 1.09E-03 | 1.56E-03 |
| Green Island Wetland Area | Average over 8 Receptors | | 1.36E-01 | 3.76E-03 | 2.14E-02 | 2.52E-02 | 1.36E-01 | 3.28E-03 | 1.64E-02 | 1.96E-02 |
| Green Island Watershed | Average over 103 Receptors | | 1.62E-01 | 4.04E-03 | 1.78E-02 | 2.18E-02 | 1.63E-01 | 3.07E-03 | 1.36E-02 | 1.67E-02 |
| Green Island - Terrestrial Site #1 | 606950 | 4734250 | 1.49E-01 | 3.78E-03 | 6.14E-03 | 9.92E-03 | 1.49E-01 | 2.57E-03 | 4.73E-03 | 7.30E-03 |
| Green Island - Terrestrial Site #1 - Area Avg. | Average over 29 Receptors | | 9.33E-02 | 2.27E-03 | 3.39E-03 | 5.66E-03 | 9.38E-02 | 1.51E-03 | 2.61E-03 | 4.12E-03 |
| Terrestrial Site #2 | 610550 | 4732550 | 7.83E-02 | 2.04E-03 | 9.90E-04 | 3.03E-03 | 7.90E-02 | 1.60E-03 | 8.20E-04 | 2.42E-03 |
| Terrestrial Site #3 | 609550 | 4735050 | 5.07E-02 | 1.01E-03 | 9.90E-04 | 2.00E-03 | 5.12E-02 | 6.00E-04 | 8.00E-04 | 1.40E-03 |

## TABLE 3-4

### ISCST3 Modeling Results

**Maximum Vapor Deposition Fluxes and Undepleted Air Concentrations - 5 Year Averages**

**Based on 1 g/sec Emission Rate**

**Norlite Facility**

| Receptor Description | Receptor Location UTM coordinate (m) East | North | Undepl. Air Conc. (µg/m³) | Vapor Depostion Rate (g/m²) Dry* | Wet | Total |
|---|---|---|---|---|---|---|
| Resident 1/Location of Max Air Conc. | 605950 | 4734750 | 2.56E+00 | 2.43E+00 | 4.04E-02 | 2.47E+00 |
| Resident 2/Location of Max Total Vapor De | 606039 | 4733870 | 7.67E-03 | 7.26E-03 | 2.67E-01 | 2.74E-01 |
| Beef Farm | 604350 | 4734950 | 1.05E-01 | 9.97E-02 | 6.39E-03 | 1.06E-01 |
| Dairy Farm | 604650 | 4734150 | 9.40E-02 | 8.89E-02 | 6.37E-03 | 9.53E-02 |
| Reservoir | 604350 | 4736950 | 1.65E-01 | 1.56E-01 | 6.39E-03 | 1.62E-01 |
| Wright Lake | 608750 | 4733450 | 1.86E-01 | 1.76E-01 | 2.78E-03 | 1.78E-01 |
| Erie Canal Lock | 605550 | 4739550 | 1.69E-01 | 1.60E-01 | 3.34E-03 | 1.63E-01 |
| Mohawk River | Watershed out to 20 km | | 3.01E-02 | 2.85E-02 | 1.41E-03 | 2.99E-02 |
| Hudson River/Mohawk River Confluence | 607750 | 4737850 | 3.62E-02 | 3.43E-02 | 1.94E-03 | 3.62E-02 |
| Hudson River Watershed | Watershed out to 10 km | | 4.05E-02 | 3.83E-02 | 1.74E-03 | 4.01E-02 |
| Green Island Wetland Area | Average over 8 Receptors | | 1.37E-01 | 1.29E-01 | 2.99E-02 | 1.59E-01 |
| Green Island Watershed | Average over 103 Receptors | | 1.64E-01 | 1.55E-01 | 2.47E-02 | 1.80E-01 |
| Green Island - Terrestrial Site #1 | 606950 | 4734250 | 1.50E-01 | 1.42E-01 | 8.49E-03 | 1.51E-01 |
| Green Island - Terrestrial Site #1 - Area Avg | Average over 29 Receptors | | 9.44E-02 | 8.93E-02 | 4.67E-03 | 9.39E-02 |
| Terrestrial Site #2 | 610550 | 4732550 | 8.02E-02 | 7.59E-02 | 1.27E-03 | 7.72E-02 |
| Terrestrial Site #3 | 609550 | 4735050 | 5.20E-02 | 4.91E-02 | 1.30E-03 | 5.04E-02 |

* Computed with a 3 cm/sec deposition velocity and the undepleted air concentration.

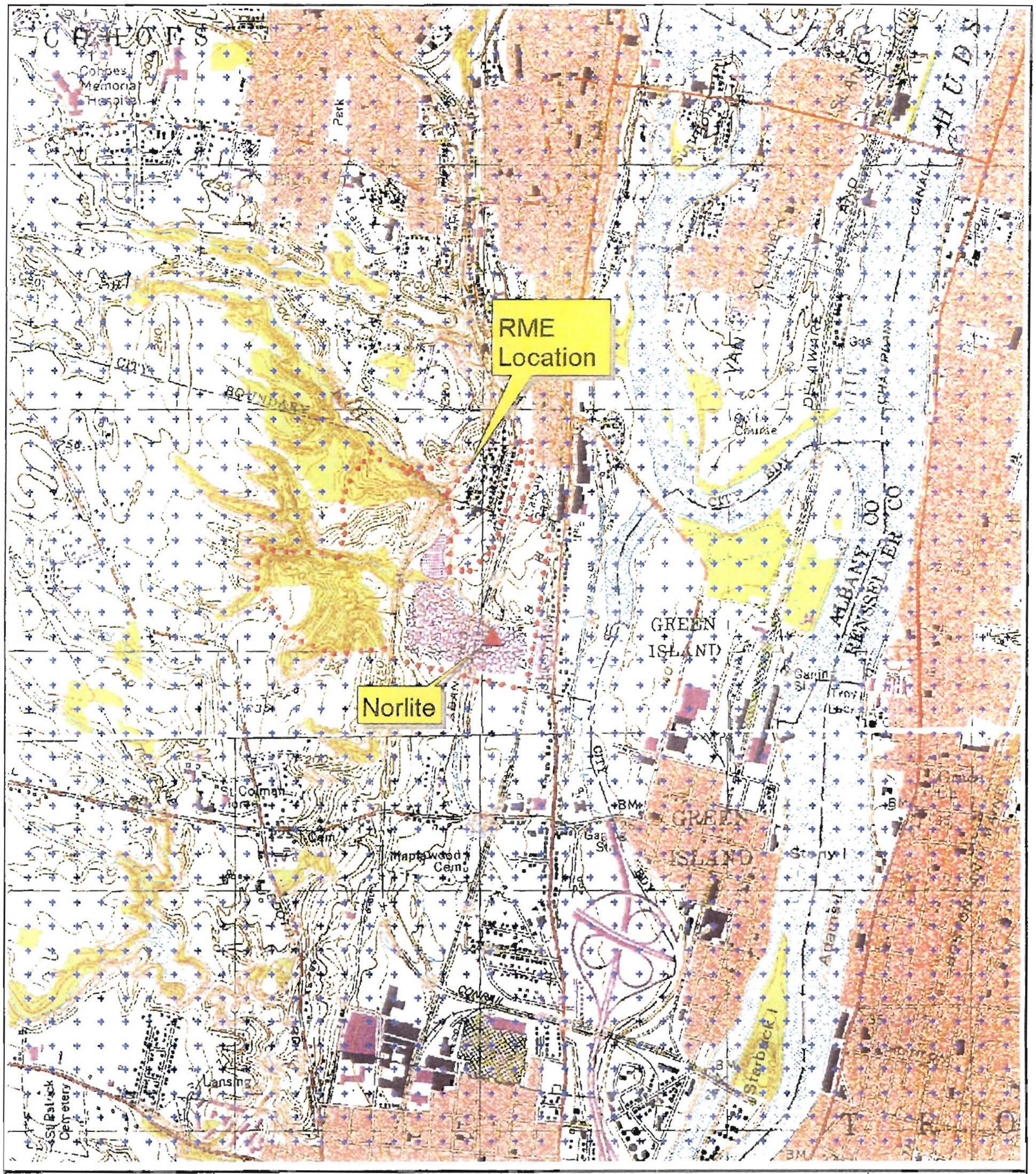
**Table 3-5 Summary of Modeling Results for Sensitive Receptors**

| Year | Averaging Period | Maximum Annual Concentrations ($\mu g/m^3$) Over All Sensitive Receptors (1,2) | |
|---|---|---|---|
| | | Ground-level Receptors | Elevated Receptors (3) |
| 1987 | Annual | 0.429 | 0.421, 0.419 |
| 1988 | Annual | 0.758 | 0.746, 0.741 |
| 1989 | Annual | 0.750 | 0.739, 0.735 |
| 1990 | Annual | **0.836** | **0.823, 0.818** |
| 1991 | Annual | 0.707 | 0.693, 0.689 |
| **5-Year** | **AVERAGE** | **0.696** | **0.684, 0.680** |

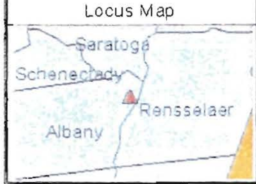
(1) Normalized model results based on 1 g/sec.

(2) Overall maximum concentrations shown in bold (for 1990). Note that all of the maximum ground-level and elevated concentrations for the five years modeled were predicted at receptors corresponding to Abram Lansing School.

(3) Elevated receptor concentrations shown correspond to first story, roof level.




Locus Map




Legend:

- ▲ Norlite
- ● Fenceline Receptors
- ✚ Near-Field Receptors

USGS 1 : 24,000 QUADRANGLES:
Troy North, NY (North), Troy South, NY (South)

Norlite

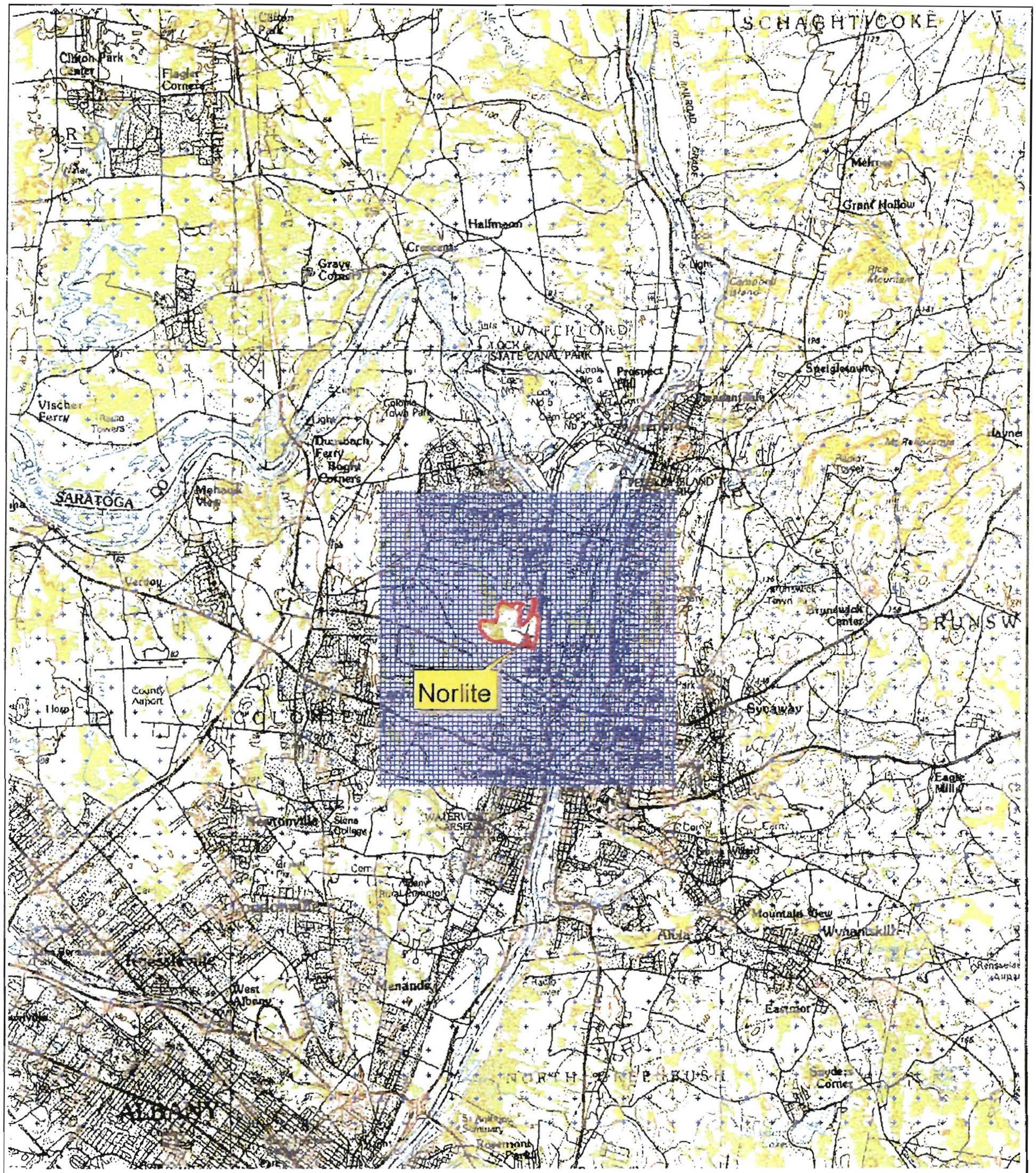
Figure 3-1(a)
Near-Field Receptors and RME Location

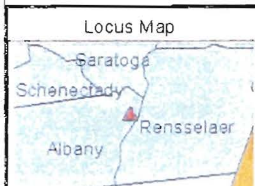
ENSR INTERNATIONAL

March 2002

Scale 1 : 24,000 — 0, 0.2, 0.4, 0.6, 0.8, 1 Kilometers

Project Number 09514-046




Legend:
- ▲ Norlite
- ● Fenceline Receptors
- ✚ Receptor Locations

USGS 1 : 100,000 QUADRANGLES: Albany, NY

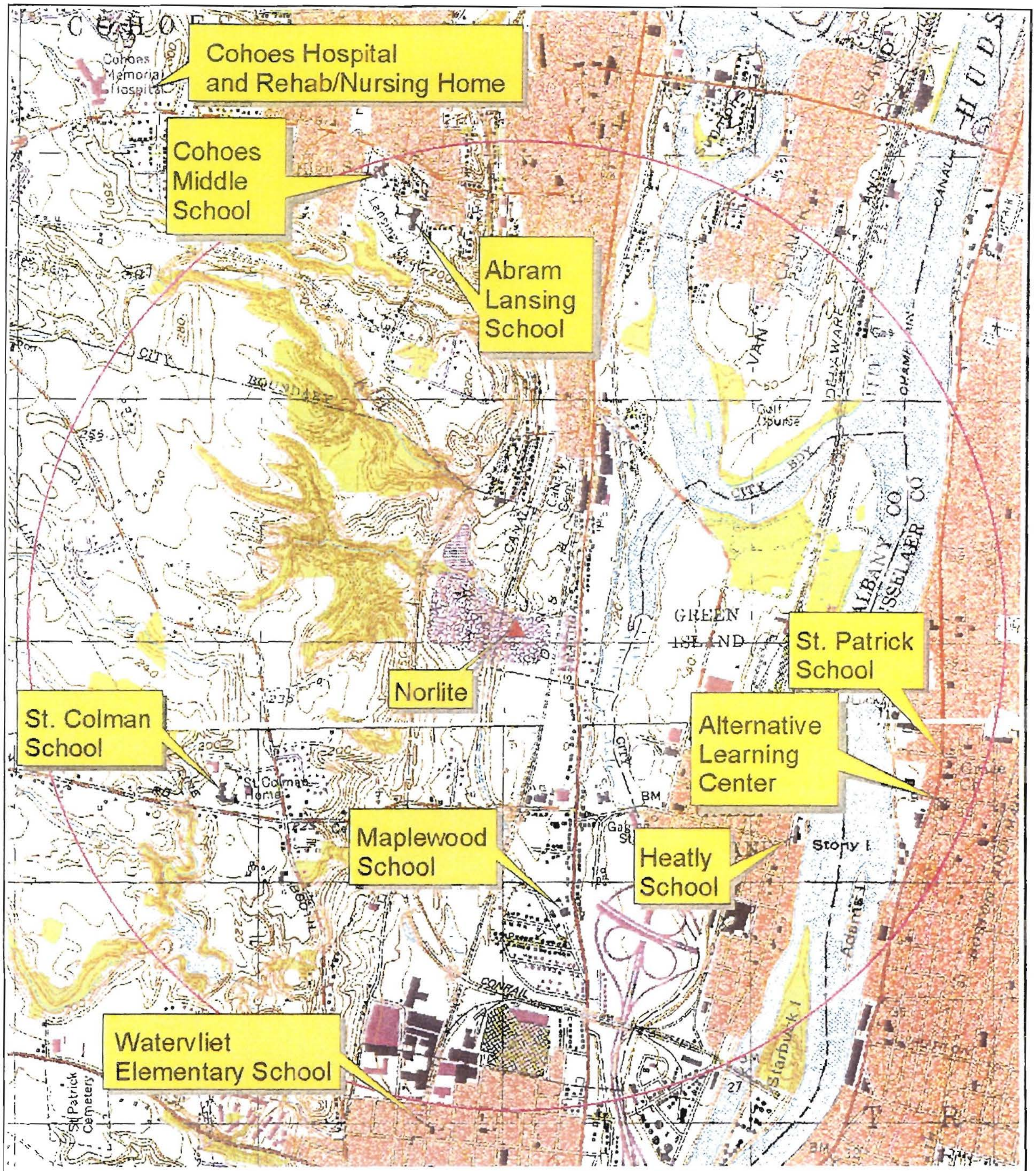
N

Norlite

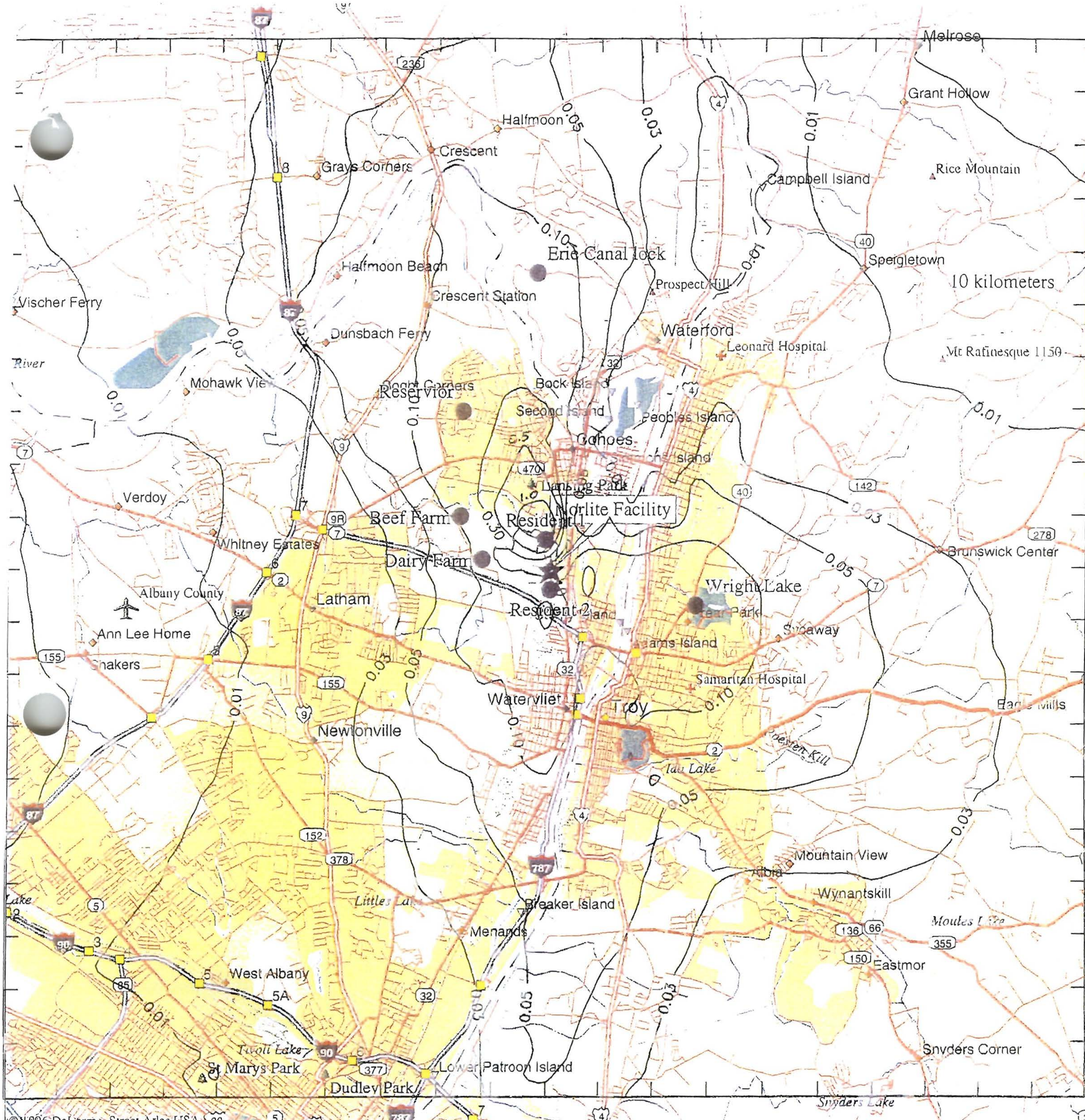
Figure3-1(b)
Far-Field Receptors

ENSR INTERNATIONAL

| March 2002 | Scale 1 120,000 | 0 1 2 3 4 5 Kilometers | Project Number 09514-046 |
|---|---|---|---|




| Locus Map | Legend: | Norlite | ENSR INTERNATIONAL |
|---|---|---|---|
| Saratoga, Schenectady, Rensselaer, Albany | ▲ Norlite; N; USGS 1 : 24,000 QUADRANGLES: Troy North, NY (North), Troy South, NY (South) | Figure 3-2 Locations of Schools, Hospitals, and Nursing Homes in 2 km Radius (Elevated Receptors) | |
| | March 2002 | Scale 1 : 24,000 — 0, 0.2, 0.4, 0.6, 0.8, 1 Kilometers | Project Number 09514-046 |

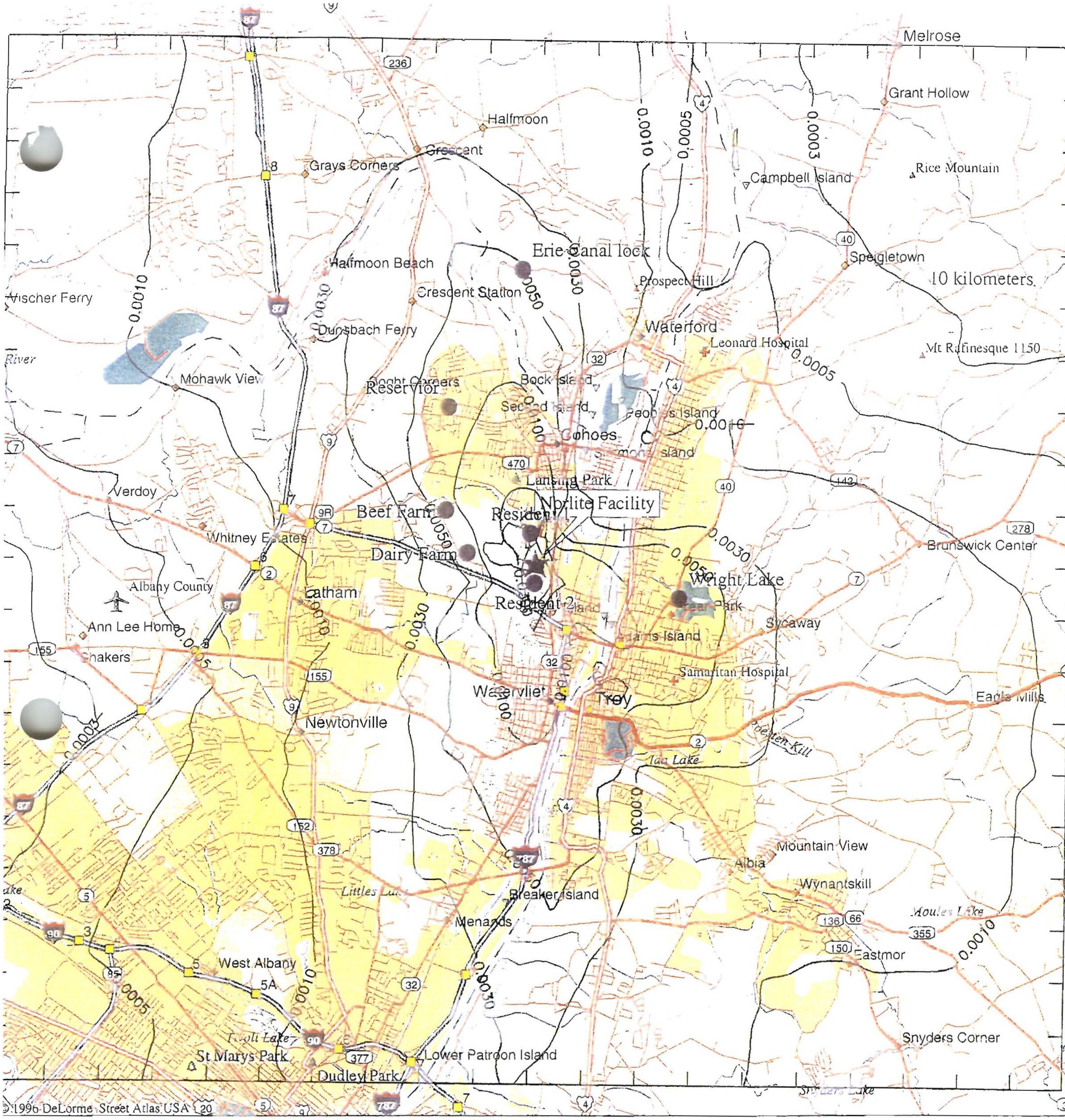



Mag 12.00
Thu Sep 30 12:08 1999
Scale 1:100,000 (at center)
2 Miles

| | |
|---|---|
| Local Road | Utility/Pipe |
| Major Connector | Railroad |
| State Route | Small Town |
| Primary State Route | Large City |
| Trail | Summit |
| Interstate/Limited Access | Geographic Feature |
| Toll Highway | Hospital |
| US Highway | Park/Reservation |

**Figure 3-3**

**Air Concentrations ($\mu g/m^3$ per g/sec)**

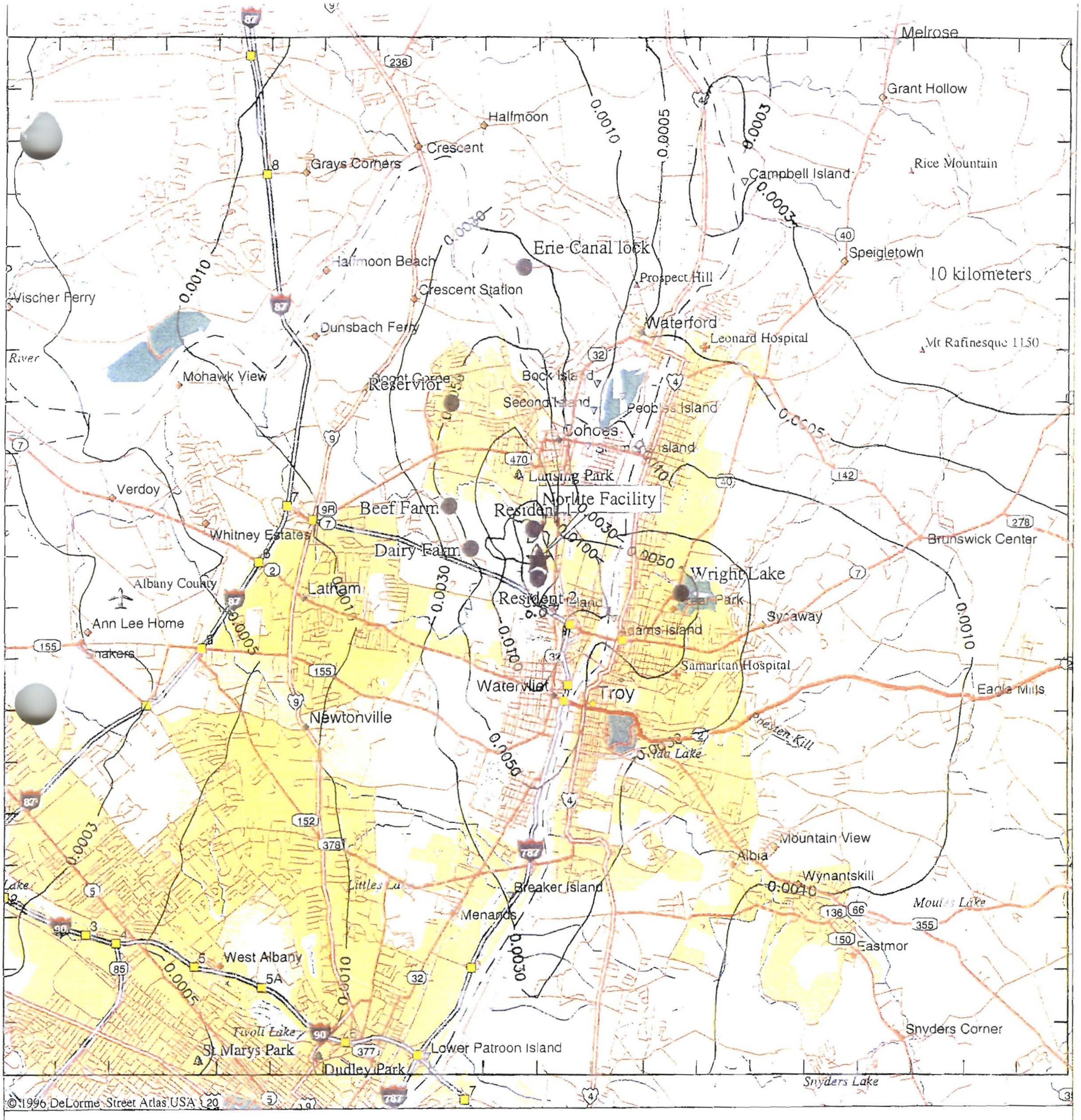



Mag 12.00
Thu Sep 30 12.08 1999
Scale 1:100,000 (at center)
2 Miles

| | |
|---|---|
| Local Road | Utility/Pipe |
| Major Connector | Railroad |
| State Route | Small Town |
| Primary State Route | Large City |
| Trail | Summit |
| Interstate/Limited Access | Geographic Feature |
| Toll Highway | Hospital |
| US Highway | Park/Reservation |

**Figure 3-4**

**Total Particle Deposition Area Weighted ($g/m^2$/year per g/sec)**

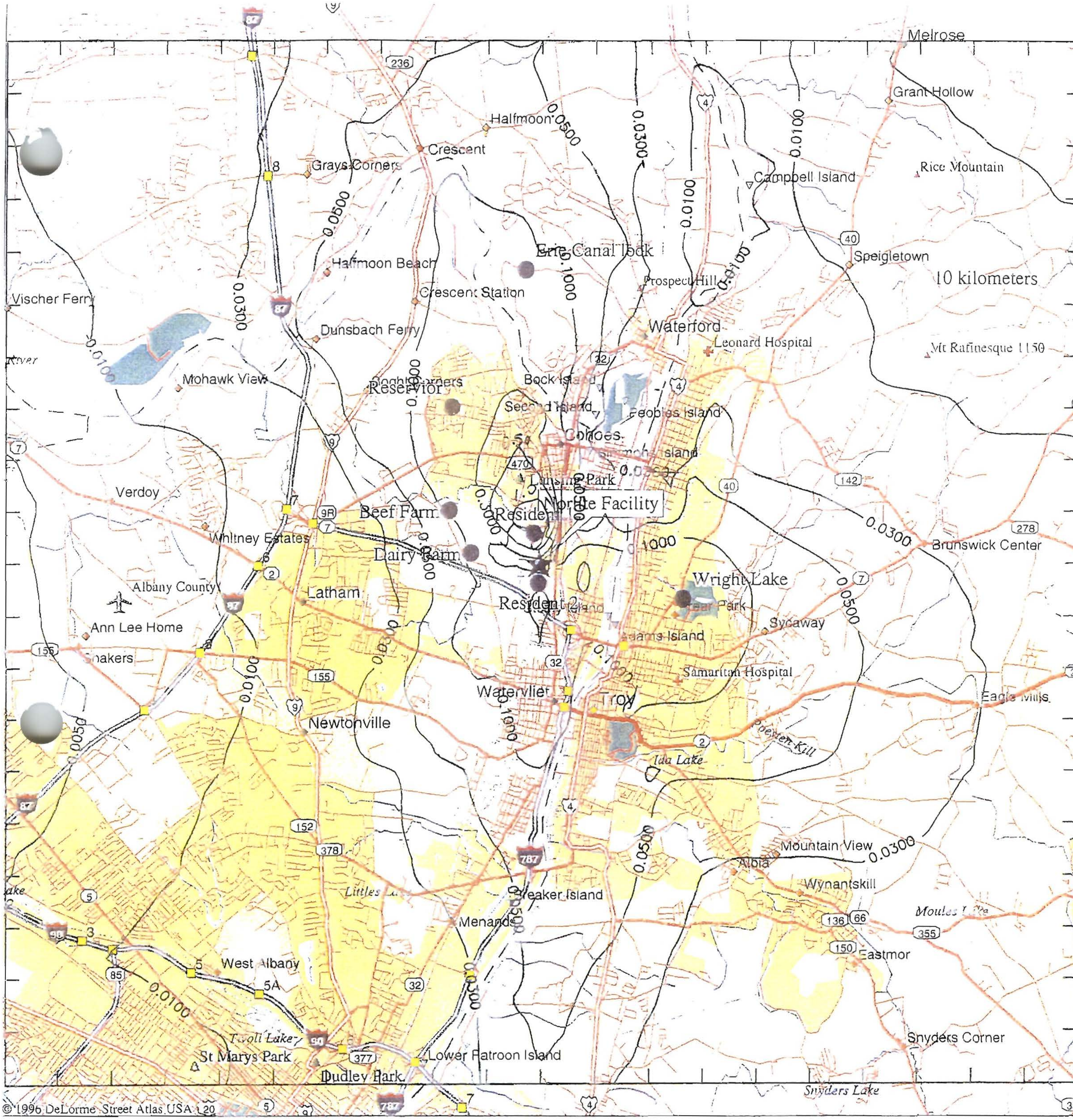



Mag 12.00
Thu Sep 30 12:08 1999
Scale 1:100,000 (at center)
2 Miles

| | | | |
|---|---|---|---|
| | Local Road | | Utility/Pipe |
| | Major Connector | | Railroad |
| | State Route | | Small Town |
| | Primary State Route | | Large City |
| | Trail | | Summit |
| | Interstate/Limited Access | | Geographic Feature |
| | Toll Highway | | Hospital |
| | US Highway | | Park/Reservation |

**Figure 3-5**

**Total Particle Deposition Mass Weighted ($g/m^2$/year per g/sec)**




Mag 12.00
Thu Sep 30 12:08 1999
Scale 1:100,000 (at center)
2 Miles

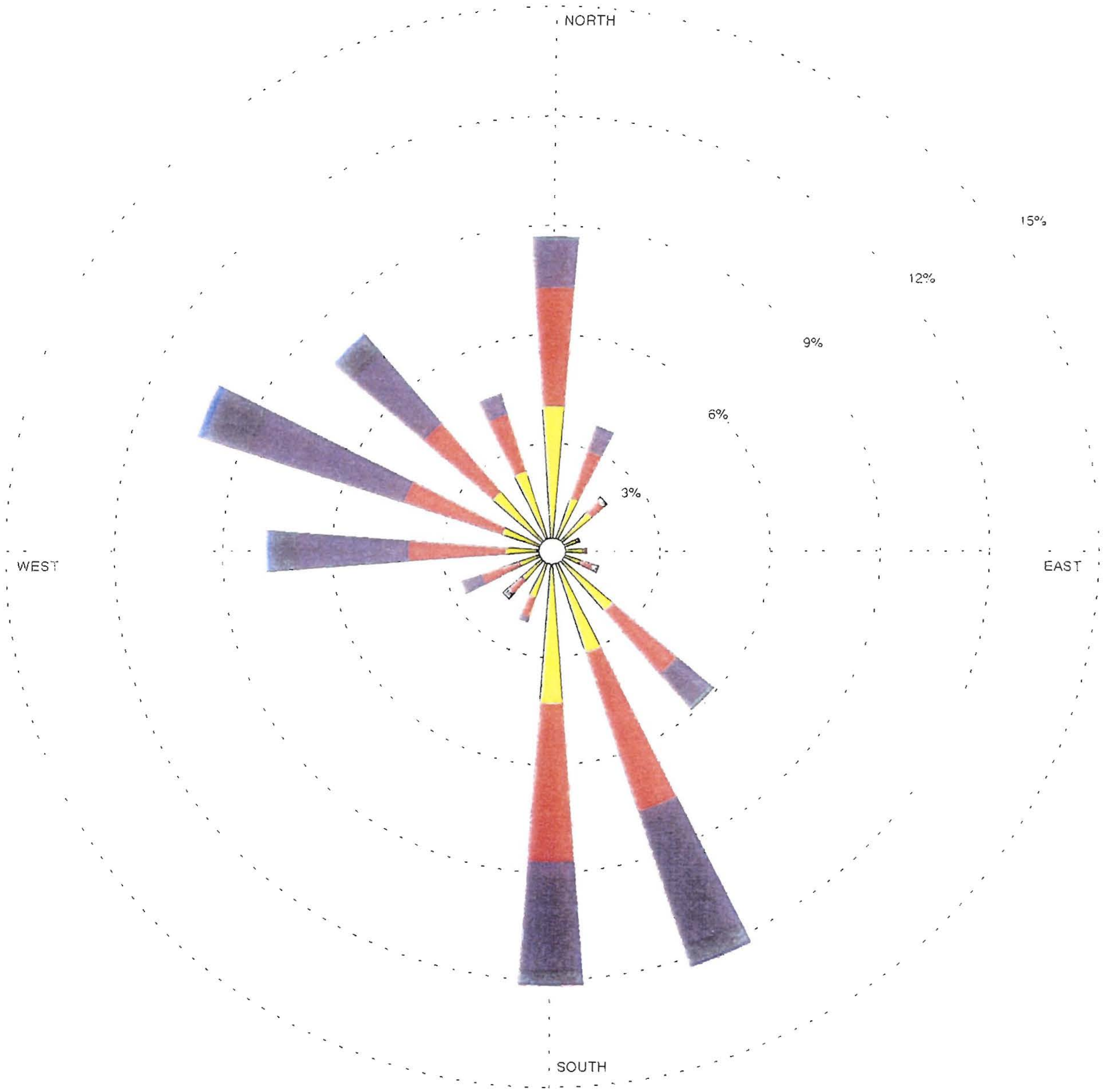
| | |
|---|---|
| Local Road | Utility/Pipe |
| Major Connector | Railroad |
| State Route | Small Town |
| Primary State Route | Large City |
| Trail | Summit |
| Interstate/Limited Access | Geographic Feature |
| Toll Highway | Hospital |
| US Highway | Park/Reservation |

Figure 3-6

Total Vapor Deposition
($g/m^2$/year per g/sec)

WIND ROSE PLOT

STATION #14735 - ALBANY/COUNTY ARPT, NY




| | | | |
|---|---|---|---|
| Wind Speed (Knots) | MODELER | DATE<br>9/21/99 | COMPANY NAME |
| | DISPLAY<br>Wind Speed | UNIT<br>Knots | Figure 3-7 |
| | AVG. WIND SPEED<br>8.90 Knots | CALM WINDS<br>14.13% | Albany Wind Rose |
| | ORIENTATION<br>Direction<br>(blowing from) | PLOT YEAR-DATE-TIME<br>98 98 98 99 99<br>January 1 - December 31<br>Midnight - 11 PM | PROJECT/PLOT NO. |


*WRPLOT View 2.01 by Lakes Environmental Software - www.lakes-environmental.com*

# 4.0 HAZARD IDENTIFICATION

This step of the risk assessment involves reviewing all chemicals detected, or that may be present, in combustion source (kiln) emissions. Those compounds that are determined to be the most toxic, mobile, persistent, or prevalent in the environment are designated as Compounds of Potential Concern (COPC) and evaluated quantitatively in the risk assessment.

## 4.1 Comprehensive List of Candidate COPCs and Emission Rates

Development of a comprehensive list of compounds that may be emitted from the kiln was based on three sets of emission measurement data. The first set was developed during the April 1999 Trial Burn and reported in the RCRA *Trial Burn Report for Lightweight Aggregate Kilns 1 & 2 (August 23, 1999)*. During that testing, the kiln was operated under two "stressed" test conditions to provide data on maximum kiln unit performance and emissions characterization. Emissions testing was conducted for an entire set of target chemicals: selected metals (including hexavalent chromium), dioxins/furans, acid gases, chlorine, total organic carbon, and particulate matter. Target analytes were described in the Trial Burn Plan for this program, and approved by NYSDEC prior to the program. In addition, tentatively identified compounds (TICs) were determined from the laboratory analyses of the list of target organic compounds sampled in this August 1999 test program. These TIC results, and those froma a related set of tests of total organic emissions (TOE), are discussed in the uncertainty section of this report with respect to the possible impacts of unidentified compounds. The August 1999 measurement results for all organics, except dioxins and furans, have been retained as the basic measurements representative of "Condition B" operations for the current risk analysis.

In September 2000, a second set of supplementary emission data from the May 2000 Risk Burn reported previously to NYDEC in "Risk Burn Final Report for Light Weight Aggregate Kilns 1 and 2" (ENSR doc. 9514-049-400, Aug. 25, 2000) was incorporated into an initial update of the multipathway risk assessment for the Norlite site. That second set of tests resulted in revised emission rates for several metals (As, Be, Cd, Ni, and Hg), as well as for dioxins and furans (PCDD/PCDF). In addition, the second test series included a special set of "speciation" tests for mercury compounds in the stack emissions. These voluntary supplemental tests were not addressed in the September 2000 Risk Assessment, but were addressed in a Supplementary Risk Review letter provided to NYSDEC in January 2001.

As noted above, a third set of tests were performed in July 2001 to demonstrate during near-normal operations–with several improvements in the combustion process and without the artificial spiking methods used in the May 2000 and April 1999 testing–that the emission rates of dioxins and furans would be significantly lower than observed in those previous tests. The feed rates and emission rates of all of the previous metals selected as compounds of potential concern (COPC) for risk analysis were monitored in this latest round of testing, since the levels employed in these tests generally represented the maximum levels that would be seen in normal operations. Rates for a few trace metal compounds, such as mercury and selenium, might vary by about a factor of two or so above or below the short-term rates measured in these latest tests, but the long-term averages would be generally lower. The measurement data obtained for dioxins and furans during "Condition B" operations in this most recent set of tests has thus replaced the similar May 2000 data, since the July 2001 data is now considered most representative of both current and future operations. Therefore, Tables 4-1a and 4-1b and Table 4-2 in this section have been updated to include these newer measurement data where applicable. For all organics other than dioxins and furans, the 1999 measurement data are still deemed the most appropriate.

As noted in the introduction in Section 1, the purpose of the current MRA is to demonstrate that requested permit limits are satisfactory, and are protective of public health. Therefore, the emission rates for metals assumed in this latest update to the MRA for risk ranking purposes are still those reported in Table 4-2. However, for the final MRA calculations the metals emissions rates have been adjusted somewhat to represent anticipated long term future conditions. Thus, for all of the metals for which feed rates are routinely measured and subject to feed rate controls, emission rates have been set at the proposed permit limits (see Table 4-11). The rest of this section describes the steps taken to determine the rest of the final list of COPCs and their final emission rates for the MRA.

### 4.1.1 Reduction of Emissions Data

For each chemical analyzed in the Trial Burn and the supplemental Risk Burns, it was necessary to select one emission rate for use in risk calculations. Development of emission rates was conducted in accordance with recommendations from NYSDEC. For data drawn from the original Trial Burn, the maximum emission rates, either Test Condition A (low temperature) or Test Condition B (high temperature) were used for each chemical. When a measurement was repeated during the Risk Burn testing, the more recent data was assumed to supercede the original data because the newer data better represented normal operating conditions.

Because of the nature of the various programs, all parameters were not measured during all runs. For instance, during the original Trial Burn, metals emissions were measured during Condition B, the high temperature test condition. During the May 2000 Risk Burn, only Condition B was repeated, since that yielded the highest emission rates for metals and for dioxins/furans. The only data now being used from the May 2000 testing is that obtained for the special mercury speciation experimental test, since that test data is still deemed relevant for future Condition B operations. For the July 2001 testing, Condition B was augmented by two operational variations, designated "Condition C" and "Condition D". However, Condition B yielded the data upon which the current MRA analysis is based.

The finally selected data on emissions of metals, polychlorinated dibenzo(p)dioxins (PCDDs, or simply dioxins) and polychlorinated dibenzo(p)furans (PCDFs, or furans), and other potentially hazardous organic compounds were used to evaluate chronic, long-term risks in the risk assessment. In addition, in accordance with NYSDEC recommendations, short-term risks were also evaluated for those chemicals likely to have short-term effects. To evaluate short-term effects, emissions data for particulate matter, acid gases, and free chlorine were also analyzed. The following data were used to calculate maximum emission rates for each chemical species:

- Dioxins. To summarize, the July 2001 Risk Burn test data for for dioxins and furans during Condition B operations is now considered to be the most representative of maximal future operational conditions, according to proposed permit conditions. The measurement results of these new (July 2001) tests are presented in Table 4-1.

- Metals. Metals emissions were also re-measured during Conditions B, C, and D. These are all high temperature conditions. During these latest tests, the organic feed material (LLGF) to the kiln was pre-fortified, rather than spiked, to assure that levels of silver, arsenic, barium, beryllium, cadmium, hexavalent chromium, copper, mercury, nickel, lead, antimony, selenium, thallium, and zinc would be higher than they would be over the long term. Only chromium-six levels were fortified by means of a supplemental spiking process (with sodium bichromate). The emission measurements from the three most recent Condition B runs for each metal were averaged and used for this risk assessment. Values not detected during the Risk Burn or Trial Burn were included in the final emission rate averages as equal to the reported detection limit. (These values are higher by about 25% than the minimum RDL values recommended by U.S. EPA, 1998 guidance.)

- Organic Compounds. Data on emissions of organic compounds from the original Trial Burn were extensive, with emissions measurements for approximately 75 target compounds as well as TICs. Data for volatile organic compounds, semivolatile organic compounds, and polynuclear aromatic hydrocarbons were collected during both Condition A and Condition B. These tests were not repeated in May 2000 or July 2001, so the maximum 1999 emission rate, the average for the three runs of either Condition A or Condition B, was used for this risk assessment. Not-detected values were included in the Condition A and Condition B averages as equal to the detection limit. Of the organics, only PCDD/PCDF emissions were re-measured during the Risk Burn, and these latter measurements were then used in the updated risk assessment.

- Particulate Matter. Particulate matter emission data were collected during both test conditions during the original Trial Burn, but not repeated in May 2000 or July 2001. Results for Condition B, the high temperature condition, were used for evaluation of short-term risks. The Condition B results were approximately 60% higher than the Condition A results of the original Trial Burn (presumably due to the spiked metals).

- Acid Gases (Hydrogen Chloride (HCl), Hydrogen Bromide (HBr), Hydrogen Fluoride (HF), Ammonia ($NH_3$) and Free Chlorine ($Cl_2$). Data on these emissions were collected during both test conditions during the original 1999 Trial Burn only; they were not repeated in May 2000 nor July 2001. The highest emission rate, either Test Condition A or Test Condition, for each species was used for evaluation of short-term risks.

The data were reduced using the following guidelines:

Maximum average emission rates observed over the three runs of the worst-case test condition were used for this MRA. Since no blank corrections, normalization, or other corrections to the data were used, it is assumed that these average rates will be conservatively high estimates for the risk analysis. "Non-detected" values were used to calculate emission averages using the reported detection limits.

- Measurement data were collected and analyzed for a number of organic species that were not suspected to be present in the stack emissions, or were always reported as *not-detected* in the test results. Although these compounds are not suspected to be in the emissions, average emission rates were calculated assuming that all of these compounds are present at concentrations equal to the detection limits. The U.S. EPA's 1998 guidance recommends a series of techniques to ensure that detection limits are not underestimated in subsequent risk assessments. Without repeating the details, it can be said that the detection limits reported with the Norlite data were equal to or greater than the values that would have been used with strict application of the EPA-recommended approach. In particular the convention used for reporting the metals data is approximately 25% more conservative than the "RDL" defined by U.S. EPA. The organic data ranges from using the "EDL" values recommended by U.S. EPA for PAHs and dioxins and furans, to using a quantitation limit that is generally at least double the "RDL" value for other VOCs and SVOCs.

- For the five phthalate compounds listed in Tables 4-26 and 4-27 of the original April 1999 Trial Burn report.. the cautions published by the U.S. EPA (1998) in their risk assessment guidance were considered. (Section 2.3.5 of that guidance cautions against including in the risk assessment any compounds which may be detected simply because they are ubiquitous laboratory contaminants. If there is not sufficient independent data to indicate that they are a feed material, or the measurement levels detected are at least 5 to 10 x the level measured in the field or laboratory blanks. Only one of the five phthalates was detected at approximately 5 times the detection limit in a single test run. That was bis (2-ethylhexyl) phthalate. However, that compound was also detected in the relevant field blank at double the detection limit specified for all of the phthalates. In such cases, the U.S., EPA recommends deleting the compound, unless it is detected at 10 times the blank level. It was decided, in order to be conservative, because bis (2-ethylhexyl) phthalate has the greatest toxicity of all of the phthalates considered, to keep it in the COPC list as a potential contributor to the calculated risk levels, but "flagged" as a "highly uncertain" contributor. . All of the others phthalates were not detected in any of the six tests, but they were left in the risk ranking process at their "non-detect" limit. Therefore, all of the "non-detect" phthalates were deleted from the COPC list In the new risk ranking process, all were excluded from the final COPC list. Thus only Bis (2-ethylhexl) phthalate was retained as a "representative" for this family of compounds.

- There were six target VOC compounds which were not detected when measured by Method M0040. Unfortunately the detection limit reported for that method is so high (~400 ug) that using it would grossly misrepresent the potential contribution of any surviving trace of these six compounds. The compounds include: bromomethane, 1,3-butadiene, chloromethane, dichlorodifluoromethane, trichlorofluoromethane, and vinyl chloride. Based on EPA sponsored research reported by C. Dempsy (1991) and a summary of similar studies reported in 1990 by J.L. Tessitore, et al., all of these compounds are more readily destroyed than carbon tetrachloride, which was barely detected at a concentration of 163 ng. The second report indicates that the destruction rates for these compounds is comparable to chloroform, which was detected at a level of 922 ng. To be conservative, a surrogate emission rate equal to that observed for chloroform, which has the highest observed concentration of all of the volatile organics, has been assigned to each of these six compounds. (It is believed that assigning a level less than or equal to carbon tetrachloride would have been more accurate, but significantly lower).

- Tentatively identified compounds (TICs) were also identified for inclusion in the uncertainty assessment but were not included in the quantitative risk calculations. For these compounds, the reported emission rates were averaged over the number of times that the compound was detected. It seemed ironic that the likely best estimates of the emission rates for the six target VOCs mentioned above would be the values obtained for each of them in the TIC analysis. Their emission rates would be about 5 times lower that that assumed from the conservative "surrogate" approach explained above.

- Total Organic Carbon Emissions (TOC/TOE) were also determined based upon the methods outlined in the current U.S. EPA guidance (U.S. EPA, 1998a) and documented in the April 1999 Trial Burn Report. This data was collected to provide a comparison between the total mass of materials emitted and the mass of those which are specifically identified as target compounds for COPC evaluation. In general, the method for collecting total organics is expected to also include the mass of all of the tentatively identified compounds (TICs) determined separately by GC/FID analysis. All of these semi-quantitative measurements are intended to aid in the qualitative interpretation of the uncertainties inherent in the risk assessment process (as recommended by the U.S. EPA, 1998a,1999), rather than attempting to include this data into the quantitative assessment. (See Section 7.4.4.3).

- For dioxins and furans, separate emission rates were determined for each of the potentially carcinogenic congeners in both the Trial Burn test and the Risk Burn tests. U.S. EPA has now adopted World Health Organization (WHO, 1998) toxicity equivalence factors (TEFs) that relate the toxicity of each congener to that of 2,3,7,8-TCDD, the most toxic congener (U.S. EPA, 1989a). The product of these factors represents the toxic equivalence of the mass for each of each of the listed dioxins and furans <u>absorbed by</u> a person. The set of product values is then summed to estimate a total Toxic Equivalency (TEQ) for the entire exposure to the measured set of congeners. In prior (1999) risk analyses, the total mass of dioxins and furans was represented as a mass of 2,3,7,8 TCDD-TEQ and its fate and transport through the environment were modeled as if the mass were a single COPC. The current analysis adopts the most recent recommendations of the U.S. EPA , 1998, that is, to use the WHO, 1998 TEF values. All seventeen congeners are tracked though the environment prior to their arrival at the target receptor. When they reach the receptor, the mass arriving is weighted by its TEF value and then the total exposure to the individual is reported in units of TCDD-TEQ.

### 4.1.2 Results of Emissions Analyses

The results of these emission measurements and subsequent prediction of future normal ranges of operating conditions are presented in Tables 4-1 through 4-12.

- <u>Dioxins</u>. Maximum dioxin emissions for each of the two kilns are shown in Table 4-1. As mentioned, data on emissions of dioxins and furans were generated during the latest tests under Condition B (as well as C and D). The results for Condition B testing conditions were used to calculate the emission rate used in the current risk assessment.

- <u>Metals</u>. As mentioned in Section 1, the emission test data for all of the metals was reviewed and adjusted to represent the rates proposed for inclusion in the updated operating permit for this facility. The derivation of the new metal emission rates is presented in Table 4-11. The metals emission rates, both measured and predicted, were initial applicable to a single kiln stack (see also Table 4-2), so they were doubled to represent normal 2-stack operations for the risk assessment. The final rates are included inthe Summary given in Table 4-12.

- <u>Organic Compounds</u>. Summaries of trial burn measurement results for a single stack for semivolatile organic compounds, SVOCs (Table 4-3a and 4-3b), volatile organic compounds, VOCs (Table 4-4a and 4-4b), and polynuclear aromatic hydrocarbons, PAHs (Tables 4-5a and 4-5b), where the "a" and "b" in the table names refer to "Condition A" and "Condition B", respectively. All of these organic compounds were measured during both test conditions of the original Trial Burn. The three runs for each test condition were averaged and the maximum average results for each compound, doubled to represent two stacks, for both the VOCs (Table 4-9) and all of the SVOCs, including the PAHs and dioxins/furans (Table 4-10) as input data for the risk ranking process. The original measured emission rates for the metals (Table 4-2) were also combined with all of the data for the organics for the risk ranking, even though it was decided ahead of time to retain all of the metals, regardless of their ranks. The final combined ranking results determine which compounds qualify as COPCs for full evaluation in the MRA.

- Total Organic Emissions. A special set of measurements were also made during the original Trial Burn to determine Total Organic Carbon (TOC) which is now more commonly called Total Organic Emissions (TOE) according to the latest U.S. EPA guidance (U.S. EPA, 1998). The TOC/TOE measurement results appear in Table 4-6 (from Table 4-28 of the original 1999 Trial Burn Report cited above). The TOC/TOE results are further discussed in Section 7.4.4, which describes "uncertainty" factors related to risk characterization.

- Particulate Matter and Acid Gases. Trial burn results for particulate matter, HCl, $Cl_2$, HBr, HF, and $NH_3$ are summarized in Table 4-7. These organic compounds were measured during both test conditions. The maximum result for each compound was used in the risk assessment.

Table 4-8 gives a qualitative summary listing of all measured compounds considered in the COPC selection process. Consideration of the risk ranking results obtained from Tables 4-2, 4-9 and 4-10, along with new permitting limits prosed in Table 4-11, yielded the final tabulation of emission rates given in Table 4-12. The next section describes in more detail how the COPC candidates were risk-ranked to obtain the final set of COPCs for the MRA.

### 4.1.3 Adjusting for Process "Upset Conditions".

In the U.S. EPA 1998 guidance it is recommended that the combustion process be reviewed to determine how to represent and include the effect of "process upset" conditions when calculating emission rates, exposures and risks. Norlite has reviewed its operational data from its CEM system records and its record of Operational Waste Feed Cut-Off (OPCO) events to estimate the frequency and duration of "upset" conditions. About half of these events are due to fluctuations in CO levels that may threaten to exceed permit limits if not addressed with protective action. In these cases the OPCO is activated at about 75% of the permit limit and, within seconds the liquid waste feed containing hazardous waste constituents is automatically shut down. Waste fuel already injected is gone from the system within milliseconds. Similarly, there are a variety of other operational fluctuations that are all addressed by the operation of the OPCO and the Automatic Waste Feed Cut Off (AWFCO) system, but all produce very similar system response in terms of ceasing flow of waste derived fuels and purging the system. Review of the last two years of records indicate that the total time for these two types of "upset" events would be <265 min or 4.4 hours per 8760-hr year or 0.05% of the time. If its is conservatively assumed that all emissions (metals and organics) were released at 10 times their normal rates during all such events (compared with the small increases observed in the one Trial Burn test run that included a CO-driven AWFCO event), the overall incremental effect on the risk results would not exceed 0.5%. This level of increase is extremely small compared to almost all other uncertainties in predicting emission rates, exposure estimates and the risk values. Therefore, to minimize potential confusion about stated emission rates and their engineering basis, no further adjustment was made to include this potential 0.5% adjustment. It's effect on the final risk predictions is expected to be linear, and thus considering this additional, but insignificant, factor when reviewing the final risk and hazard index results is quite straighforward (see Section 7.4.1.1).

## 4.2 Selection of Chemicals of Potential Concern

The comprehensive list of compounds that were analyzed in the trial burn (Table 4-8) includes many compounds that are of low toxicity or present at low concentrations, such that they will contribute negligibly to total risk. A risk-ranking method recommended by several U.S. EPA references (U.S. EPA, 1998b, 1993a, 1989b) was used to select all of the candidate COPCs expected to have any potentially important contribution to final risk calculations.

The method outlined in the latest of these documents, which is also the one intended to provide direct guidance for risk assessment of RCRA Combustor emissions is similar to that previously identified in the Risk Assessment Guidance for Superfund (U.S. EPA, 1989b). Each ranking scheme multiplies a quantitative toxicity value (e.g., cancer slope or reference dose factor) by a concentration of the compound in the exposure medium (e.g., air, water, soil). However, for combustor emissions, the "concentration" term is replaced with the emission rate of the chemical. Another factor that is similarly considered in risk ranking for combustor facilities is the potential for the chemical to bioaccumulate. U.S. EPA (1998b) suggests using the logarithm of the octanol-water partition coefficient, or log $K_{ow}$, as a surrogate factor for bioaccumulation potential. Higher values of log $K_{ow}$ result in greater partitioning onto soils, and greater persistence in the environment. Risk ranking for the inhalation pathway, which involves no bioaccumulation process, is conducted separately using just the product of the inhalation toxicity value and estimated emission rate for each chemical.

U.S. EPA has developed toxicity values for various chemicals depending on their ability to pose potentially carcinogenic or noncarcinogenic health effects. Toxicity values for potentially carcinogenic effects are called cancer slope factors (in units of $(mg/kg\text{-}day)^{-1}$) and toxicity values for noncarcinogenic effects are called reference doses (RfD) (in units of mg/kg-day) or reference concentrations (RfC) (in units of $mg/m^3$). The derivation of these toxicity values is further discussed in Section 5.0. Risk ranking was conducted separately for each chemical analyzed in the trial burn using the following combinations of parameters, where applicable:

1) Inhalation cancer slope factor x emission rate
2) (1/Inhalation RfD) x emission rate
3) Oral cancer slope factor x emission rate
4) Oral cancer slope factor x log $K_{ow}$ x emission rate
5) (1/Oral RfD) x emission rate
6) (1/Oral RfD) x log $K_{ow}$ x emission rate

Toxicity values derived by NYSDOH were used only when U.S. EPA-approved values were not available. For the remaining chemicals, toxicity values presented in U.S. EPA databases, such as the Integrated Risk Information System (U.S. EPA, 1997a) and the Health Effects Assessment Summary Tables (U.S. EPA, 1995b) were preferred when available. Some provisional toxicity values were also obtained from U.S. EPA's National Center for Environmental Assessment (NCEA). Several major updates occurred in IRIS-reported values since the original 1999 and 2000 MRA analyses. Therefore the entire risk ranking was re-done in March 2002 based upon all of the latest available dose response data (see Table 5-1 in Section 5).

Noncancer toxicity values for the inhalation pathway are often presented as reference concentrations (RfC). These values were converted to RfDs by multiplying by an inhalation rate of 20 $m^3$/day and dividing by an adult body weight of 70 kg. In accordance with NYSDOH recommendations, oral toxicity values were used to evaluate inhalation exposures for those chemicals that are systemic toxicants and lack inhalation criteria. All of the target chemicals analyzed in the trial burn have toxicity values derived by U.S. EPA or NYSDOH. Route-to-route extrapolation was not used for routes of exposure not demonstrated to produce carcinogenic risks. Only published cancer slope factors (or values derived from unit risks for the same route of exposure were used in this case.

The product of the toxicity value, emission factor and any other chemical-specific factor results in a risk factor for each chemical. Separate risk factors were calculated for each of the six categories listed above. The absolute units in the risk factor do not matter, as long as units among chemicals in a medium are the same. Chemical-specific risk factors were summed to obtain the total risk factor. The ratio of the risk factor for each chemical to the total risk factor approximates the relative risk for each chemical. Chemicals with very low risk factor ratios may be eliminated from the quantitative risk assessment, since such chemicals are not likely to contribute significantly to the total risk estimate.

In this report, a risk factor ratio of 1 percent was used as a cutoff point in accordance with the example provided in U.S. EPA (1989b). Any chemical with a risk factor ratio greater than 1 percent in any of the six categories listed above was evaluated in the quantitative risk assessment. Due to the high fraction of the oral carcinogenic risk associated with TCDD-TEQ in this case, the risk ranking was repeated with that set of compounds separated out. This assured that any other compound with 1% of any risk factor (excluding the fraction due to the TCDD-TEQ emissions) would be included. Although some of the potentially carcinogenic PAHs had a risk factor ratio much less than 1%, all of these PAHs were included as COPCs to ensure a conservative risk estimate. As noted in Section 4.1.1, there were special concerns about phthalates as artifacts that led to detection of one phthalate, di-n-octyl phthalate, that was never detected, but would have been ordinarily included if risk ranking alone were used as the decision for inclusion as a COPC. Bis-(2ethyl hexyl) phthalate, which was detected at low levels in all tests, was included in the final COPC list due to its relatively high risk ranking at the measured levels, even through these levels were below the ratio-to-field-blank values that might cause the U.S. EPA to consider its presence highly questionable.

Appendix A includes all of the individual risk ranking results. The listing of COPCs ultimately selected by combining the results of these six ranking methods are presented, along with predicted maximum emission rates, in Table 4-12. These chemicals comprise the set that should represent substantially all of the risks associated with Norlite's future emissions.

## 4.3 Speciation Issues Affecting Risk Analysis of Mercury Emissions

The U.S. EPA 1998 guidance, Human Health Risk Assessment Protocol for Hazardous Waste Facilities, and its subsequent 1999 "Addendum" recommended several additional refinements for the modeling of the fate and transport of mercury emissions for MRAs. Much of the information was drawn from the 1997 Mercury Study Reprt to Congress (U.S. EPA, 1997. Figure 4-1 is drawn from the 1998 U.S. EPA guidance document. It presents an example of the assumed physical and chemical forms of mercury expected to be emitted from hazardous waste combustion facilities, based upon the limited data which have been previously collected in research or performance tests at other hazardous waste combustion facilities. The assumed default values presented in Figure 1 were utilized in the original September 2000 Risk Assessment Report.

From Figure 4-1 it is apparent that the fate of the mercury emitted from the stack requires more information than just the fact that there are two forms of mercury assumed to be emitted from hazardous waste combustion facilities: vapor and particulate.

- Mercury emissions in the vapor form are assumed to consist of both elemental mercury ($Hg^{\circ}$) and oxidized mercury ($Hg^{++}$, evaluated in the risk assessment process as mercuric chloride (HgCl))

- Particulate mercury emissions are assumed to consist of oxidized mercury (i.e., HgCl)

- Total mercury exiting the stack is assumed to consist of $Hg^{\circ}$ and HgCl. No emission of methyl mercury (MeHg) is assumed.

The U.S. EPA default assumption is that total mercury emissions from hazardous waste combustion consist of 80% vapor phase mercury and 20% particle bound mercury.

Considering the global mercury cycle, the U.S. EPA (1998) assumes only 48.2% of total mercury emitted from the stack is deposited locally (in the vicinity of the combustion unit). 40.8% of total mercury is assumed to be deposited locally as HgCl vapor, 7.2% is assumed to be deposited locally as particle-bound HgCl, and 0.2% is deposited locally as vapor phase Hg°. 52% of total mercury emitted is assumed to leave the study area and join the global mercury cycle.

It is assumed that deposition of oxidized mercury to the various environmental media is entirely as HgCl, in either vapor or particle bound form. For Hg° vapor, only 1% is assumed to deposit on soil or water in the vapor phase. In addition:

- Exposure to Hg° is assumed to occur only via inhalation of vapor phase Hg°.
- Exposure to divalent Hg occurs through both indirect exposure (i.e., consumption of locally produced agricultural products or locally caught fish) to and inhalation of vapor and particle bound HgCl.

### 4.3.1 Use of Site-Specific Norlite Speciation Data

Based upon the supplemental mercury speciation testing performed in April 2000 an additional analysis of the significance of this data was performed in January 2001. Since the results of these tests provide a site-specific set of values for the input parameters of the newest recommended EPA mercury fate and transport model, they have been integrated into the current MRA analysis. The laboratory results serving as the foundation of this analysis were included in the Norlite Trial Burn Report of August, 2000).

The availability of this site-specific measurement data allows the hypothetical fractions portrayed in the sample case shown in Figure 4-1 to be replaced with the values shown in Figure 4-2. This figure illustrates the use of the same method, but employs the Norlite measurement results where applicable. In both cases the EPA-recommended assumption that a significant fraction is lost to the global budget is included, based on the support of a number of studies cited by EPA, 1997. The changes in the distribution fractions between vapor and particle-bound fractions are significant, but modest. The similarity of the ratios indeed lends credibility to the basic EPA method for addressing this issue.

Although site-specific source speciation data has been used in the present update, the following assumptions about methylation fractions in soil and in the surface water environment were maintained, because no independent site-specific information is available.

### 4.3.2 Methylation of Mercury in Soil

Mercury is assumed to deposit to soil in the HgCl form. A small fraction of deposited mercury is then converted to be MeHg. 98% of the total mercury concentration predicted in soil is assumed to be in the HgCl form. 2% of the total mercury in soil is assumed to be MeHg.

### 4.3.3 Methylation of Mercury in a Surface Water Environment

Watershed erosion and direct deposition are important sources of Hg to a water body. Some Hg entering a water body is methylated through biotic processes. Rather than modeling site-specific water body properties and biotic conditions the U.S. EPA 1998 recommends (consistent with the mercury report to congress) assuming 85% of total Hg in surface water is divalent (as HgCl) and that 15% is MeHg. However, due to the wide range of chemical and physical properties that influence the methylation process there is high variability in the methylation of mercury among water bodies. Correspondingly, given our lack of knowledge concerning the properties of local water bodies evaluated in a typical combustion risk assessment, there remains an inherently high level of uncertainty in predicting MeHg levels in surface water bodies.

## Table 4-1a
## PCDD / PCDF Emission Results - TEQ Basis - Condition B - (unweighted)*

| | Run No. | CB-R1 | | CB-R2 | | CB-R3 | | Average | |
|---|---|---|---|---|---|---|---|---|---|
| | Date | 24-Jul-01 | | 25-Jul-01 | | 25-Jul-01 | | | |
| | Start Time | 12:33 | | 08:02 | | 11:48 | | | |
| | Stop Time | 15:41 | | 11:09 | | 14:55 | | | |
| | **Units** | | | | | | | | |
| Sample Volume | dscf | 127.336 | | 130.421 | | 131.348 | | 129.70 | |
| Sample Volume | $m^3$ | 3.61 | | 3.69 | | 3.72 | | 3.67 | |
| Moisture Content | % v/v | 16.5 | | 15.9 | | 15.6 | | 16.01 | |
| $O_2$ Conc. | % v/v (dry) | 15.30 | | 15.00 | | 14.40 | | 14.90 | |
| $CO_2$ Conc. | % v/v (dry) | 4.30 | | 4.60 | | 4.50 | | 4.47 | |
| Isokinetics | % | 99 | | 100 | | 99 | | 99.39 | |
| Stack Flowrate | dscfm | 34,493 | | 35,272 | | 35,685 | | 35,150 | |
| PCDD / PCDF Parameters | * TEF (a) | pg/ sample | ng/m³ | pg/ sample | ng/m³ | pg/ sample | ng/m³ | Average ng/m3 | **Average g/sec** |
| 2,3,7,8-TCDD | 1.00 | 46.9 | 1.3E-02 | 17.1 | 4.6E-03 | 24.7 | 6.6E-03 | 8.1E-03 | **1.3E-10** |
| 1,2,3,7,8-PeCDD | 1.00 | 35.7 | 9.9E-03 | 9.17 | 2.5E-03 | 16.1 | 4.3E-03 | 5.6E-03 | **9.2E-11** |
| 1,2,3,4,7,8-HxCDD | 1.00 | 10.7 | 3.0E-03 | 5.5 | 1.5E-03 | 6.7 | 1.8E-03 | 2.1E-03 | **3.5E-11** |
| 1,2,3,6,7,8-HxCDD | 1.00 | 11.3 | 3.1E-03 | 5.2 | 1.4E-03 | 6.2 | 1.7E-03 | 2.1E-03 | **3.4E-11** |
| 1,2,3,7,8,9-HxCDD | 1.00 | 6.5 | 1.8E-03 | 4.9 | 1.3E-03 | 5.9 | 1.6E-03 | 1.6E-03 | **2.6E-11** |
| 1,2,3,4,6,7,8-HpCDD | 1.00 | 25.9 | 7.2E-03 | 14.4 | 3.9E-03 | 19.6 | 5.3E-03 | 5.5E-03 | **9.0E-11** |
| OCDD | 1.00 | 38.3 | 1.1E-02 | 27.8 | 7.5E-03 | 35.4 | 9.5E-03 | 9.2E-03 | **1.5E-10** |
| 2,3,7,8-TCDF | 1.00 | 1,200 | 3.3E-01 | 395 | 1.1E-01 | 585 | 1.6E-01 | 2.0E-01 | **3.3E-09** |
| 1,2,3,7,8-PeCDF | 1.00 | 501 | 1.4E-01 | 121 | 3.3E-02 | 219 | 5.9E-02 | 7.7E-02 | **1.3E-09** |
| 2,3,4,7,8-PeCDF | 1.00 | 1,040 | 2.9E-01 | 237 | 6.4E-02 | 422 | 1.1E-01 | 1.6E-01 | **2.6E-09** |
| 1,2,3,4,7,8-HxCDF | 1.00 | 218 | 6.0E-02 | 41.8 | 1.1E-02 | 85.8 | 2.3E-02 | 3.2E-02 | **5.2E-10** |
| 1,2,3,6,7,8-HxCDF | 1.00 | 189 | 5.2E-02 | 35.1 | 9.5E-03 | 66.3 | 1.8E-02 | 2.7E-02 | **4.4E-10** |
| 2,3,4,6,7,8-HxCDF | 1.00 | 178 | 4.9E-02 | 32.7 | 8.9E-03 | 62.9 | 1.7E-02 | 2.5E-02 | **4.2E-10** |
| 1,2,3,7,8,9-HxCDF | 1.00 | 61 | 1.7E-02 | 11.2 | 3.0E-03 | 21.8 | 5.9E-03 | 8.6E-03 | **1.4E-10** |
| 1,2,3,4,6,7,8-HpCDF | 1.00 | 105 | 2.9E-02 | 26 | 7.0E-03 | 45.6 | 1.2E-02 | 1.6E-02 | **2.7E-10** |
| 1,2,3,4,7,8,9-HpCDF | 1.00 | 14.1 | 3.9E-03 | 3 | 7.4E-04 | 5.64 | 1.5E-03 | 2.1E-03 | **3.4E-11** |
| OCDF | 1.00 | 37.3 | 1.0E-02 | 12.8 | 3.5E-03 | 25.3 | 6.8E-03 | 6.9E-03 | **1.1E-10** |
| TOTAL TCDD | 0.00 | 939 | 0.0E+00 | 366 | 0.0E+00 | 506 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| TOTAL PeCDD | 0.00 | 381 | 0.0E+00 | 127 | 0.0E+00 | 196 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| TOTAL HxCDD | 0.00 | 181 | 0.0E+00 | 72.6 | 0.0E+00 | 92.6 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| TOTAL HpCDD | 0.00 | 70.6 | 0.0E+00 | 40.1 | 0.0E+00 | 56.2 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| TOTAL TCDF | 0.00 | 47,200 | 0.0E+00 | 18,300 | 0.0E+00 | 25,400 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| TOTAL PeCDF | 0.00 | 11,600 | 0.0E+00 | 2,940 | 0.0E+00 | 5,000 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| TOTAL HxCDF | 0.00 | 1,870 | 0.0E+00 | 338 | 0.0E+00 | 668 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| TOTAL HpCDF | 0.00 | 168 | 0.0E+00 | 36.6 | 0.0E+00 | 71.3 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| TOTAL ($ng/m^3$) | | = | 1.031 | | 0.271 | | 0.445 | 5.8E-01 | |
| TOTAL ($ng/m^3$ @ 7 % $O_2$) | | = | 2.533 | | 0.631 | | 0.943 | 1.4E+00 | |
| TOTAL (g/s) | | = | **1.7E-08** | | **4.5E-09** | | **7.5E-09** | | **9.66E-09** |

(a) No TEF factor applied

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## Table 4-1b
## PCDD / PCDF Emission Results - TEQ Basis - Condition B - (TEQ = TEF weighted)*

| | Run No. | CB-R1 | | CB-R2 | | CB-R3 | | Average | |
|---|---|---|---|---|---|---|---|---|---|
| | Date | 24-Jul-01 | | 25-Jul-01 | | 25-Jul-01 | | | |
| | Start Time | 12:33 | | 08:02 | | 11:48 | | | |
| | Stop Time | 15:41 | | 11:09 | | 14:55 | | | |
| | **Units** | | | | | | | | |
| Sample Volume | dscf | 127.336 | | 130.421 | | 131.348 | | 129.70 | |
| Sample Volume | $m^3$ | 3.61 | | 3.69 | | 3.72 | | 3.67 | |
| Moisture Content | % v/v | 16.5 | | 15.9 | | 15.6 | | 16.01 | |
| $O_2$ Conc. | % v/v (dry) | 15.30 | | 15.00 | | 14.40 | | 14.90 | |
| $CO_2$ Conc. | % v/v (dry) | 4.30 | | 4.60 | | 4.50 | | 4.47 | |
| Isokinetics | % | 99 | | 100 | | 99 | | 99.39 | |
| Stack Flowrate | dscfm | 34,493 | | 35,272 | | 35,685 | | 35,150 | |
| PCDD / PCDF Parameters | * TEF (a) | pg/ sample | $ng/m^3$ TEQ | pg/ sample | $ng/m^3$ TEQ | pg/ sample | $ng/m^3$ TEQ | Ave. TEQ ng/m3 | **Ave. TEQ g/sec** |
| 2,3,7,8-TCDD | 1.00 | 46.9 | 1.3E-02 | 17.1 | 4.6E-03 | 24.7 | 6.6E-03 | 8.1E-03 | **1.3E-10** |
| 1,2,3,7,8-PeCDD | 1.00 | 35.7 | 9.9E-03 | 9.17 | 2.5E-03 | 16.1 | 4.3E-03 | 5.6E-03 | **9.2E-11** |
| 1,2,3,4,7,8-HxCDD | 0.10 | 10.7 | 3.0E-04 | 5.5 | 1.5E-04 | 6.7 | 1.8E-04 | 2.1E-04 | **3.5E-12** |
| 1,2,3,6,7,8-HxCDD | 0.10 | 11.3 | 3.1E-04 | 5.2 | 1.4E-04 | 6.2 | 1.7E-04 | 2.1E-04 | **3.4E-12** |
| 1,2,3,7,8,9-HxCDD | 0.10 | 6.5 | 1.8E-04 | 4.9 | 1.3E-04 | 5.9 | 1.6E-04 | 1.6E-04 | **2.6E-12** |
| 1,2,3,4,6,7,8-HpCDD | 0.01 | 25.9 | 7.2E-05 | 14.4 | 3.9E-05 | 19.6 | 5.3E-05 | 5.5E-05 | **9.0E-13** |
| OCDD | 0.0001 | 38.3 | 1.1E-06 | 27.8 | 7.5E-07 | 35.4 | 9.5E-07 | 9.2E-07 | **1.5E-14** |
| 2,3,7,8-TCDF | 0.10 | 1,200 | 3.3E-02 | 395 | 1.1E-02 | 585 | 1.6E-02 | 2.0E-02 | **3.3E-10** |
| 1,2,3,7,8-PeCDF | 0.05 | 501 | 6.9E-03 | 121 | 1.6E-03 | 219 | 2.9E-03 | 3.8E-03 | **6.4E-11** |
| 2,3,4,7,8-PeCDF | 0.50 | 1,040 | 1.4E-01 | 237 | 3.2E-02 | 422 | 5.7E-02 | 7.8E-02 | **1.3E-09** |
| 1,2,3,4,7,8-HxCDF | 0.10 | 218 | 6.0E-03 | 41.8 | 1.1E-03 | 85.8 | 2.3E-03 | 3.2E-03 | **5.2E-11** |
| 1,2,3,6,7,8-HxCDF | 0.10 | 189 | 5.2E-03 | 35.1 | 9.5E-04 | 66.3 | 1.8E-03 | 2.7E-03 | **4.4E-11** |
| 2,3,4,6,7,8-HxCDF | 0.10 | 178 | 4.9E-03 | 32.7 | 8.9E-04 | 62.9 | 1.7E-03 | 2.5E-03 | **4.2E-11** |
| 1,2,3,7,8,9-HxCDF | 0.10 | 61 | 1.7E-03 | 11.2 | 3.0E-04 | 21.8 | 5.9E-04 | 8.6E-04 | **1.4E-11** |
| 1,2,3,4,6,7,8-HpCDF | 0.01 | 105 | 2.9E-04 | 26 | 7.0E-05 | 45.6 | 1.2E-04 | 1.6E-04 | **2.7E-12** |
| 1,2,3,4,7,8,9-HpCDF | 0.01 | 14.1 | 3.9E-05 | 3 | 7.4E-06 | 5.64 | 1.5E-05 | 2.1E-05 | **3.4E-13** |
| OCDF | 0.0001 | 37.3 | 1.0E-06 | 12.8 | 3.5E-07 | 25.3 | 6.8E-07 | 6.9E-07 | **1.1E-14** |
| TOTAL TCDD | 0.00 | 939 | 0.0E+00 | 366 | 0.0E+00 | 506 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| TOTAL PeCDD | 0.00 | 381 | 0.0E+00 | 127 | 0.0E+00 | 196 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| TOTAL HxCDD | 0.00 | 181 | 0.0E+00 | 72.6 | 0.0E+00 | 92.6 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| TOTAL HpCDD | 0.00 | 70.6 | 0.0E+00 | 40.1 | 0.0E+00 | 56.2 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| TOTAL TCDF | 0.00 | 47,200 | 0.0E+00 | 18,300 | 0.0E+00 | 25,400 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| TOTAL PeCDF | 0.00 | 11,600 | 0.0E+00 | 2,940 | 0.0E+00 | 5,000 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| TOTAL HxCDF | 0.00 | 1,870 | 0.0E+00 | 338 | 0.0E+00 | 668 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| TOTAL HpCDF | 0.00 | 168 | 0.0E+00 | 36.6 | 0.0E+00 | 71.3 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| **TOTAL ($ng/m^3$)** | | = | 0.226 | | 0.055 | | 0.093 | 1.3E-01 | |
| **TOTAL ($ng/m^3$ @ 7 % $O_2$)** | | = | 0.556 | | 0.129 | | 0.198 | 2.9E-01 | |
| **TOTAL (g/s)** | | = | **3.7E-09** | | **9.2E-10** | | **1.6E-09** | | **2.07E-09** |

(a) WHO TEF factor applied

J:\Indl_Service\Project Files\Norlite-9514-046-500\2001 Emissions Update\[TABLE 4-1a Cond B - D-F unwtd.xls]TEQS

**Table 4-2**
**Method 0060 Sampling Parameters and**
**Emission Results for Target Metals - Condition B**

| Run No.<br>Date<br>Start Time<br>Stop Time | Units | CB-R1<br>24-Jul-01<br>13:03<br>15:11 | CB-R2<br>25-Jul-01<br>08:32<br>10:39 | CB-R3<br>25-Jul-01<br>12:18<br>14:25 | AVGS |
|---|---|---|---|---|---|
| **Sampling Parameters –** | | | | | |
| Barometric Pressure | in. Hg | 29.60 | 29.70 | 29.70 | 29.67 |
| Volume Metered | dcf | 97.598 | 96.079 | 99.421 | 97.699 |
| Sample Volume | dscf | 91.523 | 92.380 | 94.488 | 92.797 |
| Moisture | % v/v | 17.4 | 17.0 | 16.6 | 17.0 |
| $O_2$ at Stack | % dry | 15.30 | 15.00 | 14.40 | 14.90 |
| Avg. Stack Temp. | °F | 138 | 137 | 136 | 137 |
| Stack Flowrate | dscfm | 33,199 | 33,716 | 34,483 | 33,800 |
| Isokinetics | % | 98 | 98 | 98 | 98 |
| **Arsenic (As) –** | LVM | | | | |
| Quantity Collected | µg | 0.75 | 1.15 | 1.15 | 1.02 |
| Stack Conc. @ 7% $O_2$ | µg/m³ | 0.71 | 1.03 | 0.91 | 0.88 |
| Stack Emission Rate | lb/hr | 3.60E-05 | 5.55E-05 | 5.55E-05 | 4.90E-05 |
| | g/sec | 4.53E-06 | 7.00E-06 | 6.99E-06 | 6.17E-06 |
| Feed Quantity | lb/hr | 0.685 | 0.349 | 0.578 | 0.537 |
| Removal Efficiency | % | 99.995% | 99.984% | 99.990% | 99.990% |
| **Beryllium (Be) –** | LVM | | | | |
| Quantity Collected | µg | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Stack Conc. @ 7% $O_2$ | µg/m³ | < 0.09 | < 0.09 | < 0.08 | < 0.09 |
| Stack Emission Rate | lb/hr | < 4.80E-06 | < 4.83E-06 | < 4.83E-06 | < 4.82E-06 |
| | g/sec | < 6.05E-07 | < 6.08E-07 | < 6.08E-07 | < 6.07E-07 |
| Feed Quantity | lb/hr | 0.049 | 0.049 | 0.050 | 0.049 |
| Removal Efficiency | % | > 99.990% | > 99.990% | > 99.990% | > 99.990% |
| **Total Chromium (Cr) –** | LVM | | | | |
| Quantity Collected | µg | 1.50 | 0.70 | 1.30 | 1.17 |
| Stack Conc. @ 7% $O_2$ | µg/m³ | 1.42 | 0.62 | 1.03 | 1.03 |
| Stack Emission Rate | lb/hr | 7.20E-05 | 3.38E-05 | 6.28E-05 | 5.62E-05 |
| | g/sec | 9.07E-06 | 4.26E-06 | 7.91E-06 | 7.08E-06 |
| Feed Quantity | lb/hr | 4.24 | 4.25 | 4.11 | 4.20 |
| Removal Efficiency | % | 99.998% | 99.999% | 99.998% | 99.999% |
| **Cadmium (Cd) –** | SVM | | | | |
| Quantity Collected | µg | 0.39 | 0.52 | 0.29 | 0.40 |
| Stack Conc. @ 7% $O_2$ | µg/m³ | 0.37 | 0.46 | 0.23 | 0.35 |
| Stack Emission Rate | lb/hr | 1.87E-05 | 2.51E-05 | 1.40E-05 | 1.93E-05 |
| | g/sec | 2.36E-06 | 3.16E-06 | 1.76E-06 | 2.43E-06 |
| Feed Quantity | lb/hr | 0.184 | 0.168 | 0.192 | 0.181 |
| Removal Efficiency | % | 99.990% | 99.985% | 99.993% | 99.989% |
| **Lead (Pb) –** | SVM | | | | |
| Quantity Collected | µg | 0.74 | 0.56 | 0.74 | 0.68 |
| Stack Conc. @ 7% $O_2$ | µg/m³ | 0.70 | 0.50 | 0.59 | 0.60 |
| Stack Emission Rate | lb/hr | 3.55E-05 | 2.70E-05 | 3.57E-05 | 3.28E-05 |
| | g/sec | 4.47E-06 | 3.41E-06 | 4.50E-06 | 4.13E-06 |
| Feed Quantity | lb/hr | 3.35 | 2.89 | 3.30 | 3.18 |
| Removal Efficiency | % | 99.999% | 99.999% | 99.999% | 99.999% |
| **LVM Total =** | µg/m³ | 2.23 | 1.74 | 2.02 | **2.00** |
| **SVM Total =** | µg/m³ | 1.07 | 0.96 | 0.82 | **0.95** |

## Table 4-2 (cont'd)
## Method 0060 Sampling Parameters and Emission Results for Target Metals

| Run No.<br>Date<br>Start Time<br>Stop Time | Units | CB-R1<br>24-Jul-01<br>13:03<br>15:11 | CB-R2<br>25-Jul-01<br>08:32<br>10:39 | CB-R3<br>25-Jul-01<br>12:18<br>14:25 | AVGS |
|---|---|---|---|---|---|
| **Sampling Parameters --** | | | | | |
| Barometric Pressure | in. Hg | 29.60 | 29.70 | 29.70 | 29.67 |
| Volume Metered | dcf | 97.598 | 96.079 | 99.421 | 97.699 |
| Sample Volume | dscf | 91.523 | 92.380 | 94.488 | 92.797 |
| Moisture | % v/v | 17.4 | 17.0 | 16.6 | 17.0 |
| $O_2$ at Stack | % dry | 15.30 | 15.00 | 14.40 | 14.90 |
| Avg. Stack Temp. | °F | 138 | 137 | 136 | 137 |
| Stack Flowrate | dscfm | 33,199 | 33,716 | 34,483 | 33,800 |
| Isokinetics | % | 98 | 98 | 98 | 98 |
| **Mercury (Hg) --** | VM | | | | |
| Quantity Collected | μg | 28.2 | 17.5 | 21.4 | 22.4 |
| Stack Conc. @ 7% $O_2$ | μg/m³ | 26.7 | 15.6 | 16.9 | 19.8 |
| Stack Emission Rate | lb/hr | 1.35E-03 | 8.46E-04 | 1.03E-03 | 1.08E-03 |
| | g/sec | 1.70E-04 | 1.07E-04 | 1.30E-04 | 1.36E-04 |
| Feed Quantity | lb/hr | 0.0050 | 0.0047 | 0.0059 | 0.0052 |
| Removal Efficiency | % | 72.96% | 81.99% | 82.52% | 82.26% |
| **Antimony (Sb) --** | | | | | |
| Quantity Collected | μg | < 0.40 | < 0.40 | < 0.40 | < 0.40 |
| Stack Conc. @ 7% $O_2$ | μg/m³ | < 0.38 | < 0.36 | < 0.32 | < 0.35 |
| Stack Emission Rate | lb/hr | < 1.92E-05 | < 1.93E-05 | < 1.93E-05 | < 1.93E-05 |
| | g/sec | < 2.42E-06 | < 2.43E-06 | < 2.43E-06 | < 2.43E-06 |
| Feed Quantity | lb/hr | 0.154 | 0.143 | 0.167 | 0.155 |
| Removal Efficiency | % | > 99.988% | > 99.986% | > 99.988% | > 99.987% |
| **Barium (Ba) --** | | | | | |
| Quantity Collected | μg | 1.20 | 1.00 | 1.20 | 1.13 |
| Stack Conc. @ 7% $O_2$ | μg/m³ | 1.14 | 0.89 | 0.95 | 0.99 |
| Stack Emission Rate | lb/hr | 5.76E-05 | 4.83E-05 | 5.79E-05 | 5.46E-05 |
| | g/sec | 7.25E-06 | 6.08E-06 | 7.30E-06 | 6.88E-06 |
| Feed Quantity | lb/hr | 8.20 | 7.46 | 7.12 | 7.59 |
| Removal Efficiency | % | 99.9993% | 99.9994% | 99.9992% | 99.9993% |
| **Silver (Ag) --** | | | | | |
| Quantity Collected | μg | 0.24 | < 0.20 | < 0.20 | < 0.21 |
| Stack Conc. @ 7% $O_2$ | μg/m³ | 0.23 | < 0.18 | < 0.16 | < 0.19 |
| Stack Emission Rate | lb/hr | 1.15E-05 | < 9.66E-06 | < 9.65E-06 | < 1.03E-05 |
| | g/sec | 1.45E-06 | < 1.22E-06 | < 1.22E-06 | < 1.29E-06 |
| Feed Quantity | lb/hr | 0.096 | 0.083 | 0.088 | 0.089 |
| Removal Efficiency | % | 99.99% | > 99.99% | > 99.99% | > 99.99% |
| **Thallium (Tl) --** | | | | | |
| Quantity Collected | μg | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Stack Conc. @ 7% $O_2$ | μg/m³ | < 0.47 | < 0.45 | < 0.40 | < 0.44 |
| Stack Emission Rate | lb/hr | < 2.40E-05 | < 2.41E-05 | < 2.41E-05 | < 2.41E-05 |
| | g/sec | < 3.02E-06 | < 3.04E-06 | < 3.04E-06 | < 3.04E-06 |
| Feed Quantity | lb/hr | 0.205 | 0.157 | 0.162 | 0.175 |
| Removal Efficiency | % | > 99.988% | > 99.985% | > 99.985% | > 99.986% |

## Table 4-2 (cont'd)
## Method 0060 Sampling Parameters and Emission Results for Target Metals

| Run No.<br>Date<br>Start Time<br>Stop Time | Units | CB-R1<br>24-Jul-01<br>13:03<br>15:11 | CB-R2<br>25-Jul-01<br>08:32<br>10:39 | CB-R3<br>25-Jul-01<br>12:18<br>14:25 | AVGS |
|---|---|---|---|---|---|
| **Sampling Parameters –** | | | | | |
| Barometric Pressure | in. Hg | 29.60 | 29.70 | 29.70 | 29.67 |
| Volume Metered | dcf | 97.598 | 96.079 | 99.421 | 97.699 |
| Sample Volume | dscf | 91.523 | 92.380 | 94.488 | 92.797 |
| Moisture | % v/v | 17.4 | 17.0 | 16.6 | 17.0 |
| $O_2$ at Stack | % dry | 15.30 | 15.00 | 14.40 | 14.90 |
| Avg. Stack Temp. | °F | 138 | 137 | 136 | 137 |
| Stack Flowrate | dscfm | 33,199 | 33,716 | 34,483 | 33,800 |
| Isokinetics | % | 98 | 98 | 98 | 98 |
| **Nickel (Ni) –** | | | | | |
| Quantity Collected | µg | 11.07 | 4.87 | 26.07 | 14.0 |
| Stack Conc. @ 7% $O_2$ | µg/m³ | 10.5 | 4.34 | 20.67 | 11.8 |
| Stack Emission Rate | lb/hr | 5.31E-04 | 2.35E-04 | 1.26E-03 | 6.75E-04 |
| | g/sec | 6.69E-05 | 2.96E-05 | 1.59E-04 | 8.50E-05 |
| Feed Quantity | lb/hr | 5.05 | 4.72 | 5.01 | 4.93 |
| Removal Efficiency | % | 99.989% | 99.995% | 99.975% | 99.986% |
| **Copper (Cu) –** | | | | | |
| Quantity Collected | µg | 5.1 | 3.0 | 4.0 | 4.0 |
| Stack Conc. @ 7% $O_2$ | µg/m³ | 4.8 | 2.7 | 3.17 | 3.56 |
| Stack Emission Rate | lb/hr | 2.45E-04 | 1.45E-04 | 1.93E-04 | 1.94E-04 |
| | g/sec | 3.08E-05 | 1.82E-05 | 2.43E-05 | 2.45E-05 |
| Feed Quantity | lb/hr | 7.00 | 6.81 | 8.18 | 7.33 |
| Removal Efficiency | % | 99.997% | 99.998% | 99.998% | 99.997% |
| **Zinc (Zn) –** | | | | | |
| Quantity Collected | µg | 32.1 | 22.1 | 17.1 | 23.8 |
| Stack Conc. @ 7% $O_2$ | µg/m³ | 30.4 | 19.7 | 13.6 | 21.2 |
| Stack Emission Rate | lb/hr | 1.54E-03 | 1.07E-03 | 8.25E-04 | 1.14E-03 |
| | g/sec | 1.94E-04 | 1.34E-04 | 1.04E-04 | 1.44E-04 |
| Feed Quantity | lb/hr | 18.4 | 10.0 | 10.0 | 12.8 |
| Removal Efficiency | % | 99.992% | 99.989% | 99.992% | 99.991% |
| **Selenium (Se) –** | | | | | |
| Quantity Collected | µg | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Stack Conc. @ 7% $O_2$ | µg/m³ | < 0.47 | < 0.45 | < 0.40 | < 0.44 |
| Stack Emission Rate | lb/hr | < 2.40E-05 | < 2.41E-05 | < 2.41E-05 | < 2.41E-05 |
| | g/sec | < 3.02E-06 | < 3.04E-06 | < 3.04E-06 | < 3.04E-06 |
| Feed Quantity | lb/hr | 0.307 | 0.314 | 0.314 | 0.312 |
| Removal Efficiency | % | > 99.992% | > 99.992% | > 99.992% | > 99.992% |

## Table 4-3a
## Semivolatile Organics Emission Results - Test Condition A - Low Temperature

| | Run No. | CA-R1 | Run No. | CA-R2 | Run No. | CA-R3 |
|---|---|---|---|---|---|---|
| | Date | 28-Apr-99 | Date | 28-Apr-99 | Date | 28-Apr-99 |
| | Start Time | 09:00 | Start Time | 13:36 | Start Time | 19:00 |
| | Stop Time | 12:18 | Stop Time | 16:55 | Stop Time | 22:13 |
| | **Units** | | **Units** | | **Units** | |
| Sample Volume | dscf | 148.271 | dscf | 148.196 | dscf | 143.436 |
| Sample Volume | $m^3$ | 4.20 | $m^3$ | 4.20 | $m^3$ | 4.06 |
| Moisture Content | % v/v | 16.4 | % v/v | 16.1 | % v/v | 16.4 |
| $O_2$ Conc. | % v/v (dry) | 14.23 | % v/v (dry) | 14.27 | % v/v (dry) | 14.38 |
| $CO_2$ Conc. | % v/v (dry) | 5.20 | % v/v (dry) | 5.07 | % v/v (dry) | 4.95 |
| Isokinetics | % | 99 | % | 100 | % | 99 |
| Stack Flowrate | dscfm | 31,310 | dscfm | 31,177 | dscfm | 30,480 |
| **Semivolatile Organics:** | µg | g/sec | µg | g/sec | µg | g/sec |
| Phenol | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 |
| 2-chlorophenol | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 |
| 1,3-Dichlorobenzene | 7.3 | 2.6E-05 | 9.4 | 3.3E-05 | 12 | 4.2E-05 |
| 1,4-Dichlorobenzene | 4.8 | 1.7E-05 | 6.1 | 2.1E-05 | 7.4 | 2.6E-05 |
| 1,2-Dichlorobenzene | 5.7 | 2.0E-05 | 7.2 | 2.5E-05 | 8.7 | 3.1E-05 |
| 2-methylphenol (o-cresol) | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 |
| 4-methylphenol (m/p-cresol) | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 |
| Hexachloroethane | < 2.0 | < 7.0E-06 | < 2.0 | < 7.0E-06 | < 2.0 | < 7.1E-06 |
| Nitrobenzene | < 2.0 | < 7.0E-06 | < 2.0 | < 7.0E-06 | < 2.0 | < 7.1E-06 |
| 2,4-Dimethylphenol | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 |
| 2,4-Dichlorophenol | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 |
| 1,2,4-Trichlorobenzene | 8.0 | 2.8E-05 | 10 | 3.5E-05 | 12 | 4.2E-05 |
| Hexachlorobutadiene | < 2.0 | < 7.0E-06 | < 2.0 | < 7.0E-06 | < 2.0 | < 7.1E-06 |
| Hexachlorocyclopentadiene | < 40 | < 1.4E-04 | < 40 | < 1.4E-04 | < 40 | < 1.4E-04 |
| 2,4,6-Trichlorophenol | 27 | 9.5E-05 | 24 | 8.4E-05 | 24 | 8.5E-05 |
| 2,4,5-Trichlorophenol | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 |
| 2-Chloronaphthalene | < 2.0 | < 7.0E-06 | < 2.0 | < 7.0E-06 | < 2.0 | < 7.1E-06 |
| 2-Nitroaniline | < 20 | < 7.0E-05 | < 20 | < 7.0E-05 | < 20 | < 7.1E-05 |
| Dimethyl phthalate | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 |
| 2,6-Dinitrotoluene | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 |
| 4-Nitrophenol | < 40 | < 1.4E-04 | < 40 | < 1.4E-04 | < 40 | < 1.4E-04 |
| 2,4-Dinitrotoluene | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 |
| Diethyl phthalate | 9.9 | 3.5E-05 | 3.6 | 1.3E-05 | 10 | 3.5E-05 |
| Hexachlorobenzene | < 2.0 | < 7.0E-06 | < 2.0 | < 7.0E-06 | < 2.0 | < 7.1E-06 |
| Pentachlorophenol | < 40 | < 1.4E-04 | < 40 | < 1.4E-04 | < 40 | < 1.4E-04 |
| Di-n-butyl phthalate | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 |
| Butylbenzylphthalate | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 |
| Bis(2-ethylhexyl)phthalate | 47 | 1.7E-04 | 17 | 6.0E-05 | 16 | 5.7E-05 |
| Di-n-octyl phthalate | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 |

Note: Quantities (µg) reported below the detection limit are preceded by a less than (<) sign. Emission rates (g/sec) for compounds reported below the detection limit are calculated at the detection limit and are also preceded by a less than (<) sign.

## Table 4-3b
## Semivolatile Organics Emission Results - Test Condition B - High Temperature

| | Run No. | CB-R1 | Run No. | CB-R2 | Run No. | CB-R3 |
|---|---|---|---|---|---|---|
| | Date | 29-Apr-99 | Date | 29-Apr-99 | Date | 30-Apr-99 |
| | Start Time | 09:30 | Start Time | 14:04 | Start Time | 08:45 |
| | Stop Time | 12:39 | Stop Time | 17:12 | Stop Time | 11:55 |
| | **Units** | | **Units** | | **Units** | |
| Sample Volume | dscf | 163.854 | dscf | 161.630 | dscf | 161.251 |
| Sample Volume | $m^3$ | 4.64 | $m^3$ | 4.58 | $m^3$ | 4.57 |
| Moisture Content | % v/v | 17.0 | % v/v | 17.5 | % v/v | 17.4 |
| $O_2$ Conc. | % v/v (dry) | 15.20 | % v/v (dry) | 15.14 | % v/v (dry) | 15.13 |
| $CO_2$ Conc. | % v/v (dry) | 4.45 | % v/v (dry) | 4.48 | % v/v (dry) | 4.59 |
| Isokinetics | % | 100 | % | 100 | % | 100 |
| Stack Flowrate | dscfm | 34,464 | dscfm | 33,956 | dscfm | 33,847 |
| **Semivolatile Organics:** | µg | g/sec | µg | g/sec | µg | g/sec |
| Phenol | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 | 25 | 8.7E-05 |
| 2-chlorophenol | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 |
| 1,3-Dichlorobenzene | 14 | 4.9E-05 | 13 | 4.6E-05 | 13 | 4.5E-05 |
| 1,4-Dichlorobenzene | 8.4 | 2.9E-05 | 8.0 | 2.8E-05 | 8.2 | 2.9E-05 |
| 1,2-Dichlorobenzene | 15 | 5.3E-05 | 15 | 5.3E-05 | 14 | 4.9E-05 |
| 2-methylphenol (o-cresol) | < 10 | < 3.5E-05 | 14 | 4.9E-05 | < 10 | < 3.5E-05 |
| 4-methylphenol (m/p-cresol) | < 10 | < 3.5E-05 | 17 | 6.0E-05 | 14 | 4.9E-05 |
| Hexachloroethane | < 2.0 | < 7.0E-06 | < 2.0 | < 7.0E-06 | < 2.0 | < 7.0E-06 |
| Nitrobenzene | < 2.0 | < 7.0E-06 | < 2.0 | < 7.0E-06 | < 2.0 | < 7.0E-06 |
| 2,4-Dimethylphenol | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 |
| 2,4-Dichlorophenol | < 10 | < 3.5E-05 | 8.4 | 2.9E-05 | < 10 | < 3.5E-05 |
| 1,2,4-Trichlorobenzene | 26 | 9.1E-05 | 24 | 8.4E-05 | 23 | 8.0E-05 |
| Hexachlorobutadiene | < 2.0 | < 7.0E-06 | < 2.0 | < 7.0E-06 | < 2.0 | < 7.0E-06 |
| Hexachlorocyclopentadiene | < 40 | < 1.4E-04 | < 40 | < 1.4E-04 | < 40 | < 1.4E-04 |
| 2,4,6-Trichlorophenol | 32 | 1.1E-04 | 38 | 1.3E-04 | 17 | 5.9E-05 |
| 2,4,5-Trichlorophenol | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 |
| 2-Chloronaphthalene | < 2.0 | < 7.0E-06 | < 2.0 | < 7.0E-06 | < 2.0 | < 7.0E-06 |
| 2-Nitroaniline | < 20 | < 7.0E-05 | < 20 | < 7.0E-05 | < 20 | < 7.0E-05 |
| Dimethyl phthalate | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 |
| 2,6-Dinitrotoluene | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 |
| 4-Nitrophenol | < 40 | < 1.4E-04 | < 40 | < 1.4E-04 | < 40 | < 1.4E-04 |
| 2,4-Dinitrotoluene | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 |
| Diethyl phthalate | 2.6 | 9.1E-06 | < 10 | < 3.5E-05 | 5.8 | 2.0E-05 |
| Hexachlorobenzene | 13 | 4.6E-05 | 14 | 4.9E-05 | 11 | 3.8E-05 |
| Pentachlorophenol | < 40 | < 1.4E-04 | < 40 | < 1.4E-04 | < 40 | < 1.4E-04 |
| Di-n-butyl phthalate | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 |
| Butylbenzylphthalate | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 |
| Bis(2-ethylhexyl)phthalate | 12 | 4.2E-05 | 14 | 4.9E-05 | 19 | 6.6E-05 |
| Di-n-octyl phthalate | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 | < 10 | < 3.5E-05 |

Note: Quantities (µg) reported below the detection limit are preceded by a less than (<) sign.
Emission rates (g/sec) for compounds reported below the detection limit are calculated at the detection limit and are also preceded by a less than (<) sign.

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# Table 4-4a
## Volatile Organics Emission Results - Condition A

| | Run No. | CA-R1 | Run No. | CA-R2 | Run No. | CA-R3 |
|---|---|---|---|---|---|---|
| | Date | 28-Apr-99 | Date | 28-Apr-99 | Date | 28-Apr-99 |
| | Start Time | 09:00 | Start Time | 13:32 | Start Time | 19:00 |
| | Stop Time | 12:17 | Stop Time | 16:48 | Stop Time | 22:10 |
| | **Units** | | **Units** | | **Units** | |
| VOST Sample Volume | dsL | 47.050 | dsL | 45.640 | dsL | 46.234 |
| Stack Flowrate | dscfm | 30,238 | dscfm | 29,939 | dscfm | 29,910 |
| **VOCs by VOST:** | ng | g/sec | ng | g/sec | ng | g/sec |
| 1,1-Dichloroethene | < 150 | < 4.5E-05 | < 150 | < 4.6E-05 | < 150 | < 4.6E-05 |
| Methylene chloride | 330 | 1.0E-04 | 427 | 1.3E-04 | 261 | 8.0E-05 |
| 1,1-Dichloroethane | < 150 | < 4.5E-05 | < 150 | < 4.6E-05 | < 150 | < 4.6E-05 |
| (trans)1,2-Dichloroethene | < 150 | < 4.5E-05 | < 150 | < 4.6E-05 | < 150 | < 4.6E-05 |
| 2-butanone | 337 | 1.0E-04 | 431 | 1.3E-04 | < 225 | < 6.9E-05 |
| Chloroform | < 131 | < 4.0E-05 | 154 | 4.8E-05 | < 136 | < 4.2E-05 |
| 1,2-Dichloroethane | 151 | 4.6E-05 | 152 | 4.7E-05 | < 150 | < 4.6E-05 |
| Trichloroethene | < 139 | < 4.2E-05 | < 150 | < 4.6E-05 | < 150 | < 4.6E-05 |
| 1,1,1-Trichloroethane | < 150 | < 4.5E-05 | < 150 | < 4.6E-05 | < 150 | < 4.6E-05 |
| Benzene | 655 | 2.0E-04 | 775 | 2.4E-04 | 495 | 1.5E-04 |
| Carbon tetrachloride | < 124 | < 3.8E-05 | 148 | 4.6E-05 | < 144 | < 4.4E-05 |
| Methylene bromide | < 150 | < 4.5E-05 | < 150 | < 4.6E-05 | < 150 | < 4.6E-05 |
| 1,2-Dichloropropane | < 150 | < 4.5E-05 | < 150 | < 4.6E-05 | < 150 | < 4.6E-05 |
| 4-methyl 2-pentanone | < 300 | < 9.1E-05 | < 300 | < 9.3E-05 | < 300 | < 9.2E-05 |
| cis-1,3-Dichloropropene | < 150 | < 4.5E-05 | < 150 | < 4.6E-05 | < 150 | < 4.6E-05 |
| Bromodichloromethane | < 150 | < 4.5E-05 | < 150 | < 4.6E-05 | < 150 | < 4.6E-05 |
| (trans)1,3-Dichloropropene | < 150 | < 4.5E-05 | < 150 | < 4.6E-05 | < 150 | < 4.6E-05 |
| 1,1,2-Trichloroethane | < 150 | < 4.5E-05 | < 150 | < 4.6E-05 | < 150 | < 4.6E-05 |
| Toluene | 374 | 1.1E-04 | 236 | 7.3E-05 | 227 | 6.9E-05 |
| Tetrachloroethene | < 150 | < 4.5E-05 | < 150 | < 4.6E-05 | < 137 | < 4.2E-05 |
| 1,1,1,2-Tetrachloroethane | < 150 | < 4.5E-05 | < 150 | < 4.6E-05 | < 150 | < 4.6E-05 |
| Chlorobenzene | 348 | 1.1E-04 | 385 | 1.2E-04 | 347 | 1.1E-04 |
| Ethylbenzene | < 150 | < 4.5E-05 | < 150 | < 4.6E-05 | < 150 | < 4.6E-05 |
| m & p-xylenes | < 139 | < 4.2E-05 | < 132 | < 4.1E-05 | < 111 | < 3.4E-05 |
| Styrene | 142 | 4.3E-05 | < 135 | < 4.2E-05 | < 119 | < 3.6E-05 |
| 1,1,2,2-Tetrachloroethane | < 150 | < 4.5E-05 | < 150 | < 4.6E-05 | < 150 | < 4.6E-05 |
| o-xylene | < 150 | < 4.5E-05 | < 150 | < 4.6E-05 | < 150 | < 4.6E-05 |
| Bromoform | < 150 | < 4.5E-05 | < 150 | < 4.6E-05 | < 150 | < 4.6E-05 |
| **VOCs by M0040:** | ppb v/v | g/sec | ppb v/v | g/sec | ppb v/v | g/sec |
| Dichlorodifluoromethane | < 500 | < 3.59E-02 | < 500 | < 3.55E-02 | < 500 | < 3.55E-02 |
| Chloromethane | < 1,200 | < 3.60E-02 | < 1,200 | < 3.56E-02 | < 1,200 | < 3.56E-02 |
| Vinyl chloride | < 960 | < 3.56E-02 | < 960 | < 3.53E-02 | < 960 | < 3.52E-02 |
| 1,3-Butadiene | < 1,100 | < 3.53E-02 | < 1,100 | < 3.50E-02 | < 1,100 | < 3.49E-02 |
| Bromomethane | < 630 | < 3.55E-02 | < 630 | < 3.52E-02 | < 630 | < 3.51E-02 |
| Trichlorofluoromethane | < 440 | < 3.59E-02 | < 440 | < 3.55E-02 | < 440 | < 3.55E-02 |

Note: Quantities (ng) reported below the detection limit are preceded by a less than (<) sign. Emission rates (g/sec) for compounds reported below the detection limit are calculated at the detection limit and are also preceded by a less than (<) sign.

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# Table 4-4b
## Volatile Organics Emission Results - Condition B

| | Run No. | CB-R1 | Run No. | CB-R2 | Run No. | CB-R3 |
|---|---|---|---|---|---|---|
| | Date | 29-Apr-99 | Date | 29-Apr-99 | Date | 30-Apr-99 |
| | Start Time | 09:30 | Start Time | 14:05 | Start Time | 08:45 |
| | Stop Time | 12:44 | Stop Time | 17:16 | Stop Time | 11:55 |
| | **Units** | | **Units** | | **Units** | |
| VOST Sample Volume | dsL | 45.422 | dsL | 44.624 | dsL | 46.442 |
| Stack Flowrate | dscfm | 35,050 | dscfm | 34,169 | dscfm | 34,078 |
| **VOCs by VOST:** | ng | g/sec | ng | g/sec | ng | g/sec |
| 1,1-Dichloroethene | < 150 | < 5.5E-05 | < 150 | < 5.4E-05 | < 150 | < 5.2E-05 |
| Methylene chloride | 479 | 1.7E-04 | 579 | 2.1E-04 | 588 | 2.0E-04 |
| 1,1-Dichloroethane | < 150 | < 5.5E-05 | < 150 | < 5.4E-05 | < 150 | < 5.2E-05 |
| (trans)1,2-Dichloroethene | < 150 | < 5.5E-05 | < 150 | < 5.4E-05 | < 150 | < 5.2E-05 |
| 2-butanone | < 252 | < 9.2E-05 | < 288 | < 1.0E-04 | < 282 | < 9.8E-05 |
| Chloroform | 198 | 7.2E-05 | 247 | 8.9E-05 | 922 | 3.2E-04 |
| 1,2-Dichloroethane | < 150 | < 5.5E-05 | < 150 | < 5.4E-05 | < 150 | < 5.2E-05 |
| Trichloroethene | < 124 | < 4.5E-05 | < 130 | < 4.7E-05 | < 150 | < 5.2E-05 |
| 1,1,1-Trichloroethane | < 150 | < 5.5E-05 | < 150 | < 5.4E-05 | < 150 | < 5.2E-05 |
| Benzene | 685 | 2.5E-04 | 725 | 2.6E-04 | 535 | 1.9E-04 |
| Carbon tetrachloride | < 124 | < 4.5E-05 | < 121 | < 4.4E-05 | 163 | 5.6E-05 |
| Methylene bromide | < 150 | < 5.5E-05 | < 150 | < 5.4E-05 | < 150 | < 5.2E-05 |
| 1,2-Dichloropropane | < 150 | < 5.5E-05 | < 150 | < 5.4E-05 | < 150 | < 5.2E-05 |
| 4-methyl 2-pentanone | < 300 | < 1.1E-04 | < 300 | < 1.1E-04 | < 300 | < 1.0E-04 |
| cis-1,3-Dichloropropene | < 150 | < 5.5E-05 | < 141 | < 5.1E-05 | < 150 | < 5.2E-05 |
| Bromodichloromethane | < 150 | < 5.5E-05 | < 150 | < 5.4E-05 | 206 | 7.1E-05 |
| (trans)1,3-Dichloropropene | < 150 | < 5.5E-05 | < 150 | < 5.4E-05 | < 150 | < 5.2E-05 |
| 1,1,2-Trichloroethane | < 150 | < 5.5E-05 | < 150 | < 5.4E-05 | < 150 | < 5.2E-05 |
| Toluene | 193 | 7.0E-05 | 218 | 7.9E-05 | 182 | 6.3E-05 |
| Tetrachloroethene | 175 | 6.4E-05 | 191 | 6.9E-05 | 148 | 5.1E-05 |
| 1,1,1,2-Tetrachloroethane | < 150 | < 5.5E-05 | < 150 | < 5.4E-05 | < 150 | < 5.2E-05 |
| Chlorobenzene | 368 | 1.3E-04 | 415 | 1.5E-04 | 340 | 1.2E-04 |
| Ethylbenzene | < 150 | < 5.5E-05 | < 150 | < 5.4E-05 | < 150 | < 5.2E-05 |
| m & p-xylenes | < 150 | < 5.5E-05 | < 150 | < 5.4E-05 | < 137 | < 4.7E-05 |
| Styrene | < 112 | < 4.1E-05 | < 120 | < 4.3E-05 | < 126 | < 4.4E-05 |
| 1,1,2,2-Tetrachloroethane | < 150 | < 5.5E-05 | < 150 | < 5.4E-05 | < 150 | < 5.2E-05 |
| o-xylene | < 150 | < 5.5E-05 | < 150 | < 5.4E-05 | < 150 | < 5.2E-05 |
| Bromoform | < 150 | < 5.5E-05 | < 150 | < 5.4E-05 | 206 | 7.1E-05 |
| **VOCs by M0040:** | ppb v/v | g/sec | ppb v/v | g/sec | ppb v/v | g/sec |
| Dichlorodifluoromethane | < 500 | < 4.16E-02 | < 500 | < 4.05E-02 | < 500 | < 4.04E-02 |
| Chloromethane | < 1,200 | < 4.17E-02 | < 1,200 | < 4.06E-02 | < 1,200 | < 4.05E-02 |
| Vinyl chloride | < 960 | < 4.13E-02 | < 960 | < 4.02E-02 | < 960 | < 4.01E-02 |
| 1,3-Butadiene | < 1,100 | < 4.09E-02 | < 1,100 | < 3.99E-02 | < 1,100 | < 3.98E-02 |
| Bromomethane | < 630 | < 4.12E-02 | < 630 | < 4.01E-02 | < 630 | < 4.00E-02 |
| Trichlorofluoromethane | < 440 | < 4.16E-02 | < 440 | < 4.05E-02 | < 440 | < 4.04E-02 |

Note: Quantities (ng) reported below the detection limit are preceded by a less than (<) sign. Emission rates (g/sec) for compounds reported below the detection limit are calculated at the detection limit and are also preceded by a less than (<) sign.

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## Table 4-5a
## Semivolatile PAHs Emission Results -
## Test Condition A - Low Temperature

| | | Run No. | CA-R1 | Run No. | CA-R2 | Run No. | CA-R3 |
|---|---|---|---|---|---|---|---|
| | | Date | 28-Apr-99 | Date | 28-Apr-99 | Date | 28-Apr-99 |
| | | Start Time | 09:00 | Start Time | 13:36 | Start Time | 19:00 |
| | | Stop Time | 12:18 | Stop Time | 16:55 | Stop Time | 22:13 |
| | | **Units** | | **Units** | | **Units** | |
| Sample Volume | | dscf | 148.271 | dscf | 148.196 | dscf | 143.436 |
| Sample Volume | | $m^3$ | 4.20 | $m^3$ | 4.20 | $m^3$ | 4.06 |
| Moisture Content | | % v/v | 16.4 | % v/v | 16.1 | % v/v | 16.4 |
| $O_2$ Conc. | | % v/v (dry) | 14.23 | % v/v (dry) | 14.27 | % v/v (dry) | 14.38 |
| $CO_2$ Conc. | | % v/v (dry) | 5.2 | % v/v (dry) | 5.07 | % v/v (dry) | 4.95 |
| Isokinetics | | % | 99 | % | 100 | % | 99 |
| Stack Flowrate | | dscfm | 31,310 | dscfm | 31,177 | dscfm | 30,480 |
| **Noncarcinogenic PAHs:** | | ng | g/sec | ng | g/sec | ng | g/sec |
| Naphthalene | | 5,900 | 2.1E-05 | 7,000 | 2.5E-05 | 4,200 | 1.5E-05 |
| 2-Methylnaphthalene | | 270 | 9.5E-07 | 360 | 1.3E-06 | 250 | 8.9E-07 |
| Acenaphthylene | | 40 | 1.4E-07 | 70 | 2.5E-07 | 62 | 2.2E-07 |
| Acenaphthene | | < 26 | < 9.2E-08 | < 26 | < 9.1E-08 | < 26 | < 9.2E-08 |
| Fluorene | | < 180 | < 6.3E-07 | < 180 | < 6.3E-07 | < 180 | < 6.4E-07 |
| Phenanthrene | | < 350 | < 1.2E-06 | < 350 | < 1.2E-06 | < 350 | < 1.2E-06 |
| Anthracene | | < 60 | < 2.1E-07 | < 60 | < 2.1E-07 | < 60 | < 2.1E-07 |
| Fluoranthene | | < 120 | < 4.2E-07 | < 120 | < 4.2E-07 | < 120 | < 4.2E-07 |
| Pyrene | | < 84 | < 3.0E-07 | < 84 | < 2.9E-07 | < 84 | < 3.0E-07 |
| Benzo(e)pyrene | | 25 | 8.8E-08 | < 25 | < 8.8E-08 | < 25 | < 8.9E-08 |
| Perylene | | 8.7 | 3.1E-08 | < 5.0 | < 1.8E-08 | < 5.0 | < 1.8E-08 |
| Benzo(g,h,i)perylene | | 32 | 1.1E-07 | 6.3 | 2.2E-08 | 7.3 | 2.6E-08 |
| **Carcinogenic PAHs:** | BaP eq (a) | ng | $ng/m^3$ BaP eq | ng | $ng/m^3$ BaP eq | ng | $ng/m^3$ BaP eq |
| Benzo(a)anthracene | 0.1 | 8.2 | 0.195 | < 5.0 | < 0.119 | < 5.0 | < 0.123 |
| Chrysene | 0.001 | < 35 | < 0.008 | < 35 | < 0.008 | < 35 | < 0.009 |
| Benzo(b)fluoranthene | 0.1 | < 49 | < 1.167 | < 49 | < 1.168 | < 49 | < 1.206 |
| Benzo(k)fluoranthene | 0.01 | 9.8 | 0.023 | < 5.0 | < 0.012 | < 5.0 | < 0.012 |
| Benzo(a)pyrene | 1.0 | 12 | 2.858 | < 5.0 | < 1.191 | < 5.0 | < 1.231 |
| Indeno(1,2,3-c,d)pyrene | 0.1 | 11 | 0.262 | < 5.0 | < 0.119 | < 5.0 | < 0.123 |
| Dibenz(a,h)anthracene | 1.0 | < 5.0 | < 1.191 | < 5.0 | < 1.191 | < 5.0 | < 1.231 |
| **TOTAL BaP eq ($ng/m^3$) =** | | | 5.7 | | 3.8 | | 3.9 |
| **TOTAL BaP eq (g/s) =** | | | 8.4E-08 | | 5.6E-08 | | 5.7E-08 |

**(a)** U.S.EPA (1993) Benzo(a)pyrene Relative Potency Factor

Note: Quantities (ng) reported below the detection limit are preceded by a less than (<) sign. Emission rates (g/sec) for compounds reported below the detection limit are calculated at the detection limit and are also preceded by a less than (<) sign.

## Table 4-5b
## Semivolatile PAHs Emission Results - Test Condition B - High Temperature

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | Run No. | CB-R1 | Run No. | CB-R2 | Run No. | CB-R3 |
| | | Date | 29-Apr-99 | Date | 29-Apr-99 | Date | 30-Apr-99 |
| | | Start Time | 09:30 | Start Time | 14:04 | Start Time | 08:45 |
| | | Stop Time | 12:39 | Stop Time | 17:12 | Stop Time | 11:55 |
| | | **Units** | | **Units** | | **Units** | |
| Sample Volume | | dscf | 163.854 | dscf | 161.630 | dscf | 161.251 |
| Sample Volume | | $m^3$ | 4.64 | $m^3$ | 4.58 | $m^3$ | 4.57 |
| Moisture Content | | % v/v | 17.0 | % v/v | 17.5 | % v/v | 17.4 |
| $O_2$ Conc. | | % v/v (dry) | 15.2 | % v/v (dry) | 15.14 | % v/v (dry) | 15.13 |
| $CO_2$ Conc. | | % v/v (dry) | 4.45 | % v/v (dry) | 4.48 | % v/v (dry) | 4.59 |
| Isokinetics | | % | 100 | % | 100 | % | 100 |
| Stack Flowrate | | dscfm | 34,464 | dscfm | 33,956 | dscfm | 33,847 |
| **Noncarcinogenic PAHs:** | | ng | g/sec | ng | g/sec | ng | g/sec |
| Naphthalene | | 5,800 | 2.0E-05 | 7,000 | 2.5E-05 | 5,400 | 1.9E-05 |
| 2-Methylnaphthalene | | 120 | 4.2E-07 | 120 | 4.2E-07 | 150 | 5.2E-07 |
| Acenaphthylene | | 210 | 7.4E-07 | 370 | 1.3E-06 | 180 | 6.3E-07 |
| Acenaphthene | | < 26 | < 9.1E-08 | < 26 | < 9.1E-08 | < 26 | < 9.1E-08 |
| Fluorene | | < 180 | < 6.3E-07 | < 180 | < 6.3E-07 | < 180 | < 6.3E-07 |
| Phenanthrene | | < 350 | < 1.2E-06 | < 350 | < 1.2E-06 | < 350 | < 1.2E-06 |
| Anthracene | | < 60 | < 2.1E-07 | < 60 | < 2.1E-07 | < 60 | < 2.1E-07 |
| Fluoranthene | | < 120 | < 4.2E-07 | < 120 | < 4.2E-07 | < 120 | < 4.2E-07 |
| Pyrene | | < 84 | < 2.9E-07 | < 84 | < 2.9E-07 | < 84 | < 2.9E-07 |
| Benzo(e)pyrene | | < 25 | < 8.8E-08 | < 25 | < 8.8E-08 | < 25 | < 8.7E-08 |
| Perylene | | < 5.0 | < 1.8E-08 | < 5.0 | < 1.8E-08 | < 5.0 | < 1.7E-08 |
| Benzo(g,h,i)perylene | | < 5.0 | < 1.8E-08 | 9.5 | 3.3E-08 | 40 | 1.4E-07 |
| **Carcinogenic PAHs:** | BaP eq (a) | ng/ sample | $ng/m^3$ BaP eq | ng/ sample | $ng/m^3$ BaP eq | ng/ sample | $ng/m^3$ BaP eq |
| Benzo(a)anthracene | 0.1 | < 5.0 | < 0.108 | < 5.0 | < 0.109 | < 5.0 | < 0.109 |
| Chrysene | 0.001 | < 35 | < 0.008 | < 35 | < 0.008 | < 35 | < 0.008 |
| Benzo(b)fluoranthene | 0.1 | < 49 | < 1.056 | < 49 | < 1.071 | < 49 | < 1.073 |
| Benzo(k)fluoranthene | 0.01 | < 5.0 | < 0.011 | < 5.0 | < 0.011 | < 5.0 | < 0.011 |
| Benzo(a)pyrene | 1.0 | < 5.0 | < 1.078 | < 5.0 | < 1.092 | 6.4 | 1.402 |
| Indeno(1,2,3-c,d)pyrene | 0.1 | < 5.0 | < 0.108 | < 5.0 | < 0.109 | 7.1 | 0.155 |
| Dibenz(a,h)anthracene | 1.0 | < 5.0 | < 1.078 | < 5.0 | < 1.092 | < 5.0 | < 1.095 |
| **TOTAL BaP eq ($ng/m^3$) =** | | | 3.4 | | 3.5 | | 3.9 |
| **TOTAL BaP eq (g/s) =** | | | 5.6E-08 | | 5.6E-08 | | 6.2E-08 |

(a) U.S.EPA (1993) Benzo(a)pyrene Relative Potency Factor

Note: Quantities (ng) reported below the detection limit are preceded by a less than (<) sign. Emission rates (g/sec) for compounds reported below the detection limit are calculated at the detection limit and are also preceded by a less than (<) sign.

## Table 4-6
## Total Organic Carbon Results

### Condition A - Low Temperature

| | Run No. | 1 | 2 | 3.00 |
|---|---|---|---|---|
| | Date | 28-Apr-99 | 28-Apr-99 | 28-Apr-99 |
| | Start Time | 09:00 | 13:36 | 19:00 |
| | Stop Time | 12:18 | 16:55 | 22:13 |
| | **Units** | | | |
| Sample Volume, M0010 Train | dscf | 148.916 | 149.470 | 151.510 |
| | $m^3$ | 4.22 | 4.23 | 4.29 |
| Sample Volume, M0040 Train | dsL | 33.204 | 36.444 | 35.216 |
| (Bags A and B) | $m^3$ | 0.033 | 0.036 | 0.035 |
| Stack Flowrate | dscfm | 29,792 | 30,064 | 30,148 |
| **Volatile Organic Carbon -- (from M0040 Train)** | | | | |
| Total Volatile Organics (FGC Fraction - Bag Analysis) | $mg/m^3$ | ND | ND | ND |
| Total Volatile Organics | mg | 2.9E-04 | 2.3E-04 | 2.5E-04 |
| (Bag Condensate) | $mg/m^3$ | 0.009 | 0.006 | 0.007 |
| **Semivolatile Organic Carbon -- (from M0010 Train)** | | | | |
| Total Chromatographable Organ | mg | 0.40 | 0.20 | 0.30 |
| (TCO Fraction) | $mg/m^3$ | 0.095 | 0.047 | 0.070 |
| **Nonvolatile Organic Carbon -- (from M0010 Train)** | | | | |
| Total Nonvolatile Organics | mg | 8.0 | 2.9 | 3.5 |
| (GRAV Fraction) | $mg/m^3$ | 1.90 | 0.69 | 0.82 |
| **TOTAL ORGANICS** | $mg/m^3$ | 2.00 | 0.74 | 0.89 |
| | g/sec | 0.028 | 0.010 | 0.013 |

* TCO values have been field blank-corrected.

C:\Project Records\Norlite 9514-046 MRA\[tocca.wk4]TOC

## Table 4-7 Particulate and Acid Gas Emission Rates, g/s (a)

| Compound | Condition A | Condition B | Maximum |
| --- | --- | --- | --- |
| | | | |
| Particulate Matter | 1.13E-01 | 1.80E-01 | **1.80E-01** |
| HCl | 1.16E+00 | 8.71E-01 | **1.16E+00** |
| Cl2 | 6.68E-03 | 4.41E-03 | **6.68E-03** |
| HBr | 2.58E-02 | 2.00E-02 | **2.58E-02** |
| HF | 5.17E-03 | 7.56E-04 | **5.17E-03** |
| NH3 | 1.34E-01 | 5.13E-01 | **5.13E-01** |
| | | | |

(a) Emission rates are for one of two kilns and include not detected values at 1/2 the detection limit.

## Table 4-8a. Chemicals Measured During the Norlite Trial Burn

| Dioxins/Furans |
|---|
| 2,3,7,8-TCDD |
| TOTAL TCDD |
| 1,2,3,7,8-PeCDD |
| TOTAL PeCDD |
| 1,2,3,4,7,8-HxCDD |
| 1,2,3,6,7,8-HxCDD |
| 1,2,3,7,8,9-HxCDD |
| TOTAL HxCDD |
| 1,2,3,4,6,7,8-HpCDD |
| TOTAL HpCDD |
| OCDD |
| 2,3,7,8-TCDF |
| TOTAL TCDF |
| 1,2,3,7,8-PeCDF |
| 2,3,4,7,8-PeCDF |
| TOTAL PeCDF |
| 1,2,3,4,7,8-HxCDF |
| 1,2,3,6,7,8-HxCDF |
| 2,3,4,6,7,8-HxCDF |
| 1,2,3,7,8,9-HxCDF |
| TOTAL HxCDF |
| 1,2,3,4,6,7,8-HpCDF |
| 1,2,3,4,7,8,9-HpCDF |
| TOTAL HpCDF |
| OCDF |

| Semivolatile Organic Compounds |
|---|
| 1,2,4-Trichlorobenzene |
| 1,2-Dichlorobenzene |
| 1,3-Dichlorobenzene |
| 1,4-Dichlorobenzene |
| 2,4,5-Trichlorophenol |
| 2,4,6-Trichlorophenol |
| 2,4-Dichlorophenol |
| 2,4-Dimethylphenol |
| 2,4-Dinitrotoluene |
| 2,6-Dinitrotoluene |
| 2-Chloronaphthalene |
| 2-chlorophenol |
| 2-methylphenol (o-cresol) |
| 2-Nitroaniline |
| 4-methylphenol (m/p-cresol) |
| 4-Nitrophenol |
| Bis(2-ethylhexyl)phthalate |
| Butylbenzylphthalate |
| Diethyl phthalate |
| Dimethyl phthalate |
| Di-n-butyl phthalate |
| Di-n-octyl phthalate |
| Hexachlorobenzene |
| Hexachlorobutadiene |
| Hexachlorocyclopentadiene |
| Hexachloroethane |
| Nitrobenzene |
| Pentachlorophenol |
| Phenol |

| Metals |
|---|
| Arsenic |
| Beryllium |
| Cadmium |
| Chromium total |
| Chromium hexavalent |
| Mercury |
| Antimony |
| Barium |
| Lead |
| Silver |
| Thallium |
| Copper |
| Nickel |
| Selenium |
| Zinc |

| Volatile Organic Compounds |
|---|
| (trans)1,2-Dichloroethene |
| (trans)1,3-Dichloropropene |
| 1,1,1,2-Tetrachloroethane |
| 1,1,1-Trichloroethane |
| 1,1,2,2-Tetrachloroethane |
| 1,1,2-Trichloroethane |
| 1,1-Dichloroethane |
| 1,1-Dichloroethene |
| 1,2-Dichloroethane |
| 1,2-Dichloropropane |
| 1,3-Butadiene |
| 2-butanone |
| 4-methyl 2-pentanone |
| Benzene |
| Bromodichloromethane |
| Bromoform |
| Bromomethane |
| Carbon tetrachloride |
| Chlorobenzene |
| Chloroform |
| Chloromethane |
| cis-1,3-Dichloropropene |
| Dichlorodifluoromethane |
| Ethylbenzene |
| m & p-xylenes |
| Methylene bromide |
| Methylene chloride |
| o-xylene |
| Styrene |
| Tetrachloroethene |
| Toluene |
| Trichloroethene |
| Trichlorofluoromethane |
| Vinyl chloride |

**Table 4-8b. Chemicals Measured During the Norlite Trial Burn (cont.)**

| Polynuclear Aromatic Hydrocarbons |
|---|
| 2-Methylnaphthalene |
| Acenaphthene |
| Acenaphthylene |
| Anthracene |
| Benzo(a)anthracene |
| Benzo(a)pyrene |
| Benzo(b)fluoranthene |
| Benzo(e)pyrene |
| Benzo(g,h,i)perylene |
| Benzo(k)fluoranthene |
| Chrysene |
| Dibenz(a,h)anthracene |
| Fluoranthene |
| Fluorene |
| Indeno(1,2,3-c,d)pyrene |
| Naphthalene |
| Perylene |
| Phenanthrene |
| Pyrene |

| Particulate Matter and Acid Gases |
|---|
| Particulate Matter |
| HCl |
| Cl2 |
| HBr |
| HF |
| NH3 |

Table 4-9
Maximum Measured Emissions for VOCs

| VOCs by VOST: | Highest avg em. Rate, g/sec |
|---|---|
| 1,1-Dichloroethene | 5.36E-05 |
| Methylene chloride | 1.96E-04 |
| 1,1-Dichloroethane | 5.36E-05 |
| (trans)1,2-Dichloroethene | 5.36E-05 |
| 2-butanone | 1.01E-04 |
| Chloroform | 1.60E-04 |
| 1,2-Dichloroethane | 5.36E-05 |
| Trichloroethene | 4.80E-05 |
| 1,1,1-Trichloroethane | 5.36E-05 |
| Benzene | 2.32E-04 |
| Carbon tetrachloride | 4.84E-05 |
| Methylene bromide | 5.36E-05 |
| 1,2-Dichloropropane | 5.36E-05 |
| 4-methyl 2-pentanone | 1.07E-04 |
| cis-1,3-Dichloropropene | 5.25E-05 |
| Bromodichloromethane | 6.01E-05 |
| (trans)1,3-Dichloropropene | 5.36E-05 |
| 1,1,2-Trichloroethane | 5.36E-05 |
| Toluene | 8.53E-05 |
| Tetrachloroethene | 6.13E-05 |
| 1,1,1,2-Tetrachloroethane | 5.36E-05 |
| Chlorobenzene | 1.34E-04 |
| Ethylbenzene | 5.36E-05 |
| m & p-xylenes | 5.21E-05 |
| Styrene | 4.26E-05 |
| 1,1,2,2-Tetrachloroethane | 5.36E-05 |
| o-xylene | 5.36E-05 |
| Bromoform | 6.01E-05 |
| VOCs by M0040: | |
| Dichlorodifluoromethane | 4.09E-02 |
| Chloromethane | 4.10E-02 |
| Vinyl chloride | 4.06E-02 |
| 1,3-Butadiene | 4.02E-02 |
| Bromomethane | 4.04E-02 |
| Trichlorofluoromethane | 4.09E-02 |

Table 4-10
Maximum Measured Emissions for SVOCs
(except Dioxins/Furans)

| SVOC | Max. Avg. (g/s) |
|---|---|
| Phenol | 5.25E-05 |
| 2-Chlorophenol | 3.52E-05 |
| 1,3-Dichlorobenzene | 4.67E-05 |
| 1,4-Dichlorobenzene | 2.87E-05 |
| 1,2-Dichlorobenzene | 5.14E-05 |
| 2-Methylphenol (o-cresol) | 3.97E-05 |
| 4-Methylphenol (m/p-cresol) | 4.79E-05 |
| Hexachloroethane | 7.04E-06 |
| Nitrobenzene | 7.04E-06 |
| 2,4-Dimethylphenol | 3.52E-05 |
| 2,4-Dichlorophenol | 3.52E-05 |
| 1,2,4-Trichlorobenzene | 8.52E-05 |
| Hexachlorobutadiene | 7.04E-06 |
| Hexachlorocyclopentadiene | 1.41E-04 |
| 2,4,6-Trichlorophenol | 1.02E-04 |
| 2,4,5-Trichlorophenol | 3.52E-05 |
| 2-Chloronaphthalene | 7.04E-06 |
| 2-Nitroaniline | 7.04E-05 |
| Dimethyl phthalate | 3.52E-05 |
| 2,6-Dinitrotoluene | 3.52E-05 |
| 4-Nitrophenol | 1.41E-04 |
| 2,4-Dinitrotoluene | 3.52E-05 |
| Diethyl phthalate | 2.76E-05 |
| Hexachlorobenzene | 4.44E-05 |
| Pentachlorophenol | 1.41E-04 |
| Di-n-butyl phthalate | 3.52E-05 |
| Butylbenzylphthalate | 3.52E-05 |
| Bis(2-ethylhexyl)phthalate | 9.39E-05 |
| Di-n-octyl phthalate | 3.52E-05 |
| Naphthalene | 2.12E-05 |
| 2-Methylnaphthalene | 1.03E-06 |
| Acenaphthylene | 8.87E-07 |
| Acenaphthene | 9.16E-08 |
| Fluorene | 6.34E-07 |
| Phenanthrene | 1.23E-06 |
| Anthracene | 2.11E-07 |
| Fluoranthene | 4.23E-07 |
| Pyrene | 2.96E-07 |
| Benzo(e)pyrene | 8.81E-08 |
| Perylene | 2.20E-08 |
| Benzo(g,h,i)perylene | 6.36E-08 |
| | |
| **Carcinogenic PAHs (BaP eq):** | |
| | |
| Benzo(a)anthracene | 2.14E-09 |
| Chrysene | 1.23E-10 |
| Benzo(b)fluoranthene | 1.73E-08 |
| Benzo(k)fluoranthene | 2.32E-10 |
| Benzo(a)pyrene | 2.58E-08 |
| Indeno(1,2,3-c,d)pyrene | 2.46E-09 |
| Dibenz(a,h)anthracene | 1.76E-08 |
| * *TOTAL BaP eq ($ng/m^3$) =* | 4.48E+00 |
| **TOTAL BaP eq (g/s) =** | **6.57E-08** |

## Table 4-11

## Projections of Future Metals Emission Rate for 2 Kilns

| Metal | Emission Limit (lb/hr/kiln) | Shale (22T/hr) | | LLGF+Used Oil/Waste Fuel A | | Resulting Emission Rates (g/sec) |
|---|---|---|---|---|---|---|
| | | Metal Conc. (mg/kg) | Metal Feed Rate (lb/hr) | Metal Feed Rate (lb/hr) | Metal Conc./ kiln (mg/kg) | |
| Antimony | 4.81E-05 | 2.96 | 0.13 | 0.24 | 49 | 1.21E-05 |
| Arsenic | 2.45E-04 | 53 | 2.35 | 0.104 | 21 | 6.19E-05 |
| Barium | 8.52E-05 | 260 | 11.45 | 0.72 | 147 | 2.15E-05 |
| Beryllium | 1.38E-05 | 3 | 0.132 | 0.0058 | 1.18 | 3.48E-06 |
| Cadmium | 5.32E-05 | 7.73 | 0.34 | 0.144 | 29.4 | 1.34E-05 |
| Chromium (T) | 7.78E-05 | 127.7 | 5.62 | 2.16 | 441 | 1.96E-05 |
| Chromium (VI) | 2.02E-05 | - | - | - | - | 5.10E-06 |
| Copper | 3.94E-04 | 190.5 | 8.38 | 4.74 | 968 | 9.93E-05 |
| Lead | 6.53E-05 | 87.3 | 3.84 | 2.69 | 549 | 1.65E-05 |
| Mercury | 1.69E-03 | 0.1 | 0.0044 | 0.0037 | 0.75 | 4.26E-04 |
| Nickel | 9.88E-04 | 95 | 4.18 | 2.88 | 588 | 2.49E-04 |
| Selenium | 1.38E-05 | 1.2 | 0.0528 | 0.12 | 24 | 3.49E-06 |
| Silver | 1.82E-04 | 39.1 | 1.72 | 0.096 | 19.6 | 4.58E-05 |
| Thallium | 7.98E-05 | 7.5 | 0.33 | 0.24 | 49 | 2.01E-05 |
| Zinc | 2.39E-03 | 498.6 | 21.77 | 4.8 | 1000 | 6.02E-04 |
| | | | | | | |

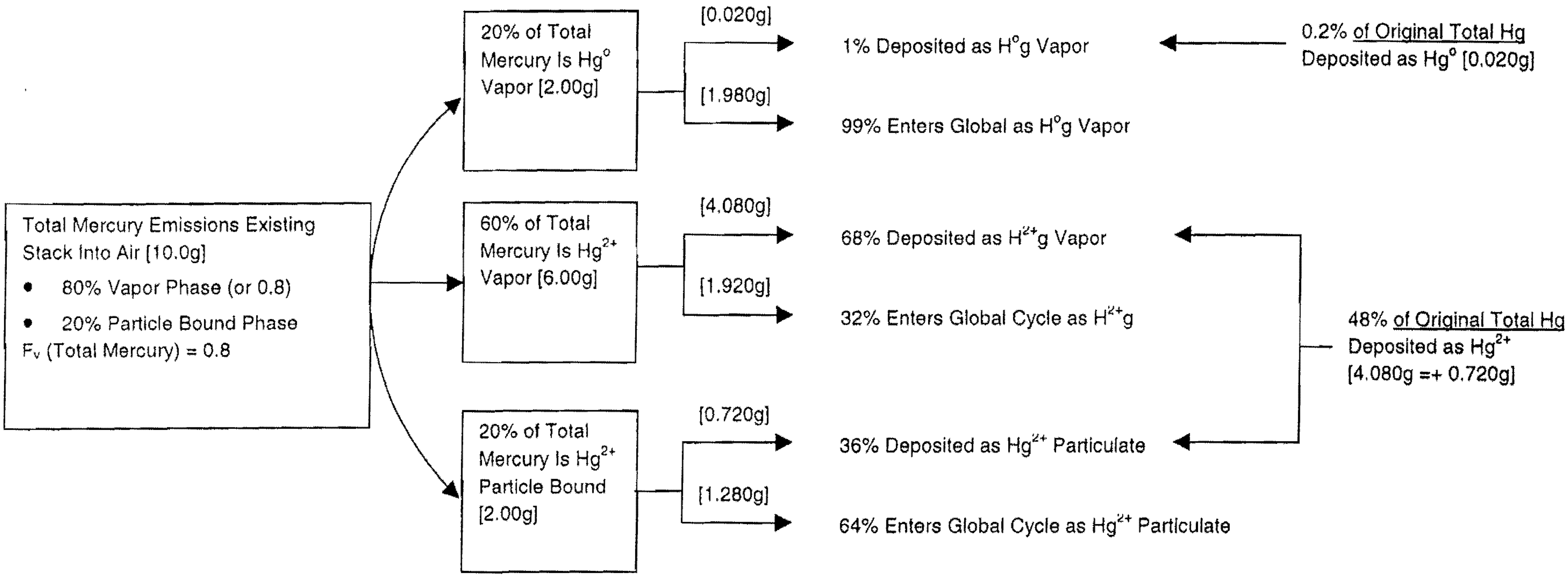
Table 4-12
Emission Rates for Selected Compounds of Concern
Norlite Corporation Light Aggregate Facility: 2-Kiln Operation
Cohoes, NY

| Compounds of Concern | Emission Rate (g/s) |
|---|---|
| Arsenic | 6.19E-05 |
| Antimony | 1.21E-05 |
| Barium | 2.15E-05 |
| Beryllium | 3.48E-06 |
| Cadmium | 1.34E-05 |
| Total Chromium | 1.96E-05 |
| Chromium VI | 5.10E-06 |
| Lead | 1.65E-05 |
| Total Mercury | 4.26E-04 |
| Nickel | 2.49E-04 |
| Selenium | 3.49E-06 |
| Silver | 4.58E-05 |
| Thallium | 2.01E-05 |
| Zinc | 6.02E-04 |
| 2,3,7,8-TCDD Toxicity Equivalents | 4.14E-09 |
| Benzo(a)anthracene | 3.10E-08 |
| Benzo(a)pyrene | 5.16E-08 |
| Benzo(b)fluoranthene | 3.46E-07 |
| Benzo(k)fluoranthene | 4.64E-08 |
| Chrysene | 2.46E-07 |
| Dibenz(a,h)anthracene | 3.52E-08 |
| Indeno(1,2,3-c,d)pyrene | 4.92E-08 |
| Bis(2-ethylhexyl)phthalate | 1.88E-04 |
| Hexachlorobenzene | 8.87E-05 |
| Benzene | 4.64E-04 |
| Bromomethane | 3.20E-04 * |
| Carbon tetrachloride | 9.69E-05 |
| Dichlorodifluoromethane | 3.20E-04 * |
| Trans-1,3-Dichloropropene | 1.07E-04 |
| Trichlorofluoromethane | 3.20E-04 * |
| Vinyl Chloride | 3.20E-04 * |
| Hexachlorocyclopentadiene | 2.82E-04 |
| 2-Nitroaniline | 1.41E-04 |
| 2,4-Dinitrotoluene | 7.04E-05 |
| 2,6-Dinitrotoluene | 7.04E-05 |
| Chloromethane | 3.20E-04 * |
| Pentachlorophenol | 2.82E-04 |
| 1,1-Dichloroethylene | 1.07E-04 |
| 1,1,2,2-Tetrachloroethane | 1.07E-04 |
| Chloroform | 3.20E-04 |
| 1,3-Butadiene | 3.20E-04 * |
| Hexachlorobutadiene | 1.41E-05 |

* Not detected, but surrogate maximum emission rate set equal to chloroform; see text for details.

Fig 1

## EPA Model Default Phase Allocation and Speciation of Mercury in Air




LEGEND
$Hg^{o}$ – Elemental Mercury
$Hg^{2+}$ - Divalent Mercury
[ ] – Example Mass Allocation

THUS:
<u>Without Consideration of Global Cycle</u>

- 80% of Total Mercury Emitted is Deposited as $H^{2+}g$ [(6g+2g)/10g]
- 20% of Total Mercury Emitted is Deposited as $H^{o}g$ [2g/10g]

Calculated Fv

- Fv ($Hg^{2+}$) = [6g/(6g+2g)] = 0.75
- Fv ($Hg^{o}$) = [2g/2g] = 1.0

BUT: <u>With Consideration of Global Cycle</u>

- <u>48% of Total Mercury Emitted is Deposited as $H^{2+}g$ [(4.08g + 0.72g)/10g]</u>
- <u>0.2% of Total Mercury Emitted is Deposited as $H^{o}g$ [0.02g/10g]</u>

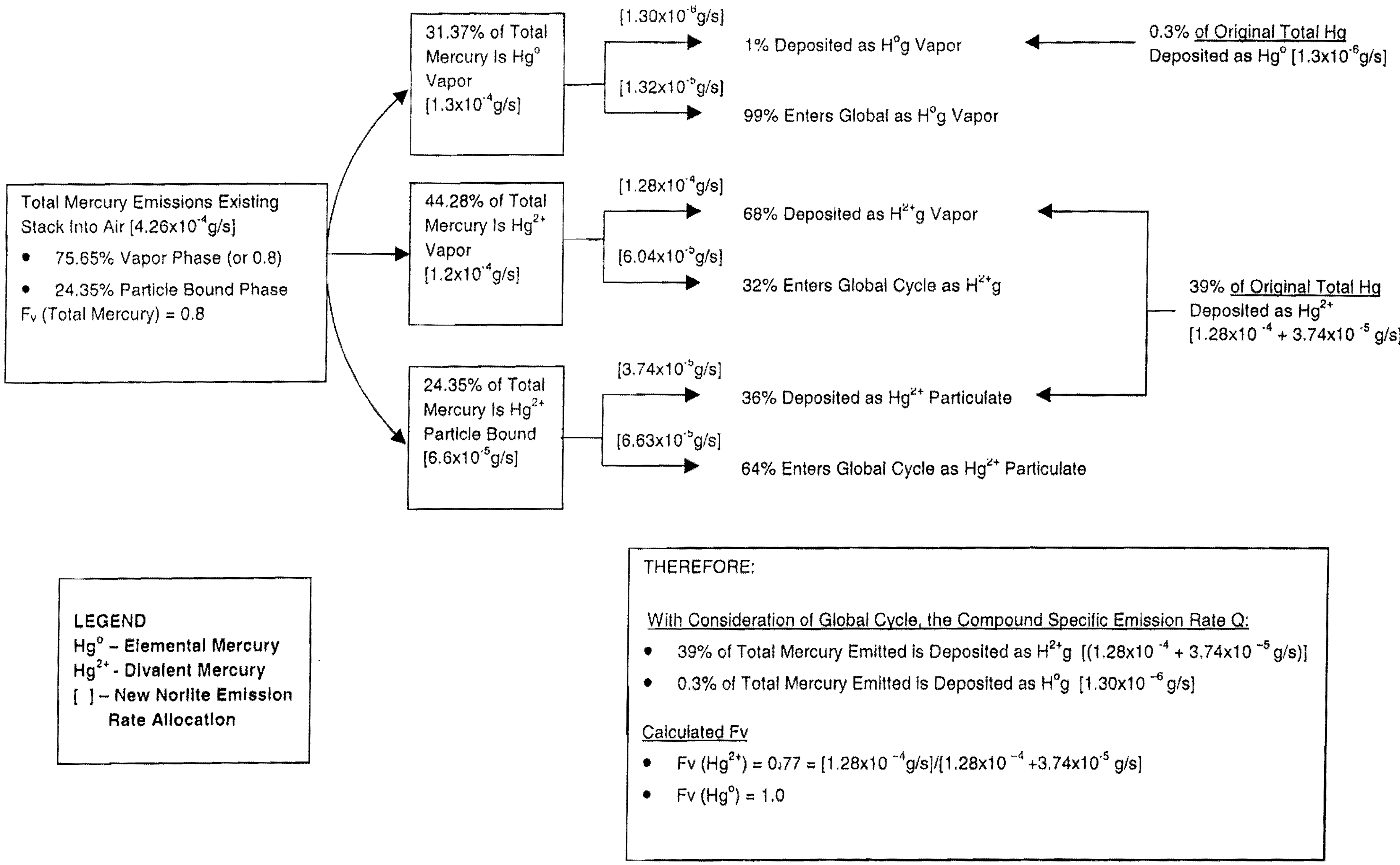
<u>Calculated Fv</u>

- <u>Fv ($Hg^{2+}$) = [4.08g/(4.08g + 0.72g)] = 0.85</u>
- <u>Fv ($Hg^{o}$) = [0.02g/(0.02g + 0g)] = 1.0</u>

<u>Compound Specific Emission Rate Q</u>

- <u>Actual Q ($Hg^{2+}$) = 48% * Q (Total Mercury)</u>
- <u>Actual Q ($H^{o}g$) = 0.2% * Q (Total Mercury)</u>

**Figure 4-2**
**Measured Norlite Phase Allocation and Speciation of Mercury in Air**



# 5.0 DOSE-RESPONSE ASSESSMENT

The dose-response assessment evaluates the relationship between magnitude of exposure and possible occurrence of specific health effects for each key chemical. Both carcinogenic and noncarcinogenic effects have been evaluated. As mentioned in Section 1.0, NYSDOH or U.S. EPA-verified dose-response criteria, including Cancer Slope Factors, Reference Doses, and Reference Concentrations, have been used whenever available. Preference has been given to the latest information published by the U.S. EPA in the IRIS database (U.S. EPA, 2002). Table 5-1 presents a summary of carcinogenic and noncarcinogenic dose-response relationships employed in this assessment.

As part of the updating process, all dose response information has been reviewed for consistency with U.S. EPA guidance and information available in current toxicity information databases. For the inhalation route, however, oral route to route extrapolation has been used when it was consistent with NYSDOH or U.S. EPA's recent guidance. Generally, the IRIS database is given initial preference, but as has been the practice at EPA regions needing practical toxicity information for making risk ranking or screening decisions, the data available from the HEAST databases are also utilized. This is particularly true when insufficient information is available in IRIS for a particular compound and ignoring the compound's contribution to the Hazard Index or the total risk would appear to be significant and unconservative.

Several chemical species have unique characteristics that require a more complex approach to the application of their dose-response information. Specific approaches for assessing several of these particular chemicals (e.g., lead, dioxins, furans, and PAH) are described below.

## 5.1 Lead

U.S. EPA has not derived any Reference Doses for lead because of the possibility that some adverse effects from lead may occur at extremely low doses. To evaluate exposure to lead, the U.S. EPA guidance recommends a direct comparison with media-specific (soil and air only) health-based levels. Specifically, the recommended comparison value for air is 0.2 ug/, which the Agency considers as representing approximately 25% of the 1.5 ug/m$^3$ annual air quality standard when it is converted to an annual equivalent of 0.9 ug/m$^3$ m$^3$ (U.S. EPA 1998a. pg ADD4). The U.S. EPA (U.S. EPA, 1995b, 1998b) recommends a value for comparison of lead in soils of 100 mg/kg. This contrasts with the values of 400 mg/kg currently recommended as a level below which no remedial action is required (U.S. EPA, 1994e). However, the lower value is often used for a comparison criterion as a conservative measure.

When these values are exceeded, the analysis methods described in the Guidance Manual for Integrated Exposure Uptake Model for Lead in Children (IEUBK) are recommended by both the NYSDOH and the U.S. EPA. The IEUBK model estimates blood lead levels in children resulting from various sources such as air, house dust, and soil. These predicted blood lead levels are compared with levels that are related to lack of adverse effects in children. Usually, 10 ug/dL blood lead is the principal comparison point of interest. If blood concentrations are predicted to be lower than this value, then no significant effects are expected.

When, as in the present case, the added lead concentrations due to the source under study are extremely low, the NYSDOH recommends that simplified calculations utilize slope factors that have been derived from IEUBK modeling analyses by the agency. These slope factors have been used for the current risk analysis so that potential blood levels could be made, regardless of operational limitations in the IEUBK model.

## 5.2 Nickel

The previous risk assessment used New York State Department of Environmental Health (NYSDOH) toxicity information. For this risk assessment, the most recent U.S. EPA dose-response information available has been used. For noncarcinogenic effects, the oral reference dose (RfD) for nickel is 2.0E-02 mg/kg-day (U.S. EPA, 1999a). No inhalation reference dose is available from U.S. EPA databases.

The U.S. EPA has not evaluated nickel soluble salts, as a class of compounds, for evidence of human carcinogenic potential. However, assessments of nickel refinery dust and nickel subsulfide indicate that inhalation of particulate forms of nickel can lead to cancer. Therefore, the U.S. EPA has classified nickel as a known human carcinogen by the inhalation route.

Ideally, the cancer slope factor would have been derived for the form of nickel with which potential human exposure is most anticipated to occur, such as for soluble nickel salts. Since such a factor is not available, the cancer slope factor for nickel refinery dust is assumed to be the most representative of potential environmental exposure because it consists of several nickel moieties (U.S. EPA, 1995a). The inhalation cancer slope factor for nickel, derived from an inhalation unit risk of 2.4E-04 ug/m3, is 8.4E-01 (mg/kg/day)-1 (U.S. EPA, 1999a).

## 5.3 Dioxins and Furans

The congener distribution pattern for polychlorinated dibenzodioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) used in the current risk assessment is derived from the checked and verified data obtained from the April 1999 trial burn tests. Many previous risk assessments have modeled the fate and transport of all designated dioxins and furan COPCs by using 2, 3, 7,8 TCDD as a surrogate, and then relating the total impact to that surogate by computing an equivalent mass of all these related species and weighting each congener by a toxicity equivalency factor (TEF) , as recommended by U.S. EPA (1986a and subsequent 1994a). However newer data on toxicity equivalency factors has been developed and reviewed by the World Health Organization (WHO) for the congeners of PCDDs and PCDFs based on their structural similarity and toxicity. For the present MRA, therefore, the TEF values assigned to each congener relative to its toxicity in relation to 2,3,7,8-TCDD follow the newer WHO convention (U.S. EPA, 1999c; Van den Berg et al., 1998). The sum of the congeners will thus be expressed as 2,3,7,8-TCDD (tetrachloro-dibenzo-p-dioxin) toxic equivalents (TCDD-TEQ).

In order to avoid making assumptions about whether use of the TEQ (TEF weighted) method over or underestimates the potential impact of these COPCs, the U.S. EPA, 1998 guidance recommends modeling the fate and transport rates for each of the individual congeners before summing the mass in media or calculating ingestion exposures that are weighted by the WHO TEF values. That recomendation was followed in both all of the MRA analyses for the Norlite facility from 1999 until, and including, the present. For fate and transport analyses and bioaccumulation in the beef and milk pathways, the variation in parameters for individual congeners have been considered in deriving estimates of mean concentrations and risks and in the characterization of risk uncertainty.

To predict the **noncarcinogenic hazard** level associated with dioxins and furans, the total mass represented by the TCDD TEQ-weighted. effective emission rates are used, because the data available on noncarcinogenic effects are limited to that level of detail. It is also important to note that the non-carcinogenic effect dose response factor included in Table 5.1 for dioxins and furans (TCDD TEQ) is derived from a lowest-observed effect level (LOEL) in rhesus monkeys for reproductive and developmental effects, based on information provided by NYSDOH (1998). It does not include additional uncertainty factors that are typical of the other RfD values in Table 5.1.

## 5.4 PAH

Consistent with the latest guidance (U.S. EPA, ), the U.S. EPA-developed comparative potency factors are used to develop benzo(a)pyrene [B(a)P] toxic equivalents (U.S. EPA, 1993b). Among the carcinogenic PAHs, only B(a)P has a U.S. EPA-derived Cancer Slope Factor. The other carcinogenic PAHs are ranked in order of their potency in relation to B(a)P. In addition, each PAH has been evaluated using its U.S. EPA RfD. When no RfDs are available for a particular compound, the RfD for a structurally similar PAH is used as a surrogate (as was done in the original 1991 assessment for Norlite).

## 5.5 Mercury

Mercury may be present in the environment in several different forms that have different toxicities (see Table 5-1) and differing environmental transport characteristics. In the principal analysis of this risk assessment, it was assumed that mercury is primarily present in the inorganic form for all pathways other than the fish pathway. However, according to the new mercury fate and transport model utilized here, all pathways except inhalation do include some organic mercury as well. The organic form (methylmercury) is the principal form of interest in the fish consumption pathway, but there are traces which also are predicted to reach every type of receptor. The model utilized is the latest version recommended by the U.S. EPA (1999a) and is based upon the research carried out to support that agency's Mercury Study Report to Congress (U.S. EPA, 1997a). As can be seen from Table 5-1, the RfD for inorganic mercury is $3x10^{-4}$ mg/kg-day, while methylmercury has an RfD of $1x10^{-4}$ mg/kg-day, a factor of three more stringent.

## 5.6 Health Benchmarks for Short-term Exposure

As currently required by both NYSDOH and U.S. EPA it is also necessary to evaluate risks due to short-term exposure (such as respiratory or irritant health effects) in addition to the more commonly evaluated chronic risks discussed above. Therefore, a screening level evaluation of short-term health effects was conducted by comparing predicted short-term air concentrations against applicable guidelines. Although these guidelines must sometimes be based upon exposure data analyses that are not as consistently defined as those established for the chronic risk factors and the RfDs given in Table 5-1, they are, nevertheless, intended to represent health benchmark levels that are appropriate for making risk management decisions to prevent adverse effects from short-term acute exposures to facility COPCs.

Short-term ambient air concentration guidelines include, in the order of recommendation made by U.S. EPA 1998a:: Acute Exposure Guideline Limits (AEGLs), ) Emergency Response Planning Guidelines (ERPGs) (AIHA, 1997), Acute Toxicity Exposure Levels (ATELs), Temporary Emergency Exposure Limits (TEELs) developed by the National Laboratories of the U.S. Department of Energy; and the Short-term Guideline Concentrations (SGCs) contained in New York State Air Guide-1 (NY DAR-1, 1999). These guidelines are generally peer reviewed values and are most appropriate for exposure periods of 1 hour or less. In addition, per NYSDEC Air Guide-1, a 24-hour average PM-10 calculation is also required. The values for the chemical-specific benchmark concentrations, and their reference sources are included with the tabulation of modeling results given in Section 7 (Tables 7-9 and 7-10).

**TABLE 5-1**
**DOSE-RESPONSE VALUES FOR RISK RANKING AND ANALYSIS**
**NORLITE, COHOS, NY**

| CAS Number | Compound | Oral Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$ | Oral Cancer Slope Factor Reference | Inhalation Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$ | Inhalation Cancer Slope Factor Reference | Oral Reference Dose (mg/kg-day) | Oral Reference Dose Reference | Inhalation Dose (mg/kg-day) | Inhalation Dose Reference |
|---|---|---|---|---|---|---|---|---|---|
| 630-20-6 | 1,1,1,2-TETRACHLOROETHANE | 2.6E-2 | IRIS, 2002 | 2.62E-2 | IRIS, 2002 | 3E-2 | IRIS, 2002 | 3E-2 | O |
| 71-55-6 | 1,1,1-TRICHLOROETHANE | | | | | 2.00E-01 | NCEA | 2.86E-01 | NCEA |
| 79-34-5 | 1,1,2,2-TETRACHLOROETHANE | 0.2 | IRIS, 2002 | 0.2 | IRIS, 2002 | 6.0E-02 | IRIS, 2002 | 6.0E-02 | IRIS, 2002 |
| 79-00-5 | 1,1,2-TRICHLOROETHANE | 0.057 | IRIS, 2002 | 0.056 | IRIS, 2002 | 0.004 | IRIS, 2002 | 0.004 | O |
| 75-34-3 | 1,1-DICHLOROETHANE | | | | | 0.1 | HEAST, 1997 | 1.4E-01 | HEAST, 1997 |
| 75-35-4 | 1,1-DICHLOROETHYLENE | 0.6 | IRIS, 2002 | 0.2 | IRIS, 2002 | 0.009 | IRIS, 2002 | 0.009 | O |
| 120-82-1 | 1,2,4-TRICHLOROBENZENE | | | | | 0.01 | IRIS, 2002 | 0.0571 | HEAST, 1997 |
| 95-50-1 | 1,2-DICHLOROBENZENE | | | | | 0.09 | IRIS, 2002 | 0.0571 | HEAST, 1997 |
| 107-06-2 | 1,2-DICHLOROETHANE | 0.091 | IRIS, 2002 | 0.091 | HEAST, 1997 | 0.03 | NCEA | 0.00286 | NCEA |
| 78-87-5 | 1,2-DICHLOROPROPANE | 0.068 | HEAST, 1997 | 0.068 | O | 0.09 | ATSDR(1) | 0.00114 | IRIS, 2002 |
| 541-73-1 | 1,3-DICHLOROBENZENE (a) | | | | | 3.0E-02 | NYSDOH | 3.0E-02 | O |
| 106-46-7 | 1,4-DICHLOROBENZENE | 0.024 | HEAST, 1997 | 2.2E-02 | NCEA,2001 | 3.0E-02 | NCEA,2001 | 2.3E-01 | IRIS,2002 |
| 106-99-0 | 1,3-BUTADIENE | | | 9.8E-01 | IRIS, 2000 | | | | |
| 95-95-4 | 2,4,5-TRICHLOROPHENOL | | | | | 0.1 | IRIS, 2002 | 0.1 | O |
| 88-06-2 | 2,4,6-TRICHLOROPHENOL (b) | 0.011 | IRIS, 2002 | 0.0109 | IRIS, 2002 | 0.1 | IRIS, 2002 | 0.1 | O |
| 120-83-2 | 2,4-DICHLOROPHENOL | | | | | 0.003 | IRIS, 2002 | 0.003 | O |
| 105-67-9 | 2,4-DIMETHYLPHENOL | | | | | 0.02 | IRIS, 2002 | 0.02 | O |
| 121-14-2 | 2,4-DINITROTOLUENE | 0.68 | IRIS, 2002 | 0.68 | O | 0.002 | IRIS, 2002 | 0.002 | O |
| 606-20-2 | 2,6-DINITROTOLUENE | 0.5 | NYSDOH, 1984 | 0.5 | O | 0.001 | HEAST, 1997 | 0.001 | O |
| 78-93-3 | 2-BUTANONE | | | | | 0.6 | IRIS, 2002 | 0.286 | IRIS, 2002 |
| 91-58-7 | 2-CHLORONAPHTHALENE | | | | | 0.08 | IRIS, 2002 | 0.08 | O |
| 95-57-8 | 2-CHLOROPHENOL | | | | | 5.0E-03 | IRIS, 2002 | 5.0E-03 | O |
| 91-57-6 | 2-METHYLNAPHTHALENE (c) | | | | | 2.0E-02 | IRIS,2002 | 8.6E-04 | O |
| 108-10-1 | 4-METHYL-2-PENTANONE | | | | | 8.0E-02 | NCEA,2001 | 2.3E-02 | NCEA,2001 |
| 95-48-7 | 2-METHYLPHENOL | | | | | 5.0E-02 | IRIS, 2002 | 5.0E-02 | O |
| 106-44-5 | 4-METHYLPHENOL | | | | | 5.0E-03 | HEAST,1997 | 5.0E-03 | O |
| 88-74-4 | 2-NITROANILINE | | | | | 0.00006 | HEAST, 1991 (W) | 0.0000571 | HEAST, 1997 |
| 100-02-7 | 4-NITROPHENOL | | | | | 8.0E-03 | NCEA | 8.0E-03 | O |
| 83-32-9 | ACENAPHTHENE | | | | | 0.06 | IRIS, 2002 | 0.06 | O |
| 208-96-8 | ACENAPHTHYLENE | | | | | 0.06 | IRIS, 2002 | 0.06 | O |
| 120-12-7 | ANTHRACENE | | | | | 0.3 | IRIS, 2002 | 0.3 | O |
| 71-43-2 | BENZENE | 5.5E-02 | IRIS, 2002 | 2.7E-02 | IRIS,2002 | 3.0E-03 | NCEA,2001 | 0.00171 | NCEA,2001 |
| 56-55-3 | BENZO(A)ANTHRACENE | 0.73 | U.S. EPA, 1993 | 2.1E+00 | NYSDOH | 0.03 | NYSDOH | 0.03 | O |
| 50-32-8 | BENZO(A)PYRENE | 7.3 | IRIS, 2002 | 2.1 | NYSDOH | 0.03 | NYSDOH | 0.03 | O |
| 205-99-2 | BENZO(B)FLUORANTHENE | 0.73 | U.S. EPA, 1993 | 2.1 | NYSDOH | 0.03 | NYSDOH | 0.03 | O |
| 192-97-2 | BENZO(E)PYRENE (e) | | | | | 0.03 | IRIS, 2002 | 0.03 | O |
| 191-24-2 | BENZO(G,H,I)PERYLENE | | | | | 0.03 | IRIS, 2002 | 0.03 | O |
| 207-08-9 | BENZO(K)FLUORANTHENE | 0.073 | U.S. EPA, 1993 | 2.1 | NYSDOH | 0.03 | NYSDOH | 0.03 | O |
| 117-81-7 | BIS(2-ETHYLHEXYL)PHTHALATE | 0.014 | IRIS, 2002 | 0.014 | O | 0.02 | IRIS, 2002 | 0.02 | O |
| 75-27-4 | BROMODICHLOROMETHANE | 0.062 | IRIS, 2002 | 0.062 | O | 0.02 | HEAST, 1997 | 0.02 | O |
| 75-25-2 | BROMOFORM | 0.0079 | IRIS, 2002 | 0.0039 | IRIS, 2002 | 0.02 | IRIS, 2002 | 0.02 | O |
| 74-83-9 | BROMOMETHANE | | | | | 0.0014 | IRIS, 2002 | 0.00143 | IRIS, 2002 |
| 85-68-7 | BUTYLBENZYLPHTHALATE | | | | | 0.2 | IRIS, 2002 | 0.2 | O |
| 56-23-5 | CARBON TETRACHLORIDE | 0.13 | IRIS, 2002 | 0.053 | IRIS, 2002 | 7.0E-04 | IRIS, 2002 | 7.0E-04 | NCEA,2001 |
| 108-90-7 | CHLOROBENZENE | | | | | 0.02 | IRIS, 2002 | 0.0057 | HEAST, 1997 |
| 67-66-3 | CHLOROFORM | 0.0061 | IRIS, 2002 | 0.081 | IRIS, 2002 | 0.01 | IRIS, 2002 | 8.6E-05 | NCEA,2001 |
| 74-87-3 | CHLOROMETHANE | 0.013 | HEAST, 1997 | 0.0063 | HEAST, 1997 | 0.2 | ATSDR(3) | 8.6E-02 | NCEA,2001 |
| 218-01-9 | CHRYSENE | 0.0073 | U.S. EPA, 1993 | 3.1E-03 | NCEA | 0.03 | NYSDOH | 0.03 | O |
| 10061-01-5 | CIS-1,3-DICHLOROPROPENE (d) | 1.0E-01 | IRIS,2002 | 1.0E-02 | O | 3.0E-02 | IRIS, 2002 | 5.71E-03 | IRIS, 2002 |
| 84-74-2 | DI-N-BUTYLPHTHALATE | | | | | 0.1 | IRIS, 2002 | 0.1 | O |
| 117-84-0 | DI-N-OCTYLPHTHALATE | | | | | 0.02 | HEAST, 1997 | 0.02 | O |
| 53-70-3 | DIBENZ(A,H)ANTHRACENE | 7.3 | U.S. EPA, 1993 | 2.1 | NYSDOH | 0.03 | NYSDOH | 0.03 | O |
| 74-95-3 | DIBROMOMETHANE | | | | | 0.01 | HEAST, 1997 | 0.01 | O |
| 75-71-8 | DICHLORODIFLUOROMETHANE | | | | | 2E-1 | IRIS 2002 | 5E-2 | HEAST, 1997 |
| 84-66-2 | DIETHYLPHTHALATE | | | | | 0.8 | IRIS, 2002 | 0.8 | O |
| 131-11-3 | DIMETHYLPHTHALATE | | | | | 10 | HEAST, 1997 | 10 | O |
| 100-41-4 | ETHYLBENZENE | | | | | 0.1 | IRIS, 2002 | 0.286 | IRIS, 2002 |
| 206-44-0 | FLUORANTHENE | | | | | 0.04 | IRIS, 2002 | 0.04 | O |
| 86-73-7 | FLUORENE | | | | | 0.04 | IRIS, 2002 | 0.04 | O |

**TABLE 5-1**
**DOSE-RESPONSE VALUES FOR RISK RANKING AND ANALYSIS**
**NORLITE, COHOS, NY**

| CAS | | Oral Cancer Slope Factor | | Inhalation Cancer Slope Factor | | Oral Reference Dose | | Inhalation Dose | |
|---|---|---|---|---|---|---|---|---|---|
| Number | Compound | $(mg/kg\text{-}day)^{-1}$ | Reference | $(mg/kg\text{-}day)^{-1}$ | Reference | (mg/kg-day) | Reference | (mg/kg-day) | Reference |
| 118-74-1 | HEXACHLOROBENZENE | 1 61 | IRIS, 2002 | 1.61 | IRIS, 2002 | 0.0008 | IRIS, 2002 | 0.0008 | O |
| 87-68-3 | HEXACHLOROBUTADIENE | 0 078 | IRIS, 2002 | 0 078 | HEAST, 1997 | 3.0E-04 | NCEA,2001 | 3 0E-04 | NCEA,2001 |
| 77-47-4 | HEXACHLOROCYCLOPENTADIENE | | | | | 0.007 | IRIS, 2002 | 0.00002 | HEAST, 1997 |
| 67-72-1 | HEXACHLOROETHANE | 0 014 | IRIS, 2002 | 0 014 | HEAST, 1997 | 0.001 | IRIS, 2002 | 0.001 | O |
| 193-39-5 | INDENO(1,2,3-CD)PYRENE | 0.73 | U.S EPA, 1993 | 2.1 | NYSDOH | 0 03 | NYSDOH | 0.03 | O |
| 1330-20-7 | M/P-XYLENE | | | | | 2 | IRIS, 2002 | 0.2 | HEAST, 1991(W) |
| 75-09-2 | METHYLENE CHLORIDE | 0 0075 | IRIS, 2002 | 0.0016 | IRIS, 2002 | 0.06 | IRIS, 2002 | 0.0171 | NYSDOH |
| 91-20-3 | NAPHTHALENE | | | | | 0.02 | IRIS, 2002 | 0.000857 | IRIS, 2002 |
| 98-95-3 | NITROBENZENE | | | | | 0.0005 | IRIS, 2002 | 0.000571 | HEAST, 1997 |
| 95-47-6 | O-XYLENE | | | | | 2.0E+00 | HEAST, 1997 | 2.0E+00 | O |
| 87-86-5 | PENTACHLOROPHENOL | 0.12 | IRIS, 2002 | 0.12 | O | 0.03 | IRIS, 2002 | 0 03 | O |
| 198-55-0 | PERYLENE (e) | | | | | 0.03 | IRIS, 2002 | 0.03 | O |
| 85-01-8 | PHENANTHRENE | | | | | 0.03 | ATSDR | 0.03 | ATSDR |
| 108-95-2 | PHENOL | | | | | 0.6 | IRIS, 2002 | 0.6 | O |
| 129-00-0 | PYRENE | | | | | 0.03 | IRIS, 2002 | 0.03 | O |
| 100-42-5 | STYRENE | 0.03 | HEAST, 1991 (W) | 0 002 | HEAST, 1991 (W) | 0.2 | IRIS, 2002 | 0.286 | IRIS, 2002 |
| 127-18-4 | TETRACHLOROETHYLENE | 0 052 | NCEA | 0.00203 | NCEA | 0.01 | IRIS, 2002 | 0.029 | NYSDOH, 1997 |
| 108-88-3 | TOLUENE | | | | | 0.2 | IRIS, 2002 | 0.114 | IRIS, 2002 |
| 156-60-5 | TRANS-1,2-DICHLOROETHENE | | | | | 0.02 | IRIS, 2002 | 0.02 | O |
| 10061-02-6 | TRANS-1,3-DICHLOROPROPENE (d) | 0 18 | HEAST, 1997 | 0.13 | HEAST, 1997 | 0.0003 | IRIS, 2002 | 0.00571 | IRIS, 2002 |
| 79-01-6 | TRICHLOROETHYLENE | 0.011 | NCEA | 0.006 | NCEA | 0.006 | NCEA | 0.006 | O |
| 75-69-4 | TRICHLOROFLUOROMETHANE | | | | | 0.3 | IRIS, 2002 | 0.2 | HEAST, 1997 |
| 75-01-4 | VINYL CHLORIDE | 1 5E+00 | IRIS,2002 | 3.0E-02 | IRIS,2002 | 3.0E-03 | IRIS,2002 | 2.8E-02 | IRIS,2002 |
| 1746-01-6 | 2,3,7,8-TCDD - TE | 150000 | HEAST, 1997 | 150000 | HEAST, 1997 | 0.00000013 | NYSDOH, 199 | 0.00000013 | NYSDOH, 1998 |
| 7440-36-0 | ANTIMONY | | | | | 0.0004 | IRIS, 2002 | 0.0004 | O |
| 7440-38-2 | ARSENIC | 1.5 | IRIS, 2002 | 1.5E+01 | IRIS, 2002 | 0.0003 | IRIS, 2002 | 0.0003 | O |
| 7440-39-3 | BARIUM | | | | | 0.07 | IRIS, 2002 | 0.000143 | HEAST, 1994 |
| 7440-41-7 | BERYLLIUM | | | 8.4 | IRIS, 2002 | 0.002 | IRIS, 2002 | 5.7E-06 | IRIS, 2002 |
| 7440-43-9 | CADMIUM (f) | | | 6.3E+00 | IRIS,2002 | 0.0005 | IRIS, 2002 | 5.7E-05 | NCEA,2001 |
| 7440-47-3 | CHROMIUM (TOTAL, as III) | | | | | 1.5 | IRIS, 2002 | 1.5E+00 | O |
| 18540-29-9 | CHROMIUM (VI) | | | 294 | IRIS, 2002 | 0.003 | IRIS, 2002 | 3.0E-05 | IRIS,2002 |
| 7439-97-6 | MERCURY | | | | | 3.0E-04 | IRIS, 2002 | 0.0000857 | HEAST,1997 |
| 2296-79-26 | METHYL MERCURY | | | | | 1.0E-04 | IRIS,2002 | 1.0E-04 | O |
| 7440-02-0 | NICKEL | | | 0.84 | IRIS, 2002 | 0.02 | IRIS, 2002 | 2.0E-02 | O |
| 7782-49-2 | SELENIUM | | | | | 0.005 | IRIS, 2002 | 0.005 | O |
| 7440-22-4 | SILVER | | | | | 0.005 | IRIS, 2002 | 0.005 | O |
| 7440-28-0 | THALLIUM | | | | | 6.6E-05 | IRIS, 2002 | 6.6E-05 | O |
| 7440-50-8 | COPPER | | | | | 3.7E-02 | HEAST 1997 | 3.7E-02 | O |
| 7440-66-6 | ZINC | | | | | 3.0E-01 | IRIS,2002 | 3.0E-01 | O |

Notes
ATSDR(1) - Chronic oral minimal risk level from "Agency for Toxic Substances and Disease Registry 1989 Toxicological Profile for 1,2-Dichloropropane U.S Dept of Health and Human Services, Atlanta, GA
ATSDR(2) - Chronic oral minimal risk level from "Agency for Toxic Substances and Disease Registry 1987 Toxicological Profile for Benzene. U.S. Dept. of Health and Human Services, Atlanta, GA
ATSDR(3) - Chronic oral minimal risk level from "Agency for Toxic Substances and Disease Registry 1990. Toxicological Profile for Chloromethane. U.S. Dept. of Health and Human Services, Atlanta, GA.
HEAST - Health Effects Assessment Summary Tables (US EPA 1995, US EPA 1997)
IRIS - Integrated Risk Information System, an on-line computer database of toxicological information (US EPA, 1998, 1999).
NA - not available
NCEA - National Center for Environmental Assessment, US EPA
NYSDOH - New York State Department of Health
NYSDOH, 1984 - New York State Department of Health Recommended Ambient Surface Water Quality Criteria Fact Sheets, Albany, New York: Bureau of Toxic Substance Assessment
O - Used oral toxicity value in accordance with NYSDOH request
U S. EPA, 1993 - Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons. EPA/600/R93/089.
W - Withdrawn from HEAST.
(a) Due to structural similarities, the values for 1,4-Dichlorobenzene were used
(b) Due to structural similarities, the values for 2,4,6-Trichlorophenol were used
(c) Due to structural similarities, the values for Naphthalene were used.
(d) Due to structural similarities, the values for 1,3-Dichloropropene were used.
(e) Due to structural similarities, the value for Pyrene was used.
(f) IRIS 2002 gives 1 E-3 mg/kg-day - for ingestion of food and 5 E-4 for water; the lower value used in this HHRA is conservative in that it may overestimate the hazard quotient contribution of Cd by a factor of two.

# 6.0 EXPOSURE ASSESSMENT

In the exposure assessment section of the risk assessment, the extent of potential human exposure to chemicals from all identified exposure pathways is determined. Media evaluated in multipathway risk assessments include air, surface water, soil, sediments, and foodstuffs. This task also includes identifying segments of the population potentially at risk of exposure, potential exposure routes, and predicted exposure frequency and duration.

As discussed in the original 1991 multi-pathway risk assessment for this facility, as well as in the several updates which have been performed since then, people are assumed to potentially be exposed via both direct and indirect pathways. The selection of pathways in this risk assessment was determined based on current land-use data and demographic information, as well as any data gathered by study team members re-visiting the site and its vicinity in 1999 to evaluate feasible future uses.

Direct exposure pathways include inhalation of gaseous-state and particle-bound chemicals. Indirect exposure pathways include inadvertent ingestion of soil and intentional consumption of fish, vegetables, meat, cow's milk, human breast milk, and drinking water.

As pointed out by U.S. EPA 1998a, there are major uncertainties in prediction models addressing the effects from exposure to mother's milk. This MRA has, however, included this pathway based on calculation methods referenced by the U.S. EPA 1998a in order to ensure that potential exposures due to this constituent of the total risk is not overlooked.

## 6.1 Risk Assessment Study Area

The risk assessment study area (see Figure 2-1) includes the locations of maximum plume concentrations and deposition rates and the locations of each of the key receptor types. These receptors are located at appropriately representative areas likely to have the maximum impacts from the facility. Based on U.S. EPA guidance (U.S. EPA, 1994c, 1998a), certain key receptors were evaluated in the risk assessment. These receptors include two sets of child and adult residents, two sets of subsistence farmers and a single subsistence fisher location. Figure 2-3 identifies the assumed locations of these receptors. Based on requests from NYSDEC and NYSDOH, a set of sensitive receptor types (such as nearby hospitals and schools) were also checked with separate modeling calculations. The results (see Table 3-5) verify that their exposures, even on elevated floors, would be substantially lower than the locations for children and full-time residents included in the MRA. All of these hypothetical receptors were selected based on their high potential for exposure to kiln-related emissions. It is important to note that the receptors and exposure pathways evaluated in this risk assessment represent hypothetical people and activities, and are not intended to represent any actual individuals living near the Norlite Facility. In particular the hypothetical model makes several very conservative assumptions regarding location and duration of predicted exposures. For example, the model assumes that hypothetical individuals would reside outdoors on their property for 100% of the 30 to 40 years that they are assumed to be exposed to possible inhalation of facility emissions.

Also included in the hypothetical assumptions is that all of the evaluated receptors would be expected to fish exclusively at the nearby waterbodies receiving the greatest exposure to airborne emissions. In the current case, the resident and farmer receptors were assumed to fish recreationally at Wright/Bradley Lake (Figure 2-3). These lakes are too small to support a large enough fish habitat for subsistence fishing. Therefore, the subsistence fisher was assumed to fish at Erie Canal (based on discussions with New York Department of Natural Resources Fisheries Office).

## 6.2 Identification of Potential Receptors

Consistent with the latest state (NYSDEC/NYSDOH, 1991) and national guidance (U.S. EPA, 1998a), Norlite has re-evaluated risks predicted for the locations of the four receptors that are likely to face the highest potential risks from exposure to emissions from the facility. These receptors consist of a resident adult and child, subsistence farmer and subsistence fisher. Candidate locations representing existing receptors for each type are illustrated in Figure 2-3. All are within 6 km of the source facility. Air modeling results show that more distant locations receive lower exposures.

Resident Child and Adult - These receptors are assumed to reside at the residential location likely to have the highest estimated facility impact based on the results of air quality and deposition modeling (Figure 2-3). Two residential locations which appeared to have almost equal potential for being affected by kiln emissions were evaluated: The "primary" one is located to the north of the facility; and can be considered the RME location because its exposure is evaluated with concentrations predicted for the fenceline location that would experience the highest annual and five-year average lexposures. The "secondary" alternative is located at a very similar distance to the south of the facility. It was assumed that the residents could inhale compounds emitted from the Norlite Facility. The residents, especially children, may also inadvertently ingest soil onto which emitted compounds may be deposited. Produce potentially exposed to kiln emissions may be grown in backyard gardens and consumed at the resident location. The residents may also consume fish caught in Wright/Bradley Lake, and may ingest surface water from Cohoes Reservoir as drinking water. Finally, the residents may consume beef and dairy products from local farms. It is assumed that the modeled residents exhibit all of these behaviors for a 30-year period (children for a 2 1/2-year period, under NYSDOH recommendations , and 6 years according to U.S. EPA). The lighter weight of the younger child (13.2 kg) vs 15 kg for the older child results in slightly higher estimates of risk for some chemicals, and is thus considered more health-conservative. (The MRA base case uses the NYSDOH recommendations.)

Subsistence Farmer - The subsistence farmer is assumed to grow crops, and raise beef and dairy cattle. The farm estimated to receive the highest facility impact from air concentrations and deposition fluxes was assumed to be the location of the subsistence farmer. Based upon prior review of land use in the vicinity of the Norlite facility, there were no current beef-raising farms, but a dairy farm was identified. However, it was assumed that both of the "most affected" closest existing farms to the west of the Norlite facility could at some future time produce both beef and dairy products for their farmers' consumption. Therefore, based on discussions with Cornell Cooperative (Agricultural) Extension Office, Rensselaer County, two farm locations were evaluated: one designated as the primary "beef farm" and located about 1 mile northwest of the Norlite kilns, and a secondary "dairy farm" located to the south-southeast of the beef farm (see Figure 2-3).

Current development trends in the immediate area surrounding the facility indicate that the closest farms are being sold and replaced with residential housing. It is thus unlikely that any of the several current nearby farms will remain farms for the next 30-year period assumed for the risk assessment. It is even less likely that any of the currently residential areas will be converted to new farming use. Thus it was assumed that it is reasonably conservative to assume that current farm locations will be considered as candidates for the subsistence farmer evaluated in the risk assessment.

In addition to the activities that may result in the farmer's being exposed to affected media at the farm location (inhalation, soil ingestion, produce consumption, beef and dairy products consumption), this receptor, like the resident, may consume fish from Wright/Bradley Lake and drinking water from Cohoes Reservoir. Once again it is assumed that the modeled farmers exhibit all of the listed behaviors, and do so for a 40-year residence period. (According to the U.S. EPA (1998a), U.S. Census data indicate that farmers tend to reside on the same property for a longer period than other residents).

Subsistence Fisher - The subsistence fisher was assumed to fish in the closest surface waterbody that can support a large fish habitat. Review of the waterbodies promoted for recreational fishing indicated that the closest lake on the Troy side of the Hudson River would support recreational fishing, but is not likely to support "subsistence" fishing. Thus, the Mohawk River above the Cohoes Falls--in particular the Erie Canal locks to the north of the lower river--was assumed to be the appropriate body of water to consider for this receptor. (This is consistent with the selection made in the 2001 risk assessment.) It was assumed that the subsistence fisher is exposed to affected media at the residential location (through inhalation, soil ingestion, produce consumption) as well as consuming beef and dairy products from local farms. The subsistence fisher is also assumed to obtain drinking water from Cohoes Reservoir, and like the resident, exhibit the same behavior for 30 years.

### 6.3 Description of Potential Exposure Pathways

Potential exposure pathways are the mechanisms by which the receptors in the study area may be exposed to compounds emitted from the Norlite kiln. According to U.S. EPA (1989b), four elements must be present in order for a potential human exposure pathway to be complete:

- a source and mechanism of compound release to the environment (in this case, emissions from the kiln stack);

- an environmental transport medium;

- an exposure point, or point of potential contact with the potentially impacted medium; and

- a receptor (i.e., a person) with a route of exposure at the point of contact.

The exposure pathways evaluated in this risk assessment are consistent with those presented in U.S. EPA (1994c, 1998a) and NCDEHNR (1997), with the exception that several categories of above-ground, as well as root vegetables, were evaluated. This inclusion of these pathway elements is based upon NYSDOH guidance (NYSDOH, 1991), but is also consistent with U.S. EPA guidance (U.S. EPA 1998a) which favors use of local information, when available. For the "EPA Alternative Case" evaluated to test sensitivity to various model assumptions, U.S. EPA "default ingestion rates were used.

Another difference from U.S. EPA, 1998 approach is that **all of the receptors** were assumed to be exposed through **all of the exposure pathways.** (Mother's milk was an exception: it was evaluated only for the children of the two Adult Residents, the two Subsistence Farmers, and the Subsistence Fisher). U.S. EPA (1994c and 1998a) assumes that only the subsistence farmer consumes beef and dairy milk, and only the subsistence fisher consumes fish. This risk assessment uses somewhat more realistic site-specific exposure assumptions. As recommended by NYSDOH 1991 it is considered likely that all of the receptors could be exposed to some extent through all of the exposure pathways, although the actual contact rates would differ from the maximally exposed individual. In this version of the risk assessment, the primary equations utilized are those presented in NCDEHNR (1997). However, these equations are generally identical to those presented in U.S. EPA (1994c and 1998a) except that some previous inconsistencies and mistakes have been corrected (as recognized in the U.S. EPA, 1998a guidance). In order to more precisely calculate the potential risks from dioxin/furan emissions, the very latest version of the model guidelines developed by the U.S. EPA (1998a) were employed. That is, all seventeen of the individual dioxin and furan congeners on the COPC list are individually evaluated for their risk contributions before they are summed and reported as TCDD-TEQ risks.

Table 6-1 summarizes the exposure pathways evaluated in this risk assessment, and the location of exposure for each of the receptors.

### 6.4 Estimation of Exposure Point Concentrations

Exposure point concentrations are concentrations of chemicals in various media to which people could be exposed. The deposition and dispersion modeling results provide the foundation for all other environmental concentration modeling efforts. The modeling techniques used to estimate exposure point concentrations follow the approach described in U.S. EPA (1998a), which includes the most up-to-date models. The equations used in this risk assessment are presented in Appendix C. These equations were reproduced from Appendices B and C of NCDEHNR (1997), since that source is also referenced by the U.S. EPA 1998a guidance. The calculations of exposure point concentrations, intakes, and risks are presented in Appendix D.

### 6.4.1 Exposure Point Concentrations in Air

COPC concentrations in air were calculated by multiplying the undepleted air concentrations (described in Section 3.2.1, Table 3-4) by the chemical-specific emission rates (Table 4-12). Air concentrations were calculated separately for the two residence and two farm locations. The calculations of exposure point concentrations in air are shown in Appendix D-2.

### 6.4.2 Exposure Point Concentrations in Soil

In accordance with NCDEHNR (1997) and U.S. EPA (1998a), soil concentrations at the residence and farm locations were calculated assuming deposition of particle and vapor phase compounds. The calculation of soil concentration includes an overal loss rate term. This term has several components which account for loss of the COPC from the soil after deposition by several mechanisms, including leaching, erosion, runoff, degradation and volatilization. The calculation of soil concentration due to deposition was conducted using the equations shown in Tables B.1.1 through B.1.5 (pg. B-4 to pg. B-9) of NCDEHNR, 1997.

Some of the parameters in the equation require site-specific exposure assumptions (listed in Table 6-2 and Appendix D-1). These include:

Average annual precipitation - The average annual precipitation at the Norlite facility is assumed to be the same as that in Troy, New York. The annual average precipitation at Troy is 112 cm/year (NOAA, 1979).

Average annual surface runoff – The average annual surface runoff from the site was estimated to be half of the total annual surface water runoff (Geraghty *et al*, 1973). The total annual surface water runoff is defined as flow contributions to surface waterbodies from direct runoff, shallow inter-flow, and groundwater recharge. Using half of the total runoff value is necessary to estimate the amount of runoff directly from surface sources (U.S. EPA, 1994). The average annual surface water runoff from the site is estimated to be 25.4 cm/yr (Geraghty *et al*, 1973).

Average annual evapotranspiration – The average annual evapotranspiration at the site was estimated using the potential evapotranspiration from the Water Atlas (Geraghty *et al*, 1973). The average annual evapotranspiration was estimated to be half of the potential evapotranspiration (U.S. EPA, 1994) or 30.5 cm/yr.

Average annual irrigation – The average annual irrigation was estimated using the Water Atlas (Geraghty *et al,* 1973). Using the Water Atlas to determine the annual irrigation is an option accepted by the U.S. EPA (1994). Based on the average annual irrigation water use in New York and the number of irrigated acres in the state, 12.3 cm/yr was calculated as the annual average irrigation rate for New York.

Rainfall erosivity factor – The rainfall erosivity factor is a site-specific value used in the Soil Conservation Service (SCS) Universal Soil Loss Equation (USLE). The USLE was developed in the early 1960's as a means of predicting soil loss on agricultural lands using six variables to parameterize several features of a particular site. The rainfall erosivity value is a measure of the energy from a storm event and the associated sediment erosion generated. Rainfall erosivity for the Troy area is 100 $year^{-1}$ (USDA, 1997).

Soil mixing depth – For the "Base Case" site-specific soil mixing depths were used (as recommended by HYSDOH, 1991) in this risk assessment. For the soil ingestion pathway, a soil mixing depth of 5 cm was used based on earthworm field studies conducted by Rogaar and Boswinkel (1978). For croplands, where the earth is assumed to be tilled a depth of 15 cm is used (NYSDOH, 1991). For the "EPA Alternative case" analysis, these values were changed: to 1 cm for surface soil ingestion (and erosion runoff calculations; and for tilled soil, a mixing depth of 20 cm per U.S. EPA, 1998 guidance.

In addition to site-specific parameters, the equations also include chemical-specific parameters. Chemical-specific parameters and their sources are listed in Appendix E. These chemical-specific parameters were either obtained from the direct sources, such as U.S. EPA (1998a), NCDEHNR (1997) and U.S. EPA (1994c); or they were calculated using equations identically presented in U.S. EPA (1994c, 1998a) and NCDEHNR (1997). U.S. EPA (1994c) lists the soil loss constant due to degradation (ksg) as 0 for the chemicals evaluated in this guidance. For additional chemicals evaluated in this risk assessment, 0 was also assumed for all the ksg values. For soil erosion loss constant, $k_{se}$, however, the NCDEHNR (1997) and U.S. EPA 1994c recommend equations for its calculation, but U.S. EPA (1998a) guidance recommends setting it to zero. As explained in the paper included in Appendix H, including this parameter can be important to maintaining mass balance in the modeling system. Therefore, it is included in the "base case". For the uncertainty analysis, the "EPA Alternative case" sets it to zero.

Exposure point concentrations are shown in Appendix D-2.

### 6.4.3 Exposure Point Concentrations in Above-Ground and Root Produce

Exposure point concentrations in above-ground produce were calculated in accordance with U.S. EPA (1994c, 1998a) and NCDEHNR (1997). In addition to above-ground produce, exposure to root vegetables was also evaluated. Exposure point concentrations in produce were calculated at the residence and farm locations. Above-ground produce may be contaminated by combustion emissions through several mechanisms, including direct deposition of compounds onto the plant, direct uptake of vapor phase compounds, and root uptake based on the soil concentration. Exposure point concentrations in above-ground vegetables were calculated using the equations listed in Tables B.2.1 through B.2.8 (pages B-12 through B-20) of NCDEHNR (1997) (shown in Appendix C).

The equation for calculating root uptake in below ground vegetables is shown in Appendix C-3. This equation has also been used by the U.S. EPA in "Estimating Exposure to Dioxin-Like Compounds" (U.S. EPA, 1994e).

Site-specific parameters used in these equations are listed in Table 6-2. These parameters include average annual precipitation, irrigation, surface runoff and evapotranspiration (discussed in Section 6.3.2). For the "Base Case" for the produce pathway, a soil mixing depth of 15 cm was used to represent tilled agricultural soils (NYSDOH, 1991; DiDomenico et al., 1982; Young, 1983). For the "EPA Alternative Case" the value is changed to the 20 cm default value recommended in U.S. EPA, 1998a.

Chemical-specific parameters used in these equations are listed in Appendix B. These values were obtained from direct sources, obtained from U.S. EPA (1998a), or calculated using equations presented in U.S. EPA (1998a).

Exposure point concentrations are shown in Appendix D-2.

### 6.4.4 Exposure Point Concentrations for Beef and Milk

Exposure point concentrations were calculated in beef tissue and milk assuming ingestion of soil, silage and forage by beef and dairy cattle. Site-specific beef and dairy cattle crop ingestion rates were used. It was assumed that all crops could receive kiln emissions through several mechanisms, including direct deposition of compounds onto the plant, direct uptake of vapor phase compounds, and root uptake of compounds deposited on the soil. It was assumed that beef and dairy cattle are present at the two farm locations. Exposure point concentrations in beef and dairy cattle were calculated using the equations listed in Tables B.3.1 through B.3.10 (pages B-22 through B-32) of NCDEHNR (1997) (shown in Appendix C). These equations are generally consistent with those presented in U.S. EPA, 1998a.

Site-specific parameters used in these equations are listed in Table 6-2. These parameters include average annual precipitation, irrigation, surface runoff and evapotranspiration (discussed in Section 6.3.2). For the crop pathway, a soil mixing depth of 15 cm was used to represent tilled agricultural soils (NYSDOH, 1991; DiDomenico et al., 1982; Young, 1983).

Site-specific values were also used for beef and dairy cattle crop ingestion rates (listed in NCDEHNR, 1997 and U.S. EPA, 1998a as Qp - quantity of plant eaten by the animal each day). Table 6-3 lists ingestion rates for alfalfa/hay, pasture grass and corn silage (NY Agricultural Statistics Service, 1992). The total crop ingestion rate was calculated to be 8.8 kg/day for beef cattle and 17.5 kg/day for dairy cattle. The site-specific ingestion rate for beef cattle was equal to the default value provided in U.S. EPA (1994c). The site-specific ingestion rate for dairy cattle was higher than the default value of 13.2 kg/day provided in U.S. EPA (1994c). Since this site is located in New York State, the New York-specific values were assumed to be appropriate for both the 'base case" and the "EPA Alternative Case"

Chemical-specific parameters used in these equations are listed in Appendix B.

Exposure point concentrations are shown in Appendix D-2.

### 6.4.5 Exposure Point Concentrations for Fish

Exposure point concentrations in fish were calculated from compound concentrations in the waterbody expected to have the highest concentrations of COPCs. This included dissolved or total water column concentrations, and sediment concentrations. It was assumed that the resident and subsistence farmer fish in Wright/Bradley Lake, and that the subsistence fisher fishes in the Erie Canal.

Calculation of exposure point concentrations in fish was conducted in several steps. The first step was to calculate the soil concentration resulting from deposition of particle phase and vapor phase compounds onto soil at the watershed location (Tables B.4.1 through B.4.6 (page B-40 through B-46) of NCDEHNR (1997) (Appendix C) and comparable sections in U.S. EPA (1998a).

The second step was to calculate the load of compound to the waterbody (Tables B.4.7 through B.4.14 (pages B-47 through B-54) of NCDEHNR (1997) (Appendix C) and comparable sections of U.S. EPA (1998a). Contaminant loading to the waterbody occurs through five pathways: 1) direct deposition; 2) runoff from impervious surfaces within the watershed; 3) runoff from pervious surfaces within the watershed; 4) soil erosion from the watershed; and 5) direct diffusion of dry-deposited vapor-phase compounds into surface water.

The third step was to calculate the total waterbody concentration (in the water column and sediments) from the waterbody load and to partition the total concentration into a dissolved water concentration, a total water column concentration, and a bed sediment concentration. As appropriate to the chemical species, only one of three concentrations was used to calculate a fish tissue concentration (Tables B.4.15 through B.4.25 (page B-55 through B-65) of NCDEHNR (1997) (Appendix C), also explained in Appendix B of U.S. EPA (1998a).

The final step was to calculate the concentration in fish from the total water column concentration, the dissolved water concentration, or the bed sediment concentration using a bioconcentration factor (BCF), a bioaccumulation factor (BAF), or a sediment bioaccumulation factor (BSAF), as appropriate. (See Tables B.4.26 through B.4.28 (pages B-66 through B-68) of NCDEHNR (1997), and comparable equations in U.S. EPA (1998a).

Site-specific parameters used in these equations, including information for Wright/Bradley Lake and Erie Canal, are listed in Table 6-2 and discussed below. Site-specific values used for average annual precipitation, irrigation, surface runoff and evapotranspiration are discussed in Section 6.3.2. Chemical-specific parameters used in these equations are listed in Appendix B. Each of these tables shows whether a BCF, BAF, or BSAF was used for a specific chemical.

Exposure point concentrations are shown in Appendix D-2.

#### 6.4.5.1 Site-Specific Information for Wright/Bradley Lake

All estimates of area and length associated with the Wright/Bradley Lake and the Wright/Bradley Lake watershed were made using a 1:100,000 scale US Geological Survey (USGS) topographic map. The Wright/Bradley Lake watershed area was estimated to be 10.5 million $m^2$. Since Wright/Bradley Lake is located in a forested area the impervious watershed area of the Wright/Bradley Lake watershed was estimated to be 1%. Based on the fact that these two areas equal the total watershed area of the Wright/Bradley Lake, the pervious watershed was estimated to be 10.6 million $m^2$.

The surface area of Wright/Bradley Lake was estimated using a topographic map to be 58.6 thousand $m^2$. The average depth of Wright/Bradley Lake was estimated using a topographic map to be 5 meters.

The average flow through Wright/Bradley Lake was estimated by multiplying the ½ the total annual surface water runoff by the Wright/Bradley Lake watershed area. The average annual flow from Wright/Bradley Lake was calculated to be 5.39 million $m^3$/yr. The average residence time of water in Wright/Bradley Lake was calculated by dividing the flow through the pond by the pond volume. This residence time was calculated to be 0.05 years (18 days). The average water temperature of the Wright/Bradley Lake was estimated to be the same as the average air temperature of 46.6°F (281.1°K).

#### 6.4.5.2 Site-Specific Information for Erie Canal State Park

Erie Canal is within the Canal State Park. All estimates of area and length associated with the canal and ponds within the Canal State Park watershed were made using a 1:100,000 scale US Geological Survey (USGS) topographic map. The Canal State Park pervious watershed area was estimated to be 243 million $m^2$ (234 million $m^2$ upstream of the diversion and 9 million $m^2$ adjacent to the canal and ponds). Since the Canal State Park watershed is located in a forested area the impervious watershed area of the Canal State Park watershed was estimated to be 2% or approximately 5 million $m^2$.

The surface area of the ponds in Canal State Park was estimated using a topographic map to be 89,500 $m^2$. The average depths of the ponds at Canal State Park were estimated using a topographic map to be 5 meters.

The average flow through the canal and ponds at Canal State Park was determined to be 82.3 $ft^3$/sec by flow records maintained at the diversion to the park by the USGS at gage #01357499. The average residence time of water in the ponds at Canal State Park was calculated by dividing the flow through the pond by the pond volume. This residence time was calculated to be 0.01 years (4 days). The average water temperature of the ponds at Canal State Park was estimated to be the same as the average air temperature of 46.6°F (281.1°K).

### 6.4.6 Exposure Point Concentrations for Drinking Water

It was assumed that all receptors obtain their drinking water from Cohoes Reservoir. The equations discussed in Section 6.3.5 for calculating dissolved water concentrations were also used for the Cohoes Reservoir.

Site-specific parameters used in these equations are listed in Table 6-2. Site-specific values used for average annual precipitation, irrigation, surface runoff and evapotranspiration are discussed in Section 6.3.2. In addition, parameters specific to Cohoes Reservoir were also used.

The equations discussed in Section 6.3.5 for calculating dissolved water concentrations and fish tissue concentrations were also used for the Cohoes Reservoir.

Chemical-specific parameters used in these equations are listed in Appendix B.

#### 6.4.6.1 Site-Specific Information for Cohoes Reservoir

Because the City of Cohoes acquires its drinking water from the Mohawk River at a diversion near Cohoes Falls the Mohawk River upstream of the diversion and the reservoir at the Cohoes filtration plant will be consider as potential receptors. The Mohawk River watershed upstream of the drinking water intake is 243 million $m^2$ and approximately 2% (4.86 million $m^2$) of that is considered to be impervious based on a 1:100,000 scale USGS topographic map of the area.

The average annual flow through the Mohawk River at the drinking water diversion is measured to be 3440 $ft^3$/sec by the USGS and the average annual volume of diverted water is approximately 3.46 million $m^3$. This is based on a daily usage of 2.5 MGD.

The surface area of the reservoir located at the City of Cohoes filtration plant is 39.7 thousand $m^2$ and the estimated depth of the reservoir is 3 meters. By dividing the flow through the reservoir by the surface area and depth the residence time was calculated to be 0.03 years (11 days). The average water temperature of the drinking water within the pond was estimated to be the same as the average air temperature or 281.1°K

#### 6.4.6.2 Wetland Adjacent to Green Island

Although this area was not directly related to human health effects of fishing in the MRA, this small watershed was also examined to support the SLERA discussed in Section 8. The pervious watershed for this wetland, the closest to the Norlite site is about 1.0 millin $m^{2,}$ and the impervius area was estimated to be about 5% of 50,000 $m^2$. The surface area of the wetland itself was estimated from the USGS (1:24,000) map to be 85,000 $m^2$, but only about 0.3 m (i ft) deep. The runoff estimate predicted a flow of about 0.14 $m^3$/sec (3.8 $ft^3$/ sec) with a residence time of 0.01 yrs (4 days) and the same average temperature as the Hudson River watershed.

### 6.5 Estimation of Exposure Doses

This section describes the equations and assumptions used to evaluate receptors' potential exposures to COPCs in media affected by emissions from the Norlite Kilns. The equations used to evaluate potential exposures in this risk assessment are from NCDEHNR (1997) and are essentially the same as those in U.S. EPA (1994c and 1998a). However, several of the site-specific exposure assumptions that were used for the different receptors in the "Base Case" differed from the default recommendations of the "EPA Alternative Case". Therefore Table 6-3, which shows the New York beef and dairy cattle ingestion rates assumed for all analyses was prepared, along with Tables 6-4 illustrating the human exposure and diet assumptions for the "Base Case", and Table 6-5 showing the same parameters for the "EPA Alternative Case". The last table is based on default values published in U.S. EPA 1998.

The exposure and risk calculation equations are organized in two separte steps. For each receptor, in the first step, a total daily intake is calculated (in units of mg/day). Intakes from individual exposure routes, such as drinking water, fish ingestion, etc., are summed. In the second step, risk levels are calculated using the total daily intake value, exposure frequency, exposure duration, toxicity value, body weight and averaging time. Cancer risk levels are calculated for potential carcinogens, and non-cancer hazard indices (HI) are calculated for noncarcinogens. The rest of this section discusses the calculation of intake exposure values, while Section 7.0 discusses the calculation of related risk levels.

The following sections describe each of the exposure pathways evaluated in the risk assessment. These pathways have common parameters for body weight and exposure duration, which are described below.

Body Weight - As shown in Table 6-4, the body weights assumed for the "Base Case" in this risk assessment are 13.2 kg for the Child Resident and 70 kg for the Adult Resident, Subsistence Farmer, and Subsistence Fisher. These values are provided in NYSDOH (1991) and are based on information in Diem et al. (1973). Table 6-5 presents the body weight of the child as 15 kg.

Exposure Duration – for the New York "Base Case", the Child Resident is assumed to be exposed to compounds from birth to age 2.5 years (NYSDOH, 1991). For the "EPA Alternative Case" the age of the child extends to 6 years. In both cases, the Adult Resident and Subsistence Fisher are assumed to have an exposure duration of 30 years, and the Subsistence Farmers are assumed to have an exposure duration of 40 years (U.S. EPA, 1994c and U.S. EPA, 1998a).

### 6.5.1 Estimation of Potential Exposure via Inhalation

Receptors assumed to live near the Norlite Facility may inhale compounds emitted from the kilns in a gaseous state or bound to particulates in the air. Inhalation exposure to compounds is a function of the concentration of compounds in the air, the receptor's inhalation rate, and the receptor's body weight. The equations used to calculate exposure through inhalation are listed in Tables C.2.1 to C.2.5 (pages C-16 through C-20) of NCDEHNR (1997), as well as in the comparable section of U.S. EPA (1998a). In this risk assessment, inhalation cancer slope factors and inhalation reference concentrations were used in the inhalation equations (see Table 5-1).

Tables 6-4 and 6-5 include the inhalation exposure assumptions recommended by NYSDOH and U.S. EPA, respectively. Both sets were used for each of the receptors in this MRA, based upon the assumptions listed below:

Compound Concentrations in Ambient Air - Compound concentrations in ambient air for the Residence and Farm locations were calculated as described in Section 6.3.1. The calculated values are shown in Appendix D-2.

Inhalation Rate - Inhalation rates were based on information provided in NYSDOH (1991) and were derived assuming that this parameter is age- and activity-dependent. Average daily inhalation rates provided in NYSDOH (1991) for a Child ($8.6 \times 10^3$ L/day) and an Adult ($2 \times 10^4$ L/day) are derived based upon information in Hawley (1985). As shown in Table 6-4, these inhalation rates have been converted to inhalation rates of 8.6 $m^3$/day for the child resident and 20 $m^3$/day for the adult resident, subsistence farmer, and subsistence fisher. For the "EPA Alternative Case" the Table 6-5 inhalation rates are as recommended in U.S. EPA 1998a, about 75% of those for the New York "Base Case"

### 6.5.2 Estimation of Potential Exposure via Incidental Ingestion of Soil

Receptors may be exposed to compounds in soil via incidentally ingesting soil while playing or working outdoors. Exposure to compounds in soil is a function of the concentration of compounds in soil, the receptor's soil ingestion rate, the frequency of the receptor's exposure, and the receptor's body weight. Although the equations in U.S. EPA (1994c) and NCDEHNR (1997) are set up such that the exposure frequency, exposure duration and body weight are in the equations for calculating risk levels rather than intakes, these parameters are also described in this section. The equation used to calculate soil intake is shown in Table C.1.1 (page C-3) of NCDEHNR (1997), and referenced by U.S. EPA (1998a). The same soil intake equation was used for all of the different receptors, and the same daily ingestion rates for adults and children are recommended by both NYSDOH and the U.S. EPA.

The exposure parameters and assumptions made for the soil ingestion pathway are described below.

Compound Concentration in Surface Soil – For the "base case," receptors are assumed to contact soil from the top .5 centimeters (defined as surface soil); for the "EPA Alternative Case, this assumption changes to the top 1 centimeter of soil. The methodology used to determine concentrations of COPCs in soil is presented in Section 6.3.2. Exposure point concentrations in surface soil are shown in Appendix D-2.

Soil Ingestion Rate - In accordance with NYSDOH (1991), the soil ingestion rates used in this risk assessment are 200 mg/day for the Child Resident and 100 mg/day for the adult resident, subsistence farmer, and subsistence fisher. The U.S. EPA, 1998 recommendations are the same in this case.

Exposure Frequency - This risk assessment assumes that receptors contact soil outdoors at a frequency which is consistent with climate conditions in New York State. The Child Resident is assumed, based upon recent discussion with the NYSDEC, NYSDOH and U.S. EPA, (ENSR, 2002), to contact soil 5 days per week, for 9 months of the year. This corresponds to an exposure frequency of 270 days per year. The Subsistence Farmer is assumed now to contact soil 5 days per week for 6 months, or about 180 days per year. The Adult Resident and Subsistence Fisher are assumed to contact soil 2 days per week, for 5 months of the year, for an exposure frequency of 44 days per year. These last two values are provided in NYSDOH (1991).

### 6.5.3 Estimation of Potential Exposure via Consumption of Produce

All receptors are assumed to consume locally-grown fruits and vegetables. It was assumed that the resident and subsistence fisher would consume produce grown in the backyard at the residence locations, and the subsistence farmers would consume produce grown at their own farm locations. Exposure to compounds via consumption of produce is a function of the concentration of compound in the produce, the receptor's produce ingestion rate, the fraction of the receptor's daily produce intake which is locally-grown, and the receptor's body weight.

The equation used to calculate produce intake is shown in Table C.1.2 (page C-4) of NCDEHNR (1997). The same intake equation was used for each type of receptor, and was used to calculate intake from both above-ground and root vegetables. The exposure parameters and assumptions for the produce pathway are described below.

Compound Concentration in Produce Type - In accordance with NYSDOH (1991), three produce types were evaluated: leafy produce, exposed produce, and protected produce. Since U.S. EPA (1994c and 1998a) guidance provides exposure equations only for above-ground and below-ground vegetables, it was assumed that leafy produce and exposed produce are exposed to kiln-related emissions similar to above-ground vegetables. Although exposure to protected produce (considered to be partially equivalent to root vegetables) was not included in the recommendations for risk evaluation in U.S. EPA (1994c), this pathway was recommended by both NYSDOH and the latest U.S. EPA 1998a guidance, and is therefore included in this MRA.

Consumption Rate for Produce Type – Deteailed consumption rates for each produce type are presented in Table 6-4, which describes assumptions used for the "Base Case". According to NYSDOH, these consumption rates are specific to the northeastern United States based on the U.S. EPA Exposure Factors Handbook (1995c) and the most recent U.S. Department of Agriculture (USDA) food consumption survey (USDA, 1993; 1994). The consumption rates used for the Resident and Subsistence Fisher are appropriate for people residing in a suburban area. Consumption rates of homegrown produce specific to the northeastern United States for a non-metropolitan area were used for the Subsistence Farmer. In order to use these consumption rates with the U.S. EPA and NCDHNR (1997) equations, the consumption rates for leafy and exposed crops were combined and used in the equation for above-ground vegetables. The consumption rate for protected crops was apportioned between the fraction that is assumed to grow above ground (~80%) and the fraction attributable to below-ground crops (~20%), based on ratios published by the U.S. EPA in its 1998 guidance for the parameters to use with the equation for predicting concentrations of COPCs in root vegetables..

The equation presented in NCDEHNR (1997) and U.S. EPA (1998a) calculates intake values for above-ground vegetables in terms of dry weight. Therefore, the ingestion rates used for above-ground vegetables are converted to dry weight. This conversion uses wet-to-dry-weight conversion factors provided in NYSDOH (1991). The specific conversion factors provided for leafy and exposed crops were used to convert the ingestion rates from wet weight to dry weight. For the "U.S. EPA Alternative Case", default national values for above and below-ground vegetable ingestion rates were adopted, as presented in Table 6-5.

### 6.5.4 Estimation of Potential Exposure via Beef Consumption

Cattle from local farms may be exposed to compounds emitted from the kilns via ingestion of locally-grown crops and incidental ingestion of soil during crop ingestion. Human receptors, then, may be exposed to compounds via consumption of beef from these cattle. Exposure to beef is a function of the concentration of compounds in beef tissue, the receptor's beef consumption rate, the beef local consumption factor, and the receptor's body weight.

The equation used to calculate beef intake is shown in Table C.1.3 (page C-5) of NCDEHNR (1997). The same intake equation is referenced by U.S. EPA (1998a) and was used for all receptors. The exposure parameters and assumptions made for the beef ingestion pathway are described below.

Compound Concentration in Beef - Compound concentration in beef tissue is a function of the cow's daily intake of compounds and the tendency of compounds to bioconcentrate in the beef tissue. Section 6.3.4 discusses the equations used to calculate compound concentrations in beef. Exposure point concentrations in beef tissue are listed in Appendix D-2.

Beef Consumption Rate and Local Consumption Factors - Receptors evaluated in the "Base Case" for this MRA are assumed to consume beef at rates provided by NYSDOH (1991) as listed in Table 6-4. These rates are derived from information in U.S.D.A. (1983). The Child and Adult Resident and Subsistence Fisher are assumed to obtain 10% of their beef from the maximally affected beef/dairy farm, and the remaining 90% from other sources unaffected by the Norlite Kilns (NYSDOH, 1993). Therefore, the beef Local Consumption Factor for these receptors is 0.1, as shown in Table 6-4. For the 'EPA Alternative Case", the default ingestion rates are based on nation-wide diet patterns for subsistence farmers as listed in Table 6-5. This table also documents the assumption that 25% of the ingested beef for every adult, except the beef farmer, comes from locally grown beef raised entirely at the subsistence farm location, or one just like it. For both scenarios, the Subsistence Farmer is assumed to obtain 100% of his/her beef from the owned farm. Thus, the beef Local Consumption Factor for the Subsistence Farmer, as shown in Tables 6-4 and 6-5, is 1.0.

### 6.5.5 Estimation of Potential Exposure via Dairy Milk Consumption

Cattle raised on dairy farms near the Norlite Facility may be exposed to compounds emitted from the kilns via ingestion of crops onto which compounds have deposited and via incidental ingestion of soil during crop ingestion. Human receptors who live near the kilns, then, may be exposed to compounds via consumption of dairy products from cattle raised on nearby farms. Exposure to compounds via consumption of diary products is a function of the concentration of compounds in the dairy products, the receptor's dairy products consumption rate, the dairy local consumption factor, and the receptor's body weight.

The equation used to calculate dairy milk intake is shown in Table C.1.3 (page C-5) of NCDEHNR (1997) is also cited in U.S. EPA (1998a). The same intake equation was used for all receptors. The exposure parameters and assumptions made for the dairy milk ingestion pathway are described below.

Compound Concentration in Milk - The concentration of compounds in dairy products is a function of the cow's daily intake of compounds and the tendency of compounds to bioconcentrate in the milk. Section 6.3.4 discusses the equations used to calculate compound concentrations in dairy milk. Exposure point concentrations in dairy milk are listed in Appendix D-2.

Dairy Products Consumption Rate and Local Consumption Factor - Receptors evaluated in this risk assessment are assumed to consume dairy products at the rates provided in NYSDOH (1991). These consumption rates are presented in Table 6-4 and are derived from information in U.S.D.A. (1983). The Child and Adult Resident, and Subsistence Fisher are assumed to obtain 10% of his/her dairy products from the maximally impacted beef/dairy farm, and the remaining 90% from other sources not impacted by the Norlite Kilns (NYSDOH, 1993). Therefore, the dairy Local Consumption Factor for the Resident and Subsistence Fisher is 0.1, as shown in Table 6-4. The Subsistence Farmer, because he/she is assumed to raise beef and dairy cattle, is assumed to obtain 100% of his/her dairy from the farm. The dairy Local Consumption Factor for the Subsistence Farmer, as shown in Table 6-4, is 1.0. For the "EPA Alternative Case" the consumption factors have been adjusted to match the default values recommended by U.S. EPA, 1998a, as shown in Table 6-5 for the subsistence farmer who gets 100% from the dairy farm. In this case the other residents are assumed to get 25% of their milk supply from the subsistence dairy farms, a more conservative assumption than is made in the "Base Case". This assumption is made even more conservative by the fact that the EPA default milk ingestion rate for the dairy farmer is about double that derived by the NYSDOH to represent New York diets.

### 6.5.6 Estimation of Potential Exposure via Consumption of Fish

It was assumed that the residents and subsistence farmer may fish recreationally in Wright/Bradley Lake. The subsistence fisher was assumed to fish at Erie Canal, since the fish population in Wright/Bradley Lake is not large enough to support subsistence fishing. Exposure to compounds due to consumption of fish, which have taken up compounds from surface water, is a function of the concentration of compound in the surface water, the tendency of the compound to bioconcentrate in the fish tissue, the receptor's fish consumption rate, and the receptor's body weight. The exposure modeling parameters and assumptions adopted for the fish ingestion pathway are described below.

Deposition Erosion Modeling to Predict Soil and Water Concentrations – The deposition modeling process and general air modeling equations have already been discussed in Sections 3.1, and some of the special aspects relating to mercury in 4.3. The air dispersion and deposition of mercury vapor is sufficiently different from other COPCs that supplemental assumptions are made when the normal models are run to calculate its rate of deposition and buildup in plants and soil. According to the model represented in Figure 4-2, the soluble vapor fraction (and an insignificant particle fraction) is deposited with precipitation onto ground and water surfaces. In the soil and sediment a small portion is transformed into methylated mercury. Eventually, the methyl mercury that is dissolved in the water is absorbed by fish prior to the fish being caught and eaten.

When it is not raining, there is still a dry deposition process that causes mercury vapor to be taken up by plants and trees, which eventually lose their leaves to the ground litter that finds its way by means of erosion into nearby water bodies. The U.S. EPA model that simulates this process has been derived from the modeling done in the Mercury Study Report to Congress (1997), but some of the default parameter values have been changed by the developers prior to its publication in the U.S. EPA 1998 guidance. This mercury fate and exposure model makes several assumptions that are still the subject of ongoing research and development. An important one is its assumption about the "effective" rate of deposition of mercury vapor to the surface. Relatively little data is available to make clear the choice of alternative rates for this process. As discussed in the paper by Smith and Garcia, 2001 presented in Appendix H, there are decade-long research studies that suggest an equivalent annual value for the "effective" deposition rate may be close to 0.1 cm/sec. This value was a summertime maximum value taken from studies of seasonal measurements on total mercury, reported as primarily insoluble forms of mercury (Lindberg, et al, 1992). Winter and nighttime rates were 1/2 to 1/3 this rate.

As noted in Appendix H, more recent results of short-term measurements indicate that higher rates of "dry deposition" exchange can be maintained for at least a few hours. That suggests the possibility of higher annual average effective rates. The guidance currently recommends the same default dry deposition rate it recommends (and this MRA used) for all VOCs, 3 cm/sec. For VOCs that rapidly re-evaporate, this parameter value has little significance. Due to the potential importance of this factor for mercury modeling, but no other COPC, the dry deposition rate used for the "EPA Alternative Case" was matched to that used for the "base" case, 0.1 cm/sec. This parameter is the only one used in the "EPA Alternative Case" that does not match the published default value recommendation. To allow the significance of this variable to be considered, however, two additional EPA Alternative Cases, "B" and "C," were run--only for mercury and methyl mercury. These two cases are discussed further in the Uncertainty Analysis of this MRA (Section 7-4) and their summarized results are presented in Appendix J.

Soil Erosion Modeling to Predict Water Concentrations - The same fate and transport model was used in this MRA for both the "Base Case" and the "EPA Alternative Case"; but some key model input parameters are subject to interpretation, and thus differ in the two cases. One key parameter is the assumed depth of soil into which COPCs will mix before uptake into plant roots or erosion into nearby water bodies. Historically, as discussed in Section 6.4.2, studies of earthworm behavior in non-tilled soils believed to be typical of many eastern states have led to the assumption that the minimum depth into which COPCs would mix in a year of accumulation would be about 5 cm (~ 2 in.) (Rogaar, H. and J.A. el. 1978). That is the value assumed for the "Base Case". U.S. EPA, 1998 recommends a default value of 1 cm (~0.4 in), and that value is used for the "EPA Alternative Case". . An additional difference is an erosion loss factor, $k_{se}$, mentioned in Section 6.4.2. In the "Base Case" this is calculated according to NCDNR 1997 and previous U.S. EPA 1993 and 1994c guidance; in the "EPA Alternative Case" it is set to zero. The potential significance of this difference is discussed in the paper presented in Appendix H.

Compound Concentrations in Fish - Section 6.3.5 has discussed the equations used to calculate compound concentrations in fish. Bioaccumulation factors were drawn from the database provided by U.S. EPA 1998, and are identified in Appendix B. Exposure point concentrations in fish tissue are listed in Appendix D-2. Due to differences in the two modeling parameters just described above, the predictions of fish concentrations are somewhat different in the "Base Case" and in the "EPA

Alternative Case." These differences are highlighted in Appendix J. They result in different estimates of the risk Hazard Index contribution from fish ingestion for the two cases.

Fish Consumption Rate - The equation used to calculate fish intake is shown in Table C.1.4 (page C-6) of NCDEHNR (1997). The same intake equation is cited by U.S. EPA (1998a) and was used for all receptors. The fish consumption rates have been revised for the MRA "Base Case" to correspond to more complete and more precise information available in the U.S. EPA Exposure Factors Handbook (1997). They are also now influenced by the default subsistence fisher rates recommended for children of subsistence fisher adults, even when the adults are recreational, rather than subsistence fishers. For the "Base Case" the subsistence fisher is still a consumption rate of 60 g/day (U.S. EPA, 1994c and U.S. EPA 1998a). However, based upon a recommendation in U.S. EPA for a recreational angler ingestion rate derived from a study performed in New York State, a value of 18 g/day is now used for the adult resident and subsistence farmer scenarios. This rate is 30% of the subsistence fisher rate used in the New York "Base Case" and 22% of the latest subsistence fishing rate recommended by the U.S. EPA, 1998a, which is 81.9 g/day (based on a 70 kg adult). This latter rate is used for the subsistence fisher in the "EPA Alternative Case," while the corresponding recreational fisher is assumed to ingest fish at 25% of that alternative subsistence rate, or 20.5 g/day.

The estimates of rates of ingestion for the children of the recreational anglers are based upon the rate recommended by the U.S. EPA for the child of a recreational fisher. For the assumed 13.2 kg 2 ½ year-old child weight NYSDOH (1991), the subsistence fisher child would consume just about 10 g/day. The child of the angler was assumed to ingest 25% of this amount or 2.5 g/day for the "Base Case". (Review of the rates of ingestion for adults and children of various ages in different regions of the country, as reported in Ruffle, et al, (1994), based on data collected and originally reported by Rupp et al. (1980)--and corroborated by data of West, (1996) reported in U.S. EPA, 1997–the rate chosen here for the child ingestion rate corresponds to approximately the 95th percentile of ingestion rates for children of recreational anglers under 6 yrs of age living in the mid-Atlantic and New England states). Therefore, for the "EPA Alternative Case" the child of the recreational angler was also assumed to ingest 25% of the 11.4 g/day recommended for the child of the subsistence fisher, or 2.85 g/day. The "EPA Alternative Case" subsistence fisher is set at the recommended default of 81.9 g/day. These rates for recreational anglers and their children are lower that previously assumed because they are more precise, and the previously assumed rates did not correct for the fraction of the fish ingestion rate that came from ocean fish and shellfish, as the present estimates now do.

Local Consumption Factor – All adult anglers and subsistence fishers are assumed to obtain 100% of their caught fish from Wright/Bradley Lake (recreational source) or Erie Canal (subsistence source). The lower rates for children are about 1/7 of the adult rates and are assumed to represent all of that portion of the diet as due to fish from the same affected sources as their respective adults.

### 6.5.7 Estimation of Potential Exposure via Ingestion of Drinking Water

Receptors in this risk assessment are assumed to ingest water from the Cohoes Reservoir as drinking water. Ingestion exposure to compounds in water is a function of concentration of compounds in water, the receptor's water ingestion rate, and the receptor's body weight.

The equation used to calculate drinking water intake is shown in Table C.1.5 (page C-7) of NCDEHNR (1997) as cited by U.S. EPA (1998a). The same intake equation was used for all receptors.

The exposure parameters and assumptions made for the drinking water pathway are described below.

Compound Concentration in Water - Receptors are assumed to ingest surface water from the Cohoes Reservoir as drinking water, conservatively assuming no reduction in COPCs, as would normally be provided by treatment. The methodology used to derive compound concentrations in surface water is described in Section 6.3.6. Compound concentrations calculated for surface water from the Cohoes Reservoir due to kiln emissions are presented in Appendix D-2.

Water Ingestion Rate - In accordance with NYSDOH (1991), the water ingestion rates used in this risk assessment are 1 L/day for the Child Resident and 2 L/day for the Adult Resident, Subsistence Farmer, and Subsistence Fisher. These rates are identical for both the "Base Case" and the EPA Alternative Cases."

### 6.5.8 Estimation of Potential Infant Exposure via Breast Milk Consumption

An infant who resides near the Norlite Facility may be indirectly exposed to compounds emitted from the kilns by consuming breast milk from his/her mother during the first year of life. Infant exposure to compounds via consumption of breast milk is a function of the concentration of compounds in the breast milk, the infant's breast milk consumption rate, and the infant's body weight.

U.S. EPA (1994c) and U.S. EPA (1998a) both recommend evaluating this pathway only for dioxins. To determine the average daily dose for a breast-feeding infant, the concentration of dioxin in the mother's milk must first be determined. All three scenarios were evaluated for the mother scenario: adult resident, subsistence farmer, and subsistence fisher. Once the dioxin concentration in maternal milk was determined, the average daily dose for infant exposure was calculated in pg/kg/day. In accordance with U.S. EPA (1998a), the acceptability of the average daily dose for one year of breastmilk exposure was determined by comparison with the average adult background exposure level for dioxin of 0.5 pg/kg/day.

Concentration of Compounds in Breast Milk - The concentration of a compound in breast milk is a function of the total exposure of the mother, the fraction of breast milk assumed to be fat, the fraction of compound assumed to be distributed to fat, the biological half-life of the compound, and the fraction of maternal weight assumed to be fat.

The average maternal intake of dioxin is the sum of the mother's exposure via all relevant routes to compounds emitted from the kilns. The total maternal exposure to compounds from the Norlite Facility, then, is the sum of the mother's exposures via the following routes:

- inhalation of gaseous and particulate-bound compounds in air;
- incidental soil ingestion;
- ingestion of drinking water;
- consumption of fish;
- consumption of produce;
- consumption of beef; and
- consumption of dairy products.

The total amount of compound in the mother's body is assumed to be distributed between the fat tissue and other tissues in the mother's body. The fraction of compound assumed to be distributed to fat is 0.8, as shown in Table 6-4. This value is provided in NYSDOH (1991), and is a conservative measure of the fraction of compounds assumed to be present in the fatty tissues of the mother. This value is based on information in Smith (1987).

As the compound accumulates in the fatty portion of the breast milk over time, a fraction of the compound is assumed to be eliminated from the mother's body, according to the biological half-life of the compound. U.S. EPA (1998a) lists a biological half-life of dioxin of 2555 days.

The fraction of the mother's body weight that is assumed to be fat is used to calculate the total maternal body burden of compound which is assumed to concentrate in the mother's fatty tissue. As shown in Table 6-4, 30% of the mother's total body weight is assumed to be fat. This value is provided in NYSDOH (1991) and is based on information in Smith (1987).

<u>Average Daily Dose to the Exposed Infant</u> - The average daily dose to the exposed infant was calculated using the equation listed in Table C.3.2 (page C-23) of NCDEHNR (1997) and cited by U.S. EPA (1998a).

The total amount of compound distributed to the breast milk is assumed to be located in the fat portion of the breast milk. The fraction of the milk which is assumed to be fat is 0.04. This value is provided in NYSDOH (1991). This value is based on information in Smith (1987).

This risk assessment assumes that infants consume 0.8 kg breast milk per day. This value is provided in NYSDOH (1991), and is shown on Table 6-4. This value is based on information in Smith (1987).

Infants are assumed to weight 8 kg, a value provided in NYSDOH (1991) and presented in Table 6-4. This value is based on information in Smith (1987).

All of the other exposure assumptions are those listed in Table 5.6.2 of U.S. EPA (1994c).

# TABLE 6-1

## Potential Exposure Pathways
## Norlite Corporation, Light Aggregate Facility
## Cohoes, NY

| Exposure Pathway | Receptor and Exposure Location | | | |
|---|---|---|---|---|
| | Child Resident | Adult Resident | Subsistence Farmer | Subsistence Fisher |
| Inhalation | Residence | Residence | Farm | Residence |
| Ingestion of Soil | Residence | Residence | Farm | Residence |
| Ingestion of Garden Produce | Residence | Residence | Farm | Residence |
| Consumption of Beef | Farm | Farm | Farm | Farm |
| Consumption of Dairy Milk | Farm | Farm | Farm | Farm |
| Consumption of Fish | Wright/Bradley Lake | Wright/Bradley Lake | Wright/Bradley Lake | Erie Canal |
| Ingestion of Drinking Water | Cohoes Reservoir | Cohoes Reservoir | Cohoes Reservoir | Cohoes Reservoir |
| Consumption of Mother's Milk | Residence | Not Applicable | Not Applicable | Not Applicable |

Table 6-2. Watershed and Water Body Parameters Used in MRA for Norlite, Cohoes, NY

| | Parameter | Units | Value | Reference |
|---|---|---|---|---|
| General Information | Time of deposition | (years) | 30 | Expected lifespan of facility |
| General Information | Average annual precipitation near Troy | (cm/yr) | 112 | NOAA. 1979. Climate Atlas of the United States. National Climate Center, Federal Building, Ashville, N.C. 28801 |
| General Information | Average annual surface runoff | (cm/yr) | 25.4 | Geraghty, et al. 1973. Water Atlas of the United States. Plate 21. Used 1/2 of total annual surface water runoff |
| General Information | Average annual evapotranspiration | (cm/yr) | 30.5 | Geraghty, et al. 1973. Water Atlas of the United States. Plate 13. Used 1/2 of Potential Evapotranspiration. |
| General Information | Average annual irrigation | (cm/yr) | 12.3 | Geraghty, et al. 1973. Water Atlas of the United States. Plates 79 & 80. |
| General Information | Rainfall Erosivity Factor | ($year^{-1}$) | 100 | USDA. 1997. Predicting Soil Erosion by Water: A Guide to Conservation Planning With the RUSLE. Agricultural Handbook No, 703. |
| General Information | Average annual temperature near Troy, New York | (°C) | 8.1 | NOAA. 1979. Climate Atlas of the United States. National Climate Center, Federal Building, Ashville, N.C. 28801 |
| Mohawk River within 20 km of stack | Mohawk River pervious watershed area within 20 km of stack | ($m^2$) | 2.64E+08 | USGS 1:100,000 topographic map |
| Mohawk River within 20 km of stack | Mohawk River impervious watershed area within 20 km of stack | ($m^2$) | 8.16E+06 | Assumed 3% impervious using USGS 1:100,000 topographic map |
| Mohawk River within 20 km of stack | Total Mohawk River watershed area within 20 km of stack | ($m^2$) | 2.72E+08 | USGS 1:100,000 topographic map |
| Mohawk River within 20 km of stack | Average flow through Mohawk River at Cohoes, New York | ($m^3/y$) | 3.07E+09 | Data from USGS gage (#01357500) on the Mohawk River at Cohoes, New York |
| Mohawk River within 20 km of stack | Width of Mohawk River at Cohoes | (m) | 220 | USGS 1:100,000 topographic map |
| Mohawk River within 20 km of stack | Depth of Mohawk River at Cohoes | (m) | 3.0 | Calculated using width from 1:24,000 USGS topo and flow from USGS gage |
| Mohawk River within 20 km of stack | Length of Mohawk River within 20 km of stack | (m) | 2.87E+04 | USGS 1:100,000 topographic map |
| Mohawk River within 20 km of stack | Average velocity of Mohawk River at Cohoes | (m/s) | 0.15 | Calculated using width from 1:100,000 USGS topo, flow from USGS gage. |
| Hudson River within 10 km of stack | Hudson River pervious watershed area within 10 km of stack | ($m^2$) | 3.06E+08 | USGS 1:100,000 topographic map |
| Hudson River within 10 km of stack | Hudson River impervious watershed area within 10 km of stack | ($m^2$) | 9.45E+06 | Assumed 3% impervious using USGS 1:100,000 topographic map |
| Hudson River within 10 km of stack | Total Hudson River watershed area within 10 km of stack | ($m^2$) | 3.15E+08 | USGS 1:100,000 topographic map |
| Hudson River within 10 km of stack | Average flow through Hudson River at Green Island New York | ($m^3/y$) | 1.24E+10 | Data from USGS gage (#01358000) on the Hudson River at Green Island New York |
| Hudson River within 10 km of stack | Width of Hudson River at Green Island | (m) | 200 | USGS 1:100,000 topographic map |
| Hudson River within 10 km of stack | Depth of Green Island River at Green Island | (m) | 10.0 | Calculated using width from 1:100,000 USGS topo and flow from USGS gage |
| Hudson River within 10 km of stack | Length of Hudson River within 10 km of stack | (m) | 1.06E+04 | USGS 1:100,000 topographic map |
| Hudson River within 10 km of stack | Average velocity of Hudson River at Green Island | (m/s) | 0.20 | Calculated using width and approximate depth from 1:100,000 USGS topo and flow from USGS gage (#01358000). |

Table 6-2. Watershed and Water Body Parameters Used in MRA for Norlite, Cohoes, NY

| | | | | |
|---|---|---|---|---|
| Canal State Park (Subsistence Fisher) | Ponds at Canal State Park pervious watershed area upstream of Mohawk River diversion | ($m^2$) | 2.29E+08 | USGS 1:100,000 topographic map |
| | Ponds at Canal State Park impervious watershed area upstream of Mohawk River diversion | ($m^2$) | 4.68E+06 | Assumed 2% impervious using USGS 1:100,000 topographic map |
| | Total watershed area for ponds at Canal State Park upstream of Mohawk River diversion | ($m^2$) | 2.34E+08 | USGS 1:100,000 topographic map |
| | Ponds at Canal State Park pervious watershed area adjacent to canal | ($m^2$) | 9.00E+06 | USGS 1:100,000 topographic map |
| | Ponds at Canal State Park impervious watershed area adjacent to canal | ($m^2$) | 0.00E+00 | Assumed 0% impervious using USGS 1:100,000 topographic map |
| | Total watershed area for ponds at Canal State Park adjacent to canal | ($m^2$) | 9.00E+06 | USGS 1:100,000 topographic map |
| | Length of Mohawk River from diversion to within 20 km of stack | (m) | 2.37E+04 | USGS 1:100,000 topographic map |
| | Average flow through ponds at Canal State Park | ($m^3$/y) | 7.36E+07 | Data from USGS gage (#01357499) at Canal State Park, Lock #6 |
| | Surface area of ponds at Canal State Park | ($m^2$) | 8.95E+04 | USGS 1:24,000 topographic map |
| | Depth of ponds at Canal State Park | (m) | 5.0 | Estimated using USGS 1:24,000 topo map and during ENSR site visit |
| | Temperature of ponds at Canal State Park | ($^oK$) | 273.1 | Estimated based on average air temperature |
| | Residence time of ponds at Canal State Park | (yr) | 0.01 | Divided flow through ponds at Canal State Park by surface area and depth. |
| Wright/Bradley Lake (Recreational Fisher) | Wright/Bradley Lake pervious watershed area | ($m^2$) | 1.05E+07 | USGS 1:100,000 topographic map |
| | Wright/Bradley Lake impervious watershed area | ($m^2$) | 1.06E+05 | Assumed 1% impervious using USGS 1:100,000 topographic map |
| | Total Wright/Bradley Lake watershed area | ($m^2$) | 1.06E+07 | USGS 1:100,000 topographic map |
| | Average flow through Wright/Bradley Lake | ($m^3$/y) | 5.39E+06 | Geraghty, et al. 1973. Water Atlas of the United States. Plate 21. Calculated using total annual surface water runoff and watershed area |
| | Wright/Bradley Lake surface area | ($m^2$) | 5.86E+04 | USGS 1:24,000 topographic map |
| | Depth of Wright/Bradley Lake | (m) | 5.0 | Estimated using USGS 1:24,000 topo map |
| | Wright/Bradley Lake temperature | ($^oK$) | 281.1 | Estimated based on average air temperature |
| | Wright/Bradley Lake residence time | (yr) | 0.05 | Divided flow through Wright/Bradley Lake by surface area and depth. |

Table 6-2. Watershed and Water Body Parameters Used in MRA for Norlite, Cohoes, NY

| | | | | |
|---|---|---|---|---|
| City of Cohoes (Drinking Water) | Cohoes drinking water intake pervious watershed area | $(m^2)$ | 2.38E+08 | USGS 1:100,000 topographic map |
| | Cohoes drinking water intake impervious watershed area | $(m^2)$ | 4.86E+06 | Assumed 2% impervious using USGS 1:100,000 topographic map |
| | Total watershed area for Cohoes drinking water intake | $(m^2)$ | 2.43E+08 | USGS 1:100,000 topographic map |
| | Average flow through Mohawk River at Cohoes, New York | $(m^3/y)$ | 3.07E+09 | Data from USGS gage (#01357500) on the Mohawk River at Cohoes, New York |
| | Width of Mohawk River at Cohoes | (m) | 220 | USGS 1:100,000 topographic map |
| | Depth of Mohawk River at Cohoes | (m) | 3.0 | Calculated using width from 1:24,000 USGS topo and flow from USGS gage |
| | Length of Mohawk River from drinking water intake to within 20 km of stack | (m) | 2.57E+04 | USGS 1:100,000 topographic map |
| | Average velocity of Mohawk River at Cohoes | (m/s) | 0.15 | Calculated using width from 1:100,000 USGS topo, flow from USGS gage. |
| | Average flow through reservoir at Cohoes water filtration plant | $(m^3/y)$ | 3.46E+06 | Information gathered from personnel at Cohoes filtration plant. |
| | Surface area of reservoir at Cohoes filtration plant | $(m^2)$ | 3.97E+04 | USGS 1:24,000 topographic map |
| | Depth of reservoir at Cohoes filtration plant | (m) | 3.0 | Estimated using USGS 1:24,000 topo map and during ENSR site visit |
| | Temperature of reservoir at Cohoes filtration plant | $(^oK)$ | 273.1 | Estimated based on average air temperature |
| | Residence time of reservoir at Cohoes filtration plant | (yr) | 0.03 | Divided flow through reservoir by surface area and depth. |
| Wetland Adjacent to Green Island | Green Island wetland pervious watershed area | $(m^2)$ | 1.00E+06 | USGS 1:24,000 topographic map |
| | Green Island wetland impervious watershed area | $(m^2)$ | 5.12E+04 | Assumed 5% impervious using USGS 1:24,000 topographic map |
| | Total watershed area for Green Island wetland | $(m^2)$ | 1.02E+06 | USGS 1:24,000 topographic map |
| | Average flow through wetland at Green Island, New York | $(m^3/y)$ | 5.20E+05 | Geraghty, et al. 1973. Water Atlas of the United States. Plate 21. Calculated using total annual surface water runoff and watershed area |
| | Surface area of wetland at Green Island | $(m^2)$ | 8.50E+04 | USGS 1:24,000 topographic map |
| | Width of wetland at Green Island | (m) | 126 | USGS 1:24,000 topographic map |
| | Depth of wetland at Green Island | (m) | 0.3 | USGS 1:24,000 topographic map |
| | Length of stream through wetland | (m) | 6.80E+02 | USGS 1:24,000 topographic map |
| | Average velocity of wetland at Green Island | (m/s) | 0.000 | Calculated using dimensions from 1:24,000 USGS topo and flow calculated using surface runoff. |
| | Average flow through wetland at Green Island, New York | $(m^3/y)$ | 3.46E+06 | Geraghty, et al. 1973. Water Atlas of the United States. Plate 21. Calculated using total annual surface water runoff and watershed area |
| | Temperature of wetland at Green Island | $(^oK)$ | 281.1 | Estimated based on average air temperature |
| | Residence time of reservoir at Cohoes filtration plant | (yr) | 0.01 | Divided flow through wetland by surface area and depth. |

Table 6-3

Beef and Dairy Cattle Crop Ingestion Rates[a]

Norlite Corporation, Light Aggregate Facility

Cohoes, NY

| Crop | Ingestion Rate (kg/day) | |
|---|---|---|
| | Beef Cattle | Dairy Cattle |
| Alfalfa/Hay | 5.0[b] | 10[b] |
| Pasture Grass | 1.25 | 2.5 |
| Corn Silage | 2.5 | 5.0 |
| **Total Feed** | **8.75** | **17.5** |

a Source: NYSDOC (1993) and NYS Agricultural Statistics Service (1992).

b In accordance with NYSDOH (1993), it was assumed that beef and dairy cattle do not consume locally-grown grain, and the alfalfa/hay ingestion rate was adjusted upwards.

Table 6-4
Summary of Potential Exposure Assumptions
Norlite Corporation Light Aggregate Facility
Cohoes, NY
(Base case)

| Parameter | Resident Child | Resident Adult | Subsistence Farmer | Subsistence Fisher | References |
|---|---|---|---|---|---|
| Parameters Used in the Inhalation Pathway | | | | | |
| Exposure Duration (yr) | 2.5 | 30 | 40 | 30 | (d,h) |
| Inhalation Rate (m^3/day) | 8.6 | 20 | 20 | 20 | (c,b) |
| Body Weight (kg) | 13.2 | 70 | 70 | 70 | (d,h) |
| Parameters Used in the Soil Ingestion Pathway | | | | | |
| Exposure Frequency (days/365 days) | 130 | 44 | 180 | 44 | (d,h,b) |
| Exposure Duration (yr) | 2.5 | 30 | 40 | 30 | (d,h) |
| Soil Ingestion Rate (mg/day) | 200 | 100 | 100 | 100 | (b,d) |
| Body Weight (kg) | 13.2 | 70 | 70 | 70 | (d,h) |
| Parameters Used in the Produce Ingestion Pathway [(1)] | | | | | |
| Exposure Duration (yr) | 2.5 | 30 | 40 | 30 | (d,h) |
| Produce Consumption Rate (Wet Weight)(g/day) | | | | | |
| Leafy Crops** | 3 | 16 | 30.7 | 16 | (d) |
| Exposed Crops** | 7 | 37.3 | 71.5 | 37.3 | (d) |
| Root Vegetable | 10.9 | 58 | 111.2 | 58 | (d) |
| Wet to Dry Weight Conversion Factor | | | | | |
| Leafy Crops** | 0.066 | 0.066 | 0.066 | 0.066 | (g) |
| Exposed Crops** | 0.126 | 0.126 | 0.126 | 0.126 | (g) |
| Net DW Above-Ground Vegetables (incl. % use) | 3 | 16 | 30.8 | 16 | (d,i) |
| Net FW Below-Ground vegetables ( incl. % use) | 2.4 | 11.6 | 22.2 | 11.6 | (d,i) |
| % Local Crop Use | 10 | 52 | 100 | 52 | (d) |
| Body Weight (kg) | 13.2 | 70 | 70 | 70 | (d,h) |
| Parameters Used in the Beef Pathway | | | | | |
| Exposure Duration (yr) | 2.5 | 30 | 40 | 30 | (d,h) |
| Beef Consumption Rate (kg/day) | 0.02 | 0.051 | 0.051 | 0.051 | (d) |
| Local Beef Consumption Factor | 0.1 | 0.1 | 1 | 0.1 | (f) |
| Body Weight (kg) | 13.2 | 70 | 70 | 70 | (d,h) |
| Parameters Used in the Dairy Pathway | | | | | |
| Exposure Duration (yr) | 2.5 | 30 | 40 | 30 | (d,h) |
| Dairy Products Consumption Rate (kg/day) | 0.418 | 0.283 | 0.283 | 0.283 | (d) |
| Local Dairy Consumption Factor | 0.1 | 0.1 | 1 | 0.1 | (f) |
| Body Weight (kg) | 13.2 | 70 | 70 | 70 | (d,h) |
| Parameters Used in the Fish Ingestion Pathway | | | | | |
| Exposure Duration (yr) | 2.5 | 30 | 40 | 30 | (d,h) |
| Fish Consumption Rate (kg/day) | 0.0100 | 0.0180 | 0.018 | 0.06 | (a,b,d,e,h,i) |
| Local Fish Consumption Factor | 0.25 | 1 | 1 | 1 | (a,f,i) |
| Body Weight (kg) | 13.2 | 70 | 70 | 70 | (d,h) |
| Parameters Used in the Drinking Water Pathway | | | | | |
| Exposure Duration (yr) | 2.5 | 30 | 40 | 30 | (d,h) |
| Water Ingestion Rate (l/day) | 1 | 2 | 2 | 2 | (d) |
| Body Weight (kg) | 13.2 | 70 | 70 | 70 | (d,h) |
| Parameters Used in the Mother's Milk Ingestion Pathway | | | | | |
| Exposure Duration (yr) | 1 | NA | NA | NA | (d) |
| Fraction Fat in Adult Female | NA | 0.3 | NA | NA | (d) |
| Fraction Fat in Breast Milk | NA | 0.04 | NA | NA | (d) |
| Breast Milk Consumption Rate (kg/day) | 0.8 | NA | NA | NA | (d) |
| Fraction of Compound Distributed to Fat | NA | 0.8 | NA | NA | (d) |
| Body Weight (kg) - Infant | 8 | NA | NA | NA | (d) |
| Body Weight (kg) - Mother | NA | 70 | NA | NA | (d) |

Notes:
NA - Not Applicable.
* - For all pathways (except for soil ingestion) an exposure frequency of 350 days per year is assumed.
** - Ingestion rate for above-ground vegetable = ingestion rate for leafy crops + ingestion rate for exposed crops.
(1) - For leafy and exposed crops, the produce consumption rates were converted to dry weight. For root vegetables, the produce consumption rates were not converted to dry weight.
(a) - Best professional judgement.
(b) - U.S. EPA (1994c and 1998).
(c) - These values have been converted from inhalation rates of 8.6E+3 l/day (child) and 2E+4 l/day (adult) provided by NYSDOH (1991).
(d) - NYSDOH (1991).
(e) - The fish ingestion rate assumed for the child was derived by prorating the adult fish ingestion rate (NYSDOH, 1991).
(f) - NYSDOH (1993).
(g) - U.S.D.A. (1993 and 1994)
(h) - NYSDOH & U.S. EPA comment agreement: 2/28/02
(i) - U.S. EPA Exposure Factors Handbook (1987)
Source: ENSR 2002

R.N.: 2

Table 6-5
Summary of Potential Exposure Assumptions
Norlite Corporation Light Aggregate Facility
Cohoes, NY
(EPA "Alternate Case")

| Parameter | Resident Child | Resident Adult | Subsistence Farmer | Subsistence Fisher | References |
|---|---|---|---|---|---|
| Parameters Used in the Inhalation Pathway | | | | | |
| Exposure Duration (yr) | 6 | 30 | 40 | 30 | (b,h) |
| Inhalation Rate (m^3/day) | 7.2 | 15 | 15 | 15 | (b) |
| Body Weight (kg) | 15 | 70 | 70 | 70 | (b,h) |
| Parameters Used in the Soil Ingestion Pathway | | | | | |
| Exposure Frequency (days/365 days) | 350 | 350 | 350 | 350 | (b,h) |
| Exposure Duration (yr) | 6 | 30 | 40 | 30 | (d,h) |
| Soil Ingestion Rate (mg/day) | 200 | 100 | 100 | 100 | (b,d) |
| Body Weight (kg) | 15 | 70 | 70 | 70 | (b,h) |
| Parameters Used in the Produce Ingestion Pathway (1) | | | | | |
| Exposure Duration (yr) | 6 | 30 | 40 | 30 | (b,h) |
| Produce Consumption Rate (Wet Weight)(g/day) | | | | | |
| Leafy Crops** | | | | | |
| Exposed Crops** | | | | | |
| Root Vegetable | | | | | |
| Wet to Dry Weight Conversion Factor | | | | | |
| Leafy Crops** | | | | | |
| Exposed Crops** | | | | | |
| Net DW Above-Ground Vegetables (incl. % use) | 3.9 | 13.2 | 52.9 | 13.2 | (b,d,i) |
| Net FW Below-Ground vegetables ( incl. % use) | 6.3 | 20 | 80 | 20 | (b,d,i) |
| % Local Crop Use | 25 | 25 | 100 | 25 | (b,i) |
| Body Weight (kg) | 15 | 70 | 70 | 70 | (b,h) |
| Parameters Used in the Beef Pathway | | | | | |
| Exposure Duration (yr) | 6 | 30 | 40 | 30 | (d,h) |
| Beef Consumption Rate (kg/day) | 0.0077 | 0.0798 | 0.0798 | 0.0798 | (b) |
| Local Beef Consumption Factor | 0.25 | 0.25 | 1 | 0.25 | (i) |
| Body Weight (kg) | 15 | 70 | 70 | 70 | (d,h) |
| Parameters Used in the Dairy Pathway | | | | | |
| Exposure Duration (yr) | 6 | 30 | 40 | 30 | (d,h) |
| Dairy Products Consumption Rate (kg/day) | 0.279 | 0.5894 | 0.5894 | 0.5894 | (d) |
| Local Dairy Consumption Factor | 0.25 | 0.25 | 1 | 0.25 | (i) |
| Body Weight (kg) | 15 | 70 | 70 | 70 | (d,h) |
| Parameters Used in the Fish Ingestion Pathway | | | | | |
| Exposure Duration (yr) | 6 | 30 | 40 | 30 | (d,h) |
| Fish Consumption Rate (kg/day) | 0.0114 | 0.0819 | 0.0819 | 0.0819 | (a,b,d,e,h,i) |
| Local Fish Consumption Factor | 0.25 | 0.25 | 0.25 | 1 | (a,f,i) |
| Body Weight (kg) | 15 | 70 | 70 | 70 | (b,h) |
| Parameters Used in the Drinking Water Pathway | | | | | |
| Exposure Duration (yr) | 6 | 30 | 40 | 30 | (b,h) |
| Water Ingestion Rate (l/day) | 0.67 | 1.4 | 1.4 | 1.4 | (b) |
| Body Weight (kg) | 15 | 70 | 70 | 70 | (d,h) |
| Parameters Used in the Mother's Milk Ingestion Pathway | | | | | |
| Exposure Duration (yr) | 1 | NA | NA | NA | (b,d) |
| Fraction Fat in Adult Female | NA | 0.3 | NA | NA | (b,d) |
| Fraction Fat in Breast Milk | NA | 0.04 | NA | NA | (b,d) |
| Breast Milk Consumption Rate (kg/day) | 0.8 | NA | NA | NA | (b,d) |
| Fraction of Compound Distributed to Fat | NA | 0.8 | NA | NA | (b,d) |
| Body Weight (kg) - Infant | 8 | NA | NA | NA | (b,d) |
| Body Weight (kg) - Mother | NA | 70 | NA | NA | (b,d) |

Notes:
NA - Not Applicable.
* - For all pathways (except for soil ingestion) an exposure frequency of 350 days per year is assumed.
** - Ingestion rate for above-ground vegetable = ingestion rate for leafy crops + ingestion rate for exposed crops.
(1) - For leafy and exposed crops, the produce consumption rates were converted to dry weight. For root vegetables, the produce consumption rates were not converted to dry weight.
(a) - Best professional judgement.
(b) - U.S. EPA (1994c and 1998)
(c) - These values have been converted from inhalation rates of 8.6E+3 l/day (child) and 2E+4 l/day (adult) provided by NYSDOH (1991).
(d) - NYSDOH (1991)
(e) - Fish ingestion rates for residents/farmers are 25% of the subsistence adult fisher and child default ingestion rates (ref i).
(f) - NYSDOH (1993).
(g) - U.S.D.A. (1993 and 1994)
(h) - NYSDOH & U.S. EPA comment agreement: 2/28/02
(i) - U.S. EPA Exposure Factors Handbook (1987)
Source: ENSR 2002 R.N.: 3b

# 7.0 RISK CHARACTERIZATION

Risk characterization is the step in the risk assessment process that combines the results of the exposure assessment and the dose response assessment for each COPC to estimate the potential for carcinogenic and noncarcinogenic human health effects from chronic exposure to all subject compounds. Although the order of combining the information may not affect the final results, the U.S. EPA (1998a) and NCDEHNR (1997) agree in suggesting certain procedures that help clarify key relationships that make identification of exceptional risks and the opportunities for controlling them a bit easier. The procedure starts with calculating daily total intakes for human receptors for animals that may be part of the food chain. Intake calculations also consider exposures by inhalation or inadvertent ingestion of soil. Every COPC and exposure route is evaluated and summed to estimate the total amount taken into the body on a daily basis (typically in mg/day) for each identified exposure route.

The next step is to sum these daily intakes for each chemical and multiply the result by the dose response factor that has been published for that COPC. That result is the chemical specific risk or Hazard Quotient for each exposure route, depending upon whether or not the COPC is potentially carcinogenic in its effects. The cancer risk for each potential carcinogen is calculated [using the equation listed in Table C.1.7 (page C-10) in NCDEHNR (1997), similarly cited in U.S. EPA (1998a)]. The noncancer Hazard Quotient (HQ) for each noncarcinogen is similarly calculated [using the equation listed in Table C.1.8 (page C-11) in NCDEHNR (1997), as cited in U.S. EPA (1998a)]. Next the results are been summed across the various exposure pathways for each chemical. The final step is to sum those risks or HQs across all of the COPCs that have a similar type of toxic effect to get either a total cancer risk, or a total Hazard Index (HI) value.

Detailed results for the “Base Case”, defined in Section 6, are presented in full in this section. The initial results tables in this section have been organized to show the detailed accounting for risks from each exposure pathway for each individual COPC (Tables 7-1 through 7-4). For each of these table additional rows are included to present the fraction of the total hazard index benchmark and the total carcinogenic risk benchmark, respectively, for each COPC and for the total of all COPCs. This makes it easier to spot those COPCs that contribute most significantly to the total risk levels for each exposure scenario. These sets of tables are immediately followed by summary tables that show the total risk for all COPCs stratified by exposure pathway (e.g., inhalation, fish ingestion, etc.) in Table 7-5 and 7-6 for the "Base Case". (A comparable set of COPC-specific and exposure pathway summary table are presnted for the “EPA Alternative Case” in Appendix I).

Presented next are the results of two special analyses: (1) dioxin in mothers' breast milk, followed by (2) predictions of lead concentrations in various environmental media with resulting projections of equilibrium blood lead content in children. These are followed in turn by the results of the short-term and long-term screening analyses requested by NYSDEC, Tables 7-9 and 7-10, respectively. Finally a summary table (Table 7-11) is included to introduce the Uncertainty section of this risk characterization section. It presents an overview of all of the risk and HI values for all of the receptors, but the table is divided into two portions. The upper portion contains the results for the primary "Base Case". The lower portion presents the "EPA Alternative case summary. Detailed results for the "EPA Alternative Case" are presented in Appendix I in a format that is exactly parallel to that of Table 7-1 through 7-8. The detailed tables for the "EPA Alternative Case" reside in Appendix I, but the summary presented in Table 7-11 provides a sufficient basis for discussing the most important comparative results in the main sub-sections of this chapter, as well as in the Uncertainty discussions presented in Section 7.4.

Results are presented and discussed separately in sections 7.1 and 7.2. Each of these sections summarizes the risk characterization for each receptor scenario. The focus of Section 7.1 is a review of results of the carcinogenic risk characterization. For Section 7.2, the focus is shifted to the results of the noncarcinogenic risk characterization.

Section 7.3 presents the short-term and long-term screening risk characterizations requested by the NYSDEC permitting procedure. These results are summarized in Tables 7-9 and 7-10.

Section 7.4 is devoted to a review of the inherent uncertainties in the risk assessment calculation process. Section 7.4 also provides specific examples of the potential effects upon risk results by discussing the differing assumptions included in the "EPA Alternative Case" defined in Section 6.

For clarity, a simple numbering convention has been adopted to make it easier to recognize cases that are, or should be, similar. Table numbers for results include an "a" to refer to the primary location set, which includes the residence located just north of the Norlite site, as described in Sections 2 and 6. Of the two farmer locations evaluated, the one designated in the tables with an "a" is the closest farm. It is assumed to have beef that are utilized directly by the "subsistence farmer." This farmer is also assumed to live and farm there for 40 years. For the "Base Case," the beef and milk from the most exposed farm are also assumed to constitute 10% of the diet for these ingredients in each resident's diet. Each resident's diet also assumes that 100% of the produce portion comes from his or her own backyard garden, rather than from one of the more distant farms. For the "EPA alternative Case," 25% of each resident's beef and milk diet are assumed to come from the subsistence farm.

The second set of tables is designated with a "b" and refers to a second residential location to the south of the Norlite facility boundary. This "b" designation is also used for the listings for the dairy farmer who occupies the second closest farm, which is also to the west of the Norlite site, just south of the first farm (See Figure 2-3).

There is assumed to be only one "subsistence fisher" location and thus the results for this individual appears in a single set of tables. The resident who is designated as a subsistence fisher is assumed to live at the location of the "northern" resident and fish regularly at the water body identified as a potential source of fish for a subsistence fisher (the Erie Canal at Canal Park). This fisher is assumed to ingest 100% of his or her fish intake from that specific body of water. All caught fish are assumed to be in equilibrium with concentrations that have built up in their environment for 30 years of plant operation. The average concentrations in the environment over this 30-year period would likely be between 50 and 60% of those values; this represents an additional factor of conservatism in the estimates of risk or hazard index associated with fish ingestion. Evaluated residents and subsistence fishers are assumed to persist in these same activity patterns for 30 years. Farmers are assumed to fish and to continue their subsistence farming in the same location for 40 years.

## 7.1 Carcinogenic Risk Characterization

The purpose of carcinogenic risk characterization is to estimate the potential risk, over and above the background cancer risk rate, that a hypothetical receptor individual will develop cancer in his or her lifetime as a result of kiln-related exposures to COPCs in various environmental media. This risk is a function of the exposure and assimilated dose for a compound and the Cancer Slope Factor (CSF) for that compound. The total cancer risk for a receptor was calculated by summing the chemical-specific cancer risks.

Typically, U.S. EPA considers cancer risks between 1x10-4 to 1x10-6 to represent an acceptably insignificant range of risks (U.S. EPA, 1989b). However, for lightweight aggregate kiln facilities, U.S. EPA recommends an initial comparison with an acceptable target level of 1x10-5 (U.S. EPA, 1994a and 1998a), suggesting that if total risk is found to be below that level, no further analysis is required. U.S. EPA (1994a and 1998a) further states that the selection of this level (rather than a cancer risk level of 1x10-4) was done in part to account for exposure to background levels (including indirect exposures from other combustion units). In this case, background is defined as those exposures in drinking water, food and air attributable to sources other than the lightweight aggregate kilns being assessed. Incremental risks for potentially fatal cancer development for each receptor scenario are discussed below.

A comparison of model input assumptions between Tables 6-4 and 6-5 indicate the principal differences that lead to higher carcinogenic risk level predictions in the EPA "Alternate Cases". These included, in approximate order of decreasing importance: (a) assuming a 1 cm vs. 5 cm mixing depth in soils (ingested by child); (b) differences in ingestion rates for fish and for vegetables grown below ground contribute to large differences in predictions of dioxin/furan risk contributions; and (c) differing durations of exposure for the Base Case vs 350 days/yr for the "Alternate Case. The impact of the several more conservative assumptions included in the Alternate Case specification is moderated somewhat by two factors that result in slightly lower risk calculations. These are the assumed inhalation rates, a significant factor for both metals and dioxins. The Alternative case assumes about 75 % of the inhalation rate used in the base cases.

In addition, for tilled soil mixing depth, a factor affecting calculated root vegetable concentrations of COPCs, the Alternative case assumes a 20 cm mixing depth, compared to a 15 cm depth used for the base case. For each of these situations the larger quantities lead to about 33% higher risks individually, or approximately 77% increas when combined. For child exposure scenarios the different number of years of childhood (6 yr. vs. 2.5 yr in the Base Case) can also more than double the incremental risk calculated, in some cases effectively cancelling the previously described 177% factor.

The Base Case was originally designed by NYSDOH to provide risk estimates that would be closer to a normal range of exposure, but still conservative. The Alternative case includes several independent assumptions about upper limits of exposure that are furhter assumed to occur simultaneously. This would make the entire combination of conditions a very rare situation, one that is much more likely to overestimate the risks that would be experienced by nearby residents. Although the following discussions do not compare each scenario with that comparable case presented in Appendix I, the underlying bases for the differences in estimates can best be understood by considering the numerous factors described in the Uncertainty discussion in Section 7.4 below.

### 7.1.1 Child Resident

The chemical-specific cancer risks associated with Child Resident exposures at each of the two residential receptor locations to COPCs emitted from the Norlite kilns facility are shown in Tables 7-1a and b. The total cancer risk rates, based on the sum of risks calculated for each exposure pathway is also shown in the Risk Summary Tables 7-5a and b for each residential location scenario. The total calculated cancer risk for this particular type of receptor is $3.61 \times 10^{-7}$ .for the primary residential location (to the north) and $5.18 \times 10^{-8}$ for the secondary alternative residential location (to the south). About 27% of the higher risk value is associated with dioxin/furan exposure, and about 10% of that is calculated as due to consumption of fish from Wright/Bradley Lake. About 23% is from chromium (VI), and 14% from arsenic inhalation, with most of the rest due to various organic vapors (see Tables 7-1a and 7-1b). However, both of the total calculated cancer risk rates are far below (<4% of) the U.S. EPA recommended screening target risk level of $1 \times 10^{-5}$.

Risk levels predicted for the EPA Alternative Case scenarios for these same Child receptor locations yielded higher estimates due to several differences in modeling assumptions. (See Uncertainty Section 7.4 and Appendix I tables). Although these predictions for the Alternate cases are significantly higher, they are still within the health benchmark criteria noted above.

### 7.1.2 Adult Resident

The chemical-specific cancer risk associated with Adult Resident exposure at each of the evaluated locations is shown in Tables 7-2a and b. The total cancer risk, again based on the sum of all exposure pathways is also shown in Risk Summary Tables 7-5a and b. The total cancer risk for this receptor is $2.08 \times 10^{-6}$ at the primary northern residence scenario location and $3.02 \times 10^{-7}$ at the secondary location. Exposure to dioxins and furans associated with inhalation and the assumed level of recreational fish consumption lead chromium (VI) and arsenic inhalation risk contributions by a small margin, but together they add up to only about 11% of the EPA benchmark. The remainder is contributed by inhalation and ingestion of traces of organics, like pentachlorophenol, 1,3 butadiene, and hexachlorobenzene, in vegetables from the local area. The total risk level for the highest RME resident is about 20% of the U.S. EPA health benchmark of $1.0 \times 10^{-5}$.

For the Adult Residents at both locations, the comparative predictions made for the Alternate cases (See Tables I-2a and I-2b) are higher by factors of less than two for the northern residence to almost four for the southern residence, but both are well within the EPA risk benchmark.

### 7.1.3 Subsistence Farmer

The chemical-specific cancer risk associated with the Subsistence Farmer's exposure to COPCs emitted from the Norlite kilns facility is shown in Table 7-3a and b. The total cancer risk is also shown in the Risk Summary Tables 7-5a and b. The total cancer risk for the beef farm receptor is $1.15 \times 10^{-6}$. For the dairy farm, the predicted value is $1.06 \times 10^{-6}$, slightly lower. These total cancer risks, due primarily to dioxins and furans are both well within the U.S. EPA recommended target risk level of $1 \times 10^{-5}$ by factors of 8 to 10, respectively. Although the inherent margin of uncertainty of in the risk calculation model, and the potential variability introduced by alternative assumptions, may be a factor of two to three (see "EPA Alternative Case summary in Table 7-11, and Appendix I), these risk predictions remain well below the recommended health benchmark. For the "Base Case," the total risk for the northern Beef Farmer resident is less than 21% of the benchmark; while, for the "EPA Alternative Case (Table I – 3a), it is predicted to be slightly less that 35% of the $1 \times 10^{-5}$ risk benchmark. Similar ratios of results are shown for the southern location of the Dairy Farmer (Table 1 – 3b).

### 7.1.4 Subsistence Fisher

The chemical-specific cancer risk associated with the Subsistence Fisher's exposure to COPCs emitted from the Norlite kilns facility is shown in Table 7-4. The total cancer risk is also shown in Risk Summary Table 7-5a. The total cancer risk for this receptor is now $2.15 \times 10^{-6}$. Once again, about 25% is due to trace levels of dioxins and furans, 22% is due to chromium (VI) and 14% is due to arsenic, with the rest due to various organic vapors. However, the total is almost a factor of 5 below the U.S. EPA recommended target risk level of $1 \times 10^{-5}$. The total includes small contributions from pentachlorophenol and hexachlorobenzene and other organic vapors. About 40% of the dioxin and furan contribution comes from ingestion of fish, but almost none of the remaining risk to this fisher comes from that part of the diet. Most of the risk is due to inhalation exposure. The subsistence fisher is exposed to lower risk levels from dioxins and furans than the recreationally active resident considered above.

For the Alternative Case, increased surface soil concentrations (due to the assumed mixing depth of 1 cm) eroding higher concentrations of COPCs (including dioxins and furans and other SVOC organics) into waterways, as well as differences in dietary intake of root vegetables combine to yield higher predictions of risk for the subsistence Fisher. However the total risk predicted in the Alternative case remains about 40% of the EPA benchmark.

In summary, all exposure scenarios, including those identified as EPA "Alternative Cases", result, in total risk predictions that are well within (less thatn 40% of) the EPA recommended risk benchmark of $1 \times 10^{-5}$. All of these totals were driven by the predicted exposures associated with potential ingestion or inhalation of trace levels of dioxins and furans or residual metals not removed by the air cleaning systems. The Base Case analysis assumptions were designed to assure health-protective results. However, the reinforcing comparabtive results of the Alternative Cases indicates that the residual risks are indeed likely to be quite low, a further reassurance.

## 7.2 Noncarcinogenic Risk Characterization

Noncancer risks are estimated by calculating hazard quotients (HQs) for each compound. The HQ for a specific compound is the average daily dose of that compound divided by the RfD for that compound The total hazard index (HI) for a receptor was calculated by summing the chemical-specific HQs. For noncarcinogenic effects, the HI should be summed for only those chemicals that have the same toxicity endpoints (U.S. EPA, 1989b), to be most accurate. The toxic endpoint is defined as the most sensitive noncarcinogenic health effect used to derive the RfD or other suitable dose-response value (U.S. EPA, 1989b). The results for noncarcinogenic risks for both the "Base Case" and the "EPA Alternative Case" follow the same pattern as that presented for the carcinogenic risks, since they are tracked in the same spreadsheet tables.

In this MRA's risk characterization, however, the HQs have been summed regardless of the similarity of their toxicity endpoints, as an initially conservative approach. Although this procedure is likely to overestimate the true risk, there is no need to perform an advanced analysis based on toxicity endpoint if the summed HI does not exceed U.S. EPA criteria. If this total HI were to exceed U.S. EPA criteria, then the HI can be reanalyzed so that only those compounds exhibiting the same (or similar) toxicity endpoints would be evaluated collectively. (When a single COPC and pathway dominates the HI calculation, as is the case here, it is not generally useful to refine the HI analysis by considering varying endpoints).

Typically, U.S. EPA considers an HI of 1 to represent an insignificant risk level (U.S. EPA, 1989b). However, for lightweight aggregate kiln and other facilities using fuels containing hazardous waste constituents or derivatives, U.S. EPA recommends comparing against a preferred target level of 0.25 (U.S. EPA, 1994a, 1998a). U.S. EPA states that the selection of this lower level is to account for exposure to other background levels (including indirect exposures from other combustion units). In this case, background is defined as those exposures in drinking water, food and air attributable to all sources other than the lightweight aggregate kilns being assessed. HI values for each receptor are discussed below.

Similar to the situation described above for carcinogenic risks, the differences in modeling assumptions governing exposure scenarios outlined in Tables 6-4 and 6-5 also affect predictions of noncarcinogenic risks. In addition to the factors noted above (Section 7.1), an additional factor that influences the difference between risks for adults and those for children is the lower body weight of the child. The Base Case and the Alternative Case differ in their estimates of the average body weight by less than 12%; thus this factor does not explain much of the differences noted in between the case predictions. Differences in assumed breathing rates are also less than 20%. Exposure duration for inadvertent soil ingestion while playing contributes another 30 %, but the primary factors of importance are differences in dietary assumptions. The Base Case is founded upon data specific to new York State; the EPA case recommends an upper limit based upon nationally diverse diets. The result, as noted below, generally indicates about a factor of three higher estimates in the Alternative Cases.

### 7.2.1 Child Resident

The chemical-specific HI levels predicted for the Child Resident's exposure at both residential locations to COPCs emitted from the Norlite kilns facility are shown in Tables 7-1a and b. The total HI is also shown in the Risk Summary Tables 7-6a and b. Based on the currently revised modeling analysis, the total HI for the primary child resident receptor is predicted to be close to 0.23 for the primary resident location (to the North) and 0.18 for the secondary resident location (to the South). Both of these calculated hazard index totals are clearly dominated (>99%) by the risk predicted by the assumed ingestion rates for fish from the source of recreationally caught fish, the Wright and Bradley Lakes. In this case, all of the other chemicals contributing anything to the total HI value are completely overshadowed by this one predicted contribution, so there would be no benefit to examining the issue of differing target organs. These predictions are very close to the EPA recommended benchmark of HI = 0.25. If the "EPA Alternative case is considered, these predictions rise to 0.61 and 0.56, respectively, values that are a bit more than double that benchmark. However, as noted in Section 5 above, and at the beginning of this section (and in EPA, 1998a), even when predicted HI levels are somewhat above 1.0 (e.g. 1 to 2), it is not expected that result in demonstrable adverse effects. That is due to the inherent safety factors always included in the derivation of RfD values used in the HI calculations. The fact that these predictions are close to the benchmark means that emissions of mercury need to be carefully reviewed in the short term, and carefully managed in the long term.

There are also several assumptions included in the calculation of the predicted risk levels that may require re-examination. These assumptions may not realistically portray the concentration in the average fish available to be caught in lakes that are regularly stocked and fished. The average concentration in the water, sediment and fish over the 30-year period assumed in the MRA modeling would be less than 60% of the 30-year maximum. Fish capture studies at many lakes have shown a lognormal distribution of concentrations in fish, with the majority of the fish containing about ¼ the methyl mercury levels that the maximum fish contained. These factors are likely to offset some of the other uncertainty factors in modeling that could suggest HI levels higher than the "Base Case" results.

### 7.2.2 Adult Resident

The chemical-specific HI associated with the Adult Resident's exposure to COPCs emitted from the Norlite kilns facility is shown in Table 7-2a and b. The total HI is also shown in the Risk Summary Tables 7-6a and b. The total HI for the maximum exposure scenario location (northern resident) is 0.29 and for the secondary southern location residential receptor 0.24. For the southern location, virtually all of the HI value is from recreationally caught fish from Wright/Bradley Lake. For the northern resident location, about 95% is from recreationally caught fish, with the small remainder from inhalation of trace metals (e.g., nickel) and a few minor contributions from organic vapors. For the "EPA Alternative Case" these HI estimates rise to 0.91 and 0.86, respectively. However, If the average adult were to ingest only 25% of caught fish from this particular location (similar to the rate assumed in the Base Case), the total hazard index for the maximum "EPA Alternative Case resident scenario would fall to less than 0.25 for both of these RME locations.

Thus, the total HI values for either the "Base Case" or the "EPA Alternative Case" are both below the HI value of 1.0 traditionally used as a risk management benchmark, but the EPA scenario is greater than the new U.S. EPA target HI of 0.25. With more realistic average ingestion rates of fish from that location, or with correction for the actual distribution of mercury body burdens applied to the population of fish available to be caught, all results would very likely be below the screening target value.

### 7.2.3 Subsistence Farmer

The chemical-specific HI associated with the two Subsistence Farmer exposure scenarios are shown in Table 7-3a and b. The total HI is summarized in the Risk Summary Tables 7-6a and b. The total HI for the beef farmer and the dairy farmer scenarios are virtually identical with those obtained for the two resident scenarios just reviewed, with the both farmer scenarios producing 0.24 as a total HI for the "Base Case" and 0.87 for the "EPA Alternative Case". These values are slightly lower than those for the northern resident because that resident gains a small extra contribution from inhalation of nickel and organic emissions. Once again the total hazard indexes for all of these case scenarios would be reduced below the EPA target HI of 0.25, if ingestion of 25% rather than 100% of the caught fish were from the most affected lakes, or the fish population characteristics were accounted for. However, under the current assumptions, the "Base Case" predicts an HI lower than the HI = 0.25 benchmark, and the "EPA Alternative Case predicts values above that benchmark but below HI = 1, often used as an alternative benchmark.

### 7.2.4 Subsistence Fisher

The chemical-specific HI values associated with the Subsistence Fisher scenario exposure to COPCs are shown in Table 7-4. The total HI is also summarized in the Risk Summary Table 7-6a. The total HI for this receptor is 0.21. This total HI is lower than for the other types of receptor, and also below the U.S. EPA target HI of 0.25. However, the contribution to the total HI from methyl mercury in fish (derived from total mercury emissions) is also nearly 100% of the total. The "EPA Alternative Case," once again predicts an increase of about a factor of four to an HI = 0.83. This difference between the "EPA Alternative Case and the "Base Case" can be attributed almost entirely to the difference in the assumptions made about the soil mixing depth for the mercury vapors depositing on foliage and soils in the area. The base case assumes that this material mixes into the top 5 cm of soil and the "EPA Alternative Case" assumes that it mixes into the top 1 cm of soil. The fact that erosion isn't 100% effective in moving this material into the sediments and water bodies explains why the ratio of the two sets of hazard indices are less that 5:1.

Curiously, in spite of the much larger intake of fish for the subsistence fisher, the "subsistence" fisher's annual exposure to organic forms of mercury in fish caught in the Erie Canal, which is fed by the Mohawk River and its large watershed, is calculated to be less than the predicted HI level as that for the residents and farmers. According to the modeling results, the fact that there is a much larger current in the Erie Canal and Mohawk River more than offsets the size of the watershed that is washed into these water bodies. This does raise a suspicion that the modeling of the predicted mercury concentrations in the Wright Bradley Lakes and the Erie Canal may vary significantly from the actual concentrations of methyl mercury that would be found it fish from both water bodies were measured under controlled conditions. In this case the continuing uncertainty in the representativeness of the fate and transport model (See Section 7.4) could be a significant issue. However, there is little measurement data available to support an alternative conclusion.

In summary, all exposure scenarios, under the alternative assumptions included in the "EPA Alternative Case" results, yielded total hazard index values for non-cancer risks that are above the U.S. EPA target value of 0.25. All of these totals were substantially driven by the exposures associated with potential ingestion of methyl mercury from the fish pathway. In all cases the assumed fish consumption rates may be appropriate for avid ("subsistence") fisherman, but may be a factor of 2 to 4 higher than that observed for the majority of the populace. Correcting the modeling predictions with information on the distribution of methyl mercury concentrations that represent the current state of equilibrium of the fish population available to be caught by recreational fishers would significantly improve the reliability of these modeling projections.

### 7.2.5 Dioxins/Furans in Mothers' Milk

To address potential concerns about the concentrations and subsequent doses of dioxins and furans that could be added to the current background levels found in the breast milk of mothers that live in the vicinity of this facility, the average daily doses of these COPCs for a breast-feeding infant were calculated. It was assumed that the mother could be one of the five adult receptors described previously in this report.

Review of results presented in Table 7-7a and b indicates that the maximum average daily dose of dioxins and furans for a breast-feeding infant is predicted for the North Resident scenario. All but the

South residents are predicted to have average daily intake contributions within a factor of two of the maximum. However the maximum value calculated is just above 0.4 pg/kg-BW for the maximum location. The range (see Table 7-7a and 7-7b) is 0.15 to 0.43 pg/kg-BW. This range of predicted exposure rates is well below (< 1.0 %) of the national average background exposure level of 60 pg/kg-day for nursing infants, the level identified as a target range by the U.S. EPA (U.S. EPA, 1998c). The predicted maximum concentration in breast milk is also a factor of 2 to 6 lower than the 1 to 3 pg/kg-day range estimated by the U.S. EPA for current background exposure in the U.S. (U.S. EPA, 1998c). All other infants within the Norlite study area would be expected to receive a smaller dose than this maximum estimate and thus would also be well below the national average background exposure levels cited above.

### 7.2.6 Significance of Exposure to Lead

As discussed in Section 5 of this report, U.S. EPA guidance (U.S. EPA, 1998a) recommends the use of the IEUBK model for evaluating Lead as a COPC in combustion related emissions. Experience with using this model to evaluate potential risk from combustion facilities has revealed that environmental media concentrations predicted from fate and transport modeling (described in Sections 3 and 6) are generally so low that it is not feasible to input these values to the IEUBK model available to the general public. As can be seen in Table 7-8a and 7-8b, this is also the case for the Norlite facility.

Therefore the risk characterization for this site utilizes an approach recommended by NYSDOH (1993). The method uses slope factors to predict maximum blood concentrations from long-term intake of concentrations of lead calculated for air, drinking water, diet, and ingested soil. The references for the particular slope factors are given in Table 7-8a and 7-8b. Table 7-8a presents results for the Child resident at the northern location and Table 7-8b shows the comparable results for the Child Resident at the southern location. When compared, the results indicate a range of about a factor of five between the highest and the second highest value.

The potential health effects of concern for lead exposures are impaired mental and physical development in young children. Available evidence indicates that a threshold for these effects occurs at a level between 10 and 15 ug/dL in the blood. Although there remains some concern for whether there are any detectable effects at somewhat lower levels, regulatory agencies such as the U.S. EPA and the Centers for Disease Control (CDC) have designated 10 ug/dL as the lowest "level of concern". The CDC has not stated that there are any demonstrable adverse effects at or very near this level.

Tables 7-8a and 7-8b show that the predicted contributions to blood concentrations of lead that could be associated with Norlite emissions are extremely low. The maximum total blood concentration calculated in Table 7-8a is $8.8 \times 10^{-5}$ ug/dL. This level is a factor of 100,000 lower that the CDC level of concern. The total concentration in blood shown in Table 7-8b is eight times lower than the maximum RME value. Therefore, exposure to lead emissions from the Norlite facility is of no significant concern. Because these levels were so low,. no separate analysis was performed for the "EPA Alternative

Case"; based on the ratios demonstrated for the other comparisons, even if the values were higher by a factor of 4 to 5, they would not produce any concern.

### 7.3 Risks Due to Short-Term Exposure and Screening for Long-Term Exposure

In addition to the formal analyses of chronic risks discussed above, NYSDEC has updated (July 12, 2000) its set of Guidelines for the Control of Toxic Air Contaminants (DAR-1) --superceding the "Air Guide – 1" document previously used for screening analysis of both short-term and long term exposures. The first set of concentration comparison criteria listed in the guidance tables addresses short-term in order to protect the public from related short-term toxic effects (such as respiratory or eye irritation health effects). Also in this guidance document is a listing of long-term exposure concentration criteria. Some of these are based upon results of previous risk analyses, and some are based on adjusting long term occupational exposure limits with safety factors in order to protect more susceptible members of the public.

For the present risk analysis, the original protocol only addressed the short-term screening level comparison as a requirement. However, the comparisons have been run for both short-term and long-term exposure concentrations for all of the chemicals species for which measurement data were available from either the original April 1999 Trial Burn, with the results of the May 2000 Risk Burn superceding the earlier results in the appropriate cases.

#### 7.3.1 Results of Short-Term Comparison

A screening level evaluation of short-term health effects was conducted by comparing predicted short-term air concentrations against applicable guidelines. These guidelines include the Short-term Guideline Concentrations (SGCs) contained in DAR-1 are appropriate for exposure periods of 1 hour or less. When DAR-1 criteria were unavailable, the TEEL values recommended by the U.S. EPA (developed by U.S. DOE) were utilized. This was only necessary for a few compounds.

In addition, per Air Guide-1, a 24-hour average PM-10 calculation is required. As discussed in Section 3.0, the maximum 1-hour and 24-hour average normalized air concentrations used in the analysis were 69.0 µg/m3 per g/sec and 16.56 µg/m3 per g/sec, respectively, based upon 1999 Trial Burn tests results. These concentrations are the maximum 1-hour and 24-hour values predicted at the maximally exposed fenceline location over the five-year modeling period. These concentrations were calculated assuming undepleted plume conditions, which is a conservative approach.

For all chemicals evaluated, the concentrations were multiplied by chemical-specific emission rates (discussed in Section 4.1). Many additional compounds, besides those selected as COPCs and evaluated in this MHRA quantitatively for potential chronic health risks, were retained for evaluation of potential short-term effects. These include particulate, hydrogen chloride, free chlorine and formaldehyde, as well as many additional volatiles and semivolatiles.

Results are shown in Table 7-9. Since similar guidelines are not available for all compounds analyzed at the kiln, it was not possible to evaluate all compounds for short-term effects. Only HCl was found to slightly exceed a short-term guideline, by a very small margin (106%), based upon 1999 measurement data. Although it is suspected that the recent changes in the operational design of the Norlite facility is likely to have lowered the HCl emission rate; there is currently no newer data to confirm that. This would only occur if Norlite is operating both kilns at maximum permitted chlorine feed rates during hours for which the atmospheric dilution is particularly adverse. Results of this screening analysis for all other evaluated chemicals were well below (<10% of) the criteria values listed.

### 7.3.2 Long-Term Concentration Screening

In a similar manner, the annual average concentrations calculated for all of the chemical compounds measured in the Trial Burn and the Risk Burn were calculated from the results of the ISCST3 modeling performed according to the procedures outlined in Section 3. Results were then compared with the AGC criteria listed in the DAR-1 tables. Since some of the criteria were based entirely on inhalation risk factors, it was anticipated that results from the screening might emphasize different chemical species than the MHRA analysis. For chemical species that had criteria based on prior risk analyses, the results would be expected to be more similar, especially in those cases for which the target risk on a per chemical basis was set at $1 \times 10^{-6}$.

Table 7-10 presents the results of the long-term comparison with ACG values tabulated in DAR-1. Of all the chemicals compared with the ACG values, none exceed 50%. The closest are 2,3,7,8 TCDD (45 %) and hydrogen chloride (38%). Because dioxins and furans also dominate the full MRA risk results, it may not be so surprising that this trend is also predicted by the screening estimate. Comparison of some of the screening results for metals like arsenic and cadmium, however, indicate an exaggeration of the true risk from these chemical species. Overall, the comparability of the totals suggests that the quantitative MRA is likely to also be conservative, but not quite as conservative in estimating total risk as performing summation of all of the screening risk values.

## 7.4 Uncertainty Analysis

There are many assumptions involved in risk assessment. Some of the assumptions are supported by considerable scientific evidence, while others have less support. Every assumption introduces some degree of uncertainty into the risk assessment process. Conservative assumptions are made throughout the risk assessment to ensure that the health of local residents is protected. U.S. EPA (1998a) guidance recommends that RME estimates be calculated with a combination of "near worst case" exposure assumptions (ones which assume that 90% to 95% of the exposed population would be expected to receive less exposure) and "average exposures" (such as 5-year average air concentrations or annually averaged flow in key water bodies). Thus, when all of the assumptions are combined, it is much more likely that actual risks are overestimated rather than underestimated.

The assumptions that introduce the greatest amount of uncertainty in this risk assessment are discussed in this section. Most are discussed in general terms, because for most of the assumptions there is not enough information to assign a numerical value that can be factored into the calculation of risk. The fact that an "EPA Alternative Case" was analyzed for the present MRA, however, does provide some insight as to the approximate magnitude of differences in risk that can result from making different choices of model input parameters that affect exposures and risks. The discussion below focuses on those elements that are best understood as contributing to the ultimate uncertainty in calculated risks. For some of these elements, the uncertainty results from the variability of the modeling parameters identified, but in addition many of the models are idealizations of processes that include inherent uncertainty due to lack of scientific knowledge about the details of the process. The conservative choices made in selecting model-input variables or descriptive parameters by experienced risk assessors are generally driven by the intention to avoid underestimation of risk. Table 7-12 has been prepared to illustrate this principle. It identifies most of the important factors that affect risk calculations, and attempts to show qualitatively which parameters are "surely overestimated = (+), which are as accurate as can currently be achieved = (~, or =), and which potentially still are at risk of underestimation, if other related input data or modeling assumptions are not as accurate as assumed.

### 7.4.1 Hazard Identification

During the Hazard Identification step, compounds are selected for inclusion in the quantitative risk assessment from a list of all compounds known or expected to be emitted from the facility. Uncertainty is introduced in three principal areas during this step: (1) estimation of emissions; (2) air quality modeling; and (3) selection of compounds for inclusion in the quantitative risk assessment based on emissions and modeling results.

#### 7.4.1.1 Emission Rates

Emission rates for this MRA have been developed for each chemical analyzed in the trial burns. In general, maximum emission rates, averaged over a set of three test runs, were used for each chemical. For non-detected chemicals; however, a conservative bias was applied to include conservatively high detection limits (higher than that recommended by U.S. EPA 1998a guidance) into the reported averages. That means that some chemicals were assumed to be present in kiln emissions even though they were never actually detected in any of the trial burns. These procedures indicate that emissions are likely to be over-estimated. Because the feed conditions and the operational monitoring are so precise in maintaining operating conditions within permit limit conditions, the additional margin of uncertainty in emission rate that can be attributed to "upset emissions" is extremely small (< 0.5%). This factor is therefore insignificant compared with the inherent uncertainties in the composition of the shale and the fuels that are routinely fed to the kilns.

### 7.4.1.2 Air Quality Modeling

An U.S. EPA-approved computerized air dispersion model has been used to estimate the levels of compounds in air following emission from the two kilns. The dispersion model provides information regarding how particulate and gases emitted from the kiln disperse, or spread, after they are released from the stack. U.S. EPA-specified deposition algorithms are applied to the results of the dispersion modeling to estimate deposition rates.

For vapors, the dispersion and deposition modeling processes are modeled as if they were independent of one another, there is no mechanism in the dispersion modeling to account for the loss of material calculated in the deposition modeling to be depleted from the plume. Therefore, both air concentrations and deposition rates are increasingly overestimated with downwind distance from the stack. In fact, the total amount of material estimated to be deposited in a given period of time could theoretically exceed the total amount of material assumed to be emitted during that time. Fortunately, this characteristic is limited to vapors and to deposition not accompanied by precipitation. In all of those other cases, the deposition process is tracked by the dispersion model and depletion of the atmospheric plume is taken into account. That is why the summarized statements about modeling conservatism in Table 4-12 differ somewhat for particles and vapors.

As special case of concern for the present MRA is the modeling of deposition and subsequent fate and transport in the soil, sediment and aqueous environment of mercury in its various forms. As previous discussions of mercury modeling (and the papers reproduced in Appendix H) indicate, the modeling of mercury vapor deposition during dry conditions is presently among the most uncertain of the atmospheric dispersion and deposition processes. Formerly, it was conventionally assumed that mercury vapor behaved in essentially the same manner as semi-volatile organics that appear to adsorb or absorb to the surface of small particles and deposit in both wet and dry environments as these particles would. The U.S. EPA 1998a guidance has recognized the complexity of this situation and recommended an alternative modeling methodology drawn from the Mercury Study Report to Congress (U.S. EPA, 1997). The remaining uncertainties are illustrated by the results of new model sensitivity studies discussed in the two papers contained in Appendix H. These remaining uncertainties directly affect the estimates of maximum concentrations in soil, water bodies, fish and humans. Ultimately this uncertainty also affects the estimates of Hazard Index values calculated for this MRA, because for this facility those estimates are completely dominated by the predicted contributions of methyl mercury in fish that results from deposition of inorganic mercury vapor.

As shown in Appendix H, this uncertainty factor can vary, depending upon choice of dry deposition rate from less than unity to a factor of 3 to 4 for moderately conservative estimates, to a factor of 15 or 16 for a "worst case estimate". As noted in Appendix H, those highest estimates are supported, at this time only by data obtained for very brief periods (1 to 3 hrs). Therefore, these maximum estimates of deposition rates (used as default values in the current U.S. EPA 1998a guidance are unlikely to represent the long term average conditions that would lead to the buildup in watershed soils, waterbodies and fish. That means use of the default values for dry vapor deposition of mercury would also produce entirely unrealistic estimates of Hazard Index if the calculation requires a long term build-up in soil, sediment, water and fish concentrations to produce those HI estimates. For that reason, the deposition velocities assumed in this MRA were selected to be consistent with predictions of water and fish concentrations that appear to be more probable. They are at least consistent with the limited environmental data available for mercury levels in waters and fish of the region.

#### 7.4.1.3 Selection of Compounds

The compounds quantitatively evaluated in the risk assessment were selected using a risk ranking proposed by U.S. EPA. Of the compounds potentially present in the predicted emissions from the kilns, those selected for analysis are therefore those believed to be the most toxic, prevalent, and/or persistent in the environment. Based on an assessment of the literature available on this subject, the compounds evaluated in this risk assessment represent key compounds in kiln emissions.

### 7.4.2 Toxicity Assessment

Dose-response values are usually based on limited toxicological data. For this reason, a margin of safety is built into estimates of both carcinogenic and noncarcinogenic risk, and actual risks are lower than those estimated. The two major areas of uncertainty introduced in the dose-response assessment are: (1) animal to human extrapolation; and (2) high to low dose extrapolation. These are discussed in the following subsections.

#### 7.4.2.1 Animal to Human Extrapolation

Human dose-response values are often extrapolated, or estimated, using the results of animal studies. Extrapolation from animals to humans introduces a great deal of uncertainty in the risk assessment because in most instances, it is not known how differently a human may react to the chemical compared to the animal species used to test the compound. The procedures used to extrapolate from animals to humans involve conservative assumptions and incorporate several uncertainty factors that overestimate the adverse effects associated with a specific dose. As a result, overestimation of the potential for adverse effects to humans is more likely than underestimation.

#### 7.4.2.2 High to Low Dose Extrapolation

Predicting potential health effects from the kiln emissions requires the use of models to extrapolate the observed health effects from the high doses used in laboratory studies to the anticipated human health effects from low doses experienced in the environment. The models contain conservative assumptions to account for the large degree of uncertainty associated with this extrapolation (especially for potential carcinogens) and therefore, tend to be more likely to overestimate than underestimate the risks.

#### 7.4.2.3 Use of Latest Dose Factors

Ongoing toxicological research is continually the source of new data that can be applied to re-evaluation of standardized information on dose response functions for the many chemicals of potential interest and concern. As noted above, U.S. EPA 1998a guidance has sought to further standardize the hierarchy for using available toxicological information in risk assessments. Over the course of development of the RCRA permit renewal application for the Norlite facility there have been numerous changes in the "recommended" dose response factors. Many of these have had little impact, either because the changes themselves were not large (less than a factor of two), or the concentrations of the materials involved were so low that their presence was of little importance, almost regardless of the magnitude of their dose response function. An exception was vinyl chloride. Before its information was updated in 2000, early risk calculations were based on very conservative estimates of its possible presence (it was not detected in the VOC analysis) and a high response factor. The combination made it appear as if, although not detected, vinyl chloride might be a potentially significant risk. The updated risk factor, and more refined information about the maximum possible concentration likely to occur led to revised calculations, and confirmation that the risk contribution, if any, would be minor. That experience illustrates the importance of employing the latest, most reliable, toxicological information—as recommended by both NYSDOH and U.S. EPA.

#### 7.4.2.4 Dioxin Reference Dose (RfD) Factors

The U.S. EPA and many state departments of health have been challenged by the difficulty of assigning an appropriate reference dose value to the large set of dioxins and furans, and other dioxin-like compounds, such as co-planar PCBs (when the are present). There has been a national effort to review the large volume of research data now available to try to resolve this issue, but the U.S. EPA has to this point been unwilling to set a particular value or range of values for routine use in risk assessments. (Therefore, they have not published a value in the IRIS database). In the absence of federal guidance, the NYSDOH has proposed to utilize the results of one of the better-designed studies of noncarcinogenic effects in primates to recommend a relationship that can be used as an effective reference dose factor for present purposes (NYSDOH, 1993). The value is based on reported increases in the incidence of endometriosis in adult female monkeys and noted developmental effects. These include reduced growth during nursing and post-weaning behavioral/learning effects in offspring with 2,3,7,8 TCDD maternal dose levels of 0.13 ng/kg-day.

For the current analysis, the value of 0.13 ng/kg-day was used directly as an "effective" RfD (see Table 5-1). However, because the test results cited represent a LOEL value, rather than a NOAEL level, recent evidence suggests that it may be more appropriate to include an uncertainty factor that would decrease this value and subsequently lead to higher estimates of hazard quotients for dioxin and furan exposures. The size of the appropriate uncertainty factor is itself uncertain, as is whether the application of the RfD should apply equally to all of the congeners that are currently grouped for the assessment of possible carcinogenic risk. Appendix G presents a toxicologist's argument that indicates an appropriate uncertainty factor of 50 may be applied to the HI constituents due to dioxin and furan concentrations in the present report. Review of the current contributions of dioxins and furans to noncarcinogenic risks in Table 7-1 through 7-4 (and the summaries) shows that the maximum value is that for the beef farmer ($2.48 \times 10^{-5}$). If this HI constituent were multiplied by 50, the total HI contribution would be $1.24 \times 10^{-3}$. This value is only 0.5% of the benchmark, and an insignificantly small fraction of the predicted total HI, which is clearly dominated by methyl mercury.

### 7.4.3 Exposure Assessment

During the exposure assessment, exposure point concentrations are estimated and exposure doses calculated. Exposure point concentrations are the estimated concentrations of compounds to which humans may be exposed. Once the concentrations in an environmental medium such as soil, water, or air have been predicted, the calculation of human exposure and dose involves making additional assumptions. The major sources of uncertainty associated with these assumptions are discussed below.

#### 7.4.3.1 Effect of Soil Mixing Depths

There is much uncertainty associated with estimating the depth of soil into which COPCs are will mix uniformly after they deposit during atmospheric transport and dispersion. Agricultural experiments and farming practice information have led to reasonable agreement on the range of depths to be associated with tilled soils, approximately 15 to 20 cm. The cases addressed in this MRA use both ends of this range. For untilled soils the question is more difficult. The answer depends heavily on the type of surface (forest or plain) and the presence of natural mixing mechanisms, such as earthworms and/or cyclical flooding. The use of a 5 cm mixing depth in New York risk assessments has been historically based upon evidence from a limited number of earthworm studies. The U.S. EPA 1998a guidance recommends 1 cm as a conservative estimate that may well apply to drier climates. The ratio of 5 between these two alternate values makes it apparent that predicted concentrations in surface soil that could be ingested by adults or children would be strongly affected by this factor. Two papers by Smith and Garcia (2001) illustrate the potential importance of this factor on predictions of mercury in fish that are in turn affected by concentrations in eroded surficial soils. (These papers are included in Appendix H). Sensitivity testing indicates that the effect on calculated risks is less than linear: i.e., a factor of about three, rather than a factor of five, change in the answer may be associated with choosing one end of this range rather than the other.

#### 7.4.3.2 Estimation of Surface Water and Sediment Concentrations

The compound concentrations in surface water and sediment in the Drinking Water Reservoir, Erie Canal Locks and Wright Lake were estimated using equations provided in U.S. EPA (1994c and 1998a). Assumptions about adsorption of compound particles in the air, the amount and rate of soil runoff, the deposition of particles, the rate of compound degradation, and the size of the catchment, or watershed area, are included in the U.S. EPA model. Each assumption has uncertainty associated with it, particularly because input data were based on U.S. Geological Survey (USGS) or Soil Conservation Service (SCS) information for the general area. Estimating surface water and sediment compound concentrations also involves numerous assumptions regarding the fate and transport of compounds, and the hydrology of local waterbodies, such as turnover patterns and flow rates. These assumptions are conservative to provide reasonable assurance that the evaluation of surface water and sediment exposures does not understate actual exposures.

#### 7.4.3.3 Degradation of Selected Compounds

The risk assessment assumes that all selected organic compounds degrade slowly in surface waters and not at all in soils. Inorganic compounds were assumed not to degrade in soil and surface water. These assumptions ignore processes that, in reality, result in the loss of compounds from soil and water. Therefore, risks to human health are likely to be overestimated.

#### 7.4.3.4 Estimation of Compound Intake from Food Diet

Estimation of potential compound intake in the food consumed by the receptors evaluated incorporates many assumptions. Conservative estimates are made about the uptake of compounds into root crops, leaf crops, beef, and dairy products. Parameters, such as root uptake factors and air-to-leaf transfer factors for the produce pathway, and biotransfer factors for the beef and dairy pathways, are high-end estimates provided in U.S. EPA (1994c and 1998a) and may not precisely represent actual conditions near the Norlite Facility.

People may be exposed to compounds in the soil through ingestion of crops and inadvertent ingestion of soil. Because the compounds deposited on the soil surface are bound to or mixed with soil particles, conservative assumptions were made concerning the intake of the compounds by receptors. The conservative assumptions were made to provide reasonable assurance that the evaluation of risks from exposure to soil is not understated.

Ingestion rates for various components of the diets of residents, farmers and fishers differ in various geographic regions. For that reason the "Base Case" values given in Table 6-4, based primarily upon information provided by NYSDOH (see footnotes in Table 6-4), was considered the most realistic and accurate for the area around Norlite. This opinion is also reflected in Table 7-12. For the "EPA Alternative Case the dietary assumptions are intended to represent the "upper end" estimates for the national population. In general that accounting includes some areas with heavier reliance on "subsistence" farming or fishing. Thus these estimates (presented in Table 6-5) are generally higher than the New York data suggest, and this relationship is also suggested by the ranking given in Table 7-12.

Fish in area waterbodies may accumulate compounds in their tissues. Accumulation of compounds in fish tissue is estimated using bioconcentration factors (BCFs) and bioaccumulation factors (BAFs) that are estimated from fish studies which may not reflect actual area conditions. The use of BCFs and BAFs introduces uncertainty into the predicted fish tissue concentrations and ultimately into the prediction of human intake and risk (or HI).

The Table 7-11 presentation of comparative results of the two separate risk assessments, the "Base Case" and the "EPA Alternative Case", shows that the overall difference in risk and HI values, when deposition velocity of mercury vapor is held constant) is less than a factor of four, supplementary sensitivity analyses demonstrate that most of this difference (about ½ to 2/3) is due to the differing assumption about the mixing depth of untilled soil for deposited COPCs. Therefore differences in dietary assumptions concerning vegetables, beef and milk are usually within a factor of 2, unless there is an obvious difference specified as to the fraction of the diet that comes from food sources external to the area. The risks calculated for the contributions of fish ingestion to the diets of all key receptors are especially sensitive to the assumptions made about dietary intake. That is the reason that great care was taken in the present update of the MRA to utilize ingestion rates for adult and child residents that agree with both national and regional fish ingestion study results published in U.S. EPA 1997 and by Ruffle, et al 1994.

#### 7.4.3.5 Estimation of Exposure Dose

Once the concentrations of the potentially released compounds in water, soil, air, and food have been predicted through modeling, the extent of human exposure must be estimated. This requires making assumptions about the frequency and duration of human exposure to water, soil, air and food. Tables 6-4 and 6-5 have been included to make clear the values selected each of risk assessment cases for the various exposure durations and frequencies for each type of receptor life style.

For the Base Case, the exposure durations estimated for the different types of receptors vary according to their likely behavior patterns. The Farmer is assumed to spend about 50% of his days (180 days/yr) working outdoors and exposed to inhalation or inadvertent ingestion of soil. The Child Resident is assumed to spend ¾ of the time (270 days/yr) outdoors, a maximum for a northern climate. The Adult Resident and the Fisher resident are only assumed to spend about 1/8 of their year (44 days) outside. For the Alternative Case, the exposure time for all three types of scenario was assumed to be virtually the entire year (350 days). For the resident and the fisher this would seem to be a significant factor predicting difference in total risks. However, due to the significant influence of other exposure pathways, such as inhalation of airborne releases, and ingestion of fish and root vegetables by the Farmer and the Fisher, differences due to this factor are subdued.

### 7.4.4 Risk Characterization

The risk of adverse human health effects depends on estimated levels of exposure and dose-response relationships. Two important additional sources of uncertainty are introduced in this phase of the risk assessment: (1) the evaluation of potential exposure to more than one compound; and (2) the presence of subpopulations which may be particularly sensitive.

#### 7.4.4.1 Risk from Multiple Compounds

Once exposure to and risk from each of the selected compounds is calculated, the total risk posed by the Norlite Facility is determined by combining the health risk contributed by each compound. For virtually all combinations of compounds potentially released from combustion facilities, there is little or no evidence of interaction. However, in order not to understate the risk, it is assumed that carcinogenic effects of different compounds may be added together. Noncarcinogenic effects are often summed, as in this report, although this is less appropriate because different compounds may have different health endpoints (e.g., neurotoxicity, liver effects, and respiratory irritation). The amount of uncertainty associated with summing the effects may vary on a case-by-case basis.

#### 7.4.4.2 Combination of Several Upper-Bound Assumptions

Generally, the goal of risk assessment is to estimate an upper bound, but reasonable, potential risk. Most of the assumptions about exposure and toxicity used in this assessment are representative of statistical upper bounds or even maxima for each of the parameters. The result of combining several such upper-bound assumptions is that the final estimate of potential exposure or potential risk is very conservative.

#### 7.4.4.3 Accounting for Total Organic Carbon/Emissions (TOC/TOE)

The primary quantitative risk assessment relies upon knowledge of both the potential toxicity of the chemicals measured as emissions and reliable qualitative and quantitative information about the emission rates for each identified chemical species. A preliminary comparison has been made between the magnitudes of the TOC measurements given in Table 4-6 with the emission rates quantified for the various individual VOCs and SVOCs in Tables 4-3 through 4-5 (and dioxins/furans in Table 4-1). In addition, the trial burn test data for tentatively identified compounds (TICs) presented in the original April 1999 Trial Burn Report was reviewed. The results raised a number of difficult questions. These include the observation that carefully measured and quantified emission rates for target COPCs, such as Benzene, were found to have emission rates larger than the total VOC fraction determined by the bag condensate analysis. The SVOC total chromatographable organic (TCO) fraction seems to similarly underestimate the total sum of the individually determined SVOC target chemical fraction, because there are more than 20 individual SVOC TICs that were measured with higher individual emission rates. The sum of the masses of the individually identified SVOC TICs is comparable to the total mass found in the nonvolatile organic (gravimetric) samples, but that mass is more likely related to chemicals which would not be found downstream of a particulate filter. All of these uncertainties surrounding the TOC/TOE measurements make it impossible to identify what they qualitatively consist of, and thus it is also impossible to make any statement about their likely toxicity. Therefore these measurements are not included in the quantitative analysis of human health or ecological risks, due to these overwhelming uncertainties about the nature of the information.

Table 7-1a
Noncarcinogenic Hazard Index - Child Resident
North Resident Location - Refined Evaluation
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | As | Sb | Ba | Be | Cd | Total Cr | Cr VI |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Child Resident** | | | | | | | |
| **Total HI = 2.25E-01** | | | | | | | |
| Hazard Index for consumption of beef | 1.78E-07 | 1.35E-08 | 2.04E-11 | 9.29E-10 | 1.63E-09 | 4.09E-11 | 4.00E-09 |
| Hazard Index for consumption of milk | 2.02E-07 | 5.08E-08 | 1.79E-09 | 2.83E-11 | 3.30E-09 | 3.68E-10 | 4.14E-08 |
| Hazard Index for consumption of fish | 7.46E-07 | 2.27E-07 | 3.60E-08 | 2.07E-08 | 1.32E-06 | 1.49E-12 | 9.01E-10 |
| Hazard Index for consumption of soil | 4.26E-06 | 9.70E-07 | 8.95E-09 | 3.69E-07 | 1.42E-06 | 3.48E-09 | 2.31E-08 |
| Hazard Index for consumption of above-ground vegetables | 3.30E-06 | 9.74E-07 | 9.48E-09 | 3.07E-08 | 3.18E-06 | 2.87E-10 | 2.51E-08 |
| Hazard Index for consumption of below-ground vegetables | 5.23E-07 | 4.25E-07 | 1.99E-09 | 3.33E-09 | 1.15E-06 | 8.12E-11 | 1.61E-09 |
| Hazard Index for consumption of drinking water | 1.75E-06 | 2.05E-07 | 2.07E-09 | 1.07E-08 | 1.83E-07 | 3.85E-12 | 1.14E-08 |
| Hazard Index for inhalation | 1.50E-04 | 2.16E-05 | 1.10E-04 | 4.44E-04 | 1.72E-04 | 5.00E-04 | 1.24E-04 |
| **Total Hazard Index - All Potential Exposure Pathways** | 1.61E-04 | 2.45E-05 | 1.10E-04 | 4.44E-04 | 1.79E-04 | 5.00E-04 | 1.24E-04 |
| **Fraction of 0.25 Benchmark** | 0.001 | 0.000 | 0.000 | 0.002 | 0.001 | 0.002 | 0.000 |
| **Total Cancer Risk - Child Resident** | | | | | | | |
| **Total Risk = 3.61E-07** | | | | | | | |
| Cancer Risk for consumption of beef | 2.75E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of milk | 3.12E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of fish | 1.15E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of soil | 6.57E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of above-ground vegetables | 5.09E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of below-ground vegetables | 8.04E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of drinking water | 2.69E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for inhalation | 5.28E-08 | 0.00E+00 | 0.00E+00 | 1.66E-09 | 4.81E-09 | 0.00E+00 | 8.41E-08 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 5.30E-08 | 0.00E+00 | 0.00E+00 | 1.66E-09 | 4.81E-09 | 0.00E+00 | 8.41E-08 |
| **Fraction of 1E-05 Benchmark** | 0.005 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.008 |

Notes:

| | |
|---|---|
| As | Arsenic |
| Sb | Antimony |
| Ba | Barium |
| Be | Beryllium |
| Cd | Cadmium |
| Total Cr | Total Chromium |
| Cr VI | Chromium VI |

Table 7-1a
Noncarcinogenic Hazard Index - Child Resident
North Resident Location - Refined Evaluation
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | Pb | Ni | Se | Ag | Tl | Zn | TCDD-TEQ |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Child Resident** | | | | | | | |
| **Total HI = 2.25E-01** | | | | | | | |
| Hazard Index for consumption of beef | 0.00E+00 | 3.35E-08 | 6.70E-10 | 1.18E-08 | 4.49E-06 | 8.51E-11 | 5.17E-06 |
| Hazard Index for consumption of milk | 0.00E+00 | 2.07E-07 | 6.62E-08 | 3.02E-06 | 8.32E-06 | 1.15E-09 | 3.31E-05 |
| Hazard Index for consumption of fish | 0.00E+00 | 1.89E-07 | 1.54E-08 | 3.22E-07 | 4.93E-08 | 7.98E-07 | 1.99E-05 |
| Hazard Index for consumption of soil | 0.00E+00 | 5.74E-07 | 2.54E-09 | 5.48E-08 | 1.26E-05 | 8.82E-08 | 5.16E-05 |
| Hazard Index for consumption of above-ground vegetables | 0.00E+00 | 2.57E-07 | 1.04E-08 | 2.71E-07 | 3.57E-06 | 1.34E-07 | 1.29E-07 |
| Hazard Index for consumption of below-ground vegetables | 0.00E+00 | 6.11E-08 | 8.70E-10 | 8.52E-08 | 6.54E-08 | 5.24E-08 | 5.14E-06 |
| Hazard Index for consumption of drinking water | 0.00E+00 | 8.48E-08 | 4.66E-09 | 6.12E-08 | 1.71E-06 | 1.36E-08 | 1.18E-07 |
| Hazard Index for inhalation | 0.00E+00 | 3.18E-02 | 4.95E-07 | 6.49E-06 | 1.83E-04 | 1.46E-06 | 5.12E-05 |
| **Total Hazard Index - All Potential Exposure Pathways** | 0.00E+00 | 3.18E-02 | 5.95E-07 | 1.03E-05 | 2.14E-04 | 2.55E-06 | 1.66E-04 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.127 | 0.000 | 0.000 | 0.001 | 0.000 | 0.001 |
| **Total Cancer Risk - Child Resident** | | | | | | | |
| **Total Risk = 3.61E-07** | | | | | | | |
| Cancer Risk for consumption of beef | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.46E-09 |
| Cancer Risk for consumption of milk | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.26E-08 |
| Cancer Risk for consumption of fish | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 9.39E-09 |
| Cancer Risk for consumption of soil | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.38E-08 |
| Cancer Risk for consumption of above-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 7.90E-11 |
| Cancer Risk for consumption of below-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.06E-09 |
| Cancer Risk for consumption of drinking water | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 7.81E-11 |
| Cancer Risk for inhalation | 0.00E+00 | 1.19E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.57E-08 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 0.00E+00 | 1.19E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 9.82E-08 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.010 |

Notes:

| | |
|---|---|
| Pb | Lead |
| Ni | Nickel |
| Se | Selenium |
| Ag | Silver |
| Tl | Thallium |
| Zn | Zinc |
| TCDD-TEQ | 2,3,7,8-TCDD Toxicity Equivalents |

Table 7-1a
Noncarcinogenic Hazard Index - Child Resident
North Resident Location - Refined Evaluation
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | BAA | BAP | BBF | BKF | CHRYS | DBAHA | INDENO |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Child Resident** | | | | | | | |
| **Total HI = 2.25E-01** | | | | | | | |
| Hazard Index for consumption of beef | 3.76E-11 | 4.94E-10 | 2.41E-09 | 6.52E-10 | 8.51E-10 | 6.33E-09 | 7.43E-08 |
| Hazard Index for consumption of milk | 3.66E-10 | 5.58E-09 | 2.40E-08 | 7.44E-09 | 8.78E-09 | 7.43E-08 | 8.72E-07 |
| Hazard Index for consumption of fish | 4.05E-09 | 5.93E-09 | 6.89E-08 | 3.70E-09 | 6.13E-08 | 7.55E-10 | 7.88E-10 |
| Hazard Index for consumption of soil | 3.26E-09 | 5.20E-09 | 5.65E-08 | 2.97E-09 | 4.62E-08 | 6.10E-10 | 7.86E-10 |
| Hazard Index for consumption of above-ground vegetables | 9.40E-10 | 9.19E-10 | 7.35E-09 | 8.35E-10 | 9.34E-09 | 2.98E-09 | 1.49E-08 |
| Hazard Index for consumption of below-ground vegetables | 7.20E-08 | 3.63E-08 | 7.43E-07 | 2.68E-08 | 6.58E-07 | 4.56E-09 | 4.86E-09 |
| Hazard Index for consumption of drinking water | 1.71E-11 | 1.55E-11 | 1.57E-10 | 1.19E-11 | 1.77E-10 | 4.16E-12 | 3.27E-12 |
| Hazard Index for inhalation | 7.55E-10 | 1.25E-09 | 8.42E-09 | 1.12E-09 | 5.99E-09 | 8.52E-10 | 1.19E-09 |
| **Total Hazard Index - All Potential Exposure Pathways** | 8.14E-08 | 5.57E-08 | 9.10E-07 | 4.35E-08 | 7.91E-07 | 9.04E-08 | 9.69E-07 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Child Resident** | | | | | | | |
| **Total Risk = 3.61E-07** | | | | | | | |
| Cancer Risk for consumption of beef | 2.81E-14 | 3.69E-12 | 1.80E-12 | 4.88E-14 | 6.34E-15 | 4.75E-11 | 5.57E-11 |
| Cancer Risk for consumption of milk | 2.74E-13 | 4.18E-11 | 1.80E-11 | 5.57E-13 | 6.56E-14 | 5.57E-10 | 6.54E-10 |
| Cancer Risk for consumption of fish | 3.02E-12 | 4.32E-11 | 5.10E-11 | 2.69E-13 | 4.51E-13 | 5.49E-12 | 5.72E-13 |
| Cancer Risk for consumption of soil | 2.43E-12 | 3.75E-11 | 4.16E-11 | 2.14E-13 | 3.38E-13 | 4.39E-12 | 5.65E-13 |
| Cancer Risk for consumption of above-ground vegetables | 6.89E-13 | 6.78E-12 | 5.38E-12 | 6.20E-14 | 6.80E-14 | 2.23E-11 | 1.12E-11 |
| Cancer Risk for consumption of below-ground vegetables | 5.26E-11 | 2.61E-10 | 5.39E-10 | 1.93E-12 | 4.76E-12 | 3.28E-11 | 3.50E-12 |
| Cancer Risk for consumption of drinking water | 1.28E-14 | 1.14E-13 | 1.17E-13 | 8.76E-16 | 1.31E-15 | 3.09E-14 | 2.43E-15 |
| Cancer Risk for inhalation | 3.71E-12 | 6.15E-12 | 4.14E-11 | 5.53E-12 | 2.95E-11 | 4.19E-12 | 5.86E-12 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 6.28E-11 | 4.01E-10 | 6.98E-10 | 8.61E-12 | 3.51E-11 | 6.74E-10 | 7.31E-10 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Notes:

| | |
|---|---|
| BAA | Benzo(a)anthracene |
| BAP | Benzo(a)pyrene |
| BBF | Benzo(b)fluoranthene |
| BKF | Benzo(k)fluoranthene |
| CHRYS | Chrysene |
| DBAHA | Dibenz(a,h)anthracene |
| INDENO | Indeno(1,2,3-c,d)pyrene |

Table 7-1a
Noncarcinogenic Hazard Index - Child Resident
North Resident Location - Refined Evaluation
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | BEHP | HCBZ | BZ | BM | CCl4 | DCDFM | T13DCP |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Child Resident** | | | | | | | |
| **Total HI = 2.25E-01** | | | | | | | |
| Hazard Index for consumption of beef | 2.87E-08 | 1.21E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Index for consumption of milk | 2.64E-07 | 1.22E-07 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Index for consumption of fish | 1.28E-06 | 1.42E-06 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Index for consumption of soil | 9.40E-06 | 1.32E-06 | 2.61E-11 | 3.86E-12 | 3.13E-11 | 1.08E-15 | 9.59E-13 |
| Hazard Index for consumption of above-ground vegetables | 6.87E-06 | 6.96E-07 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Index for consumption of below-ground vegetables | 3.03E-04 | 1.03E-04 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Index for consumption of drinking water | 1.17E-07 | 3.02E-07 | 3.05E-07 | 4.17E-07 | 2.68E-07 | 3.16E-09 | 7.32E-09 |
| Hazard Index for inhalation | 6.87E-06 | 8.11E-05 | 1.98E-04 | 1.64E-04 | 1.24E-04 | 4.10E-06 | 1.37E-05 |
| **Total Hazard Index - All Potential Exposure Pathways** | 3.28E-04 | 1.88E-04 | 1.98E-04 | 1.64E-04 | 1.24E-04 | 4.10E-06 | 1.37E-05 |
| **Fraction of 0.25 Benchmark** | 0.001 | 0.001 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Child Resident** | | | | | | | |
| **Total Risk = 3.61E-07** | | | | | | | |
| Cancer Risk for consumption of beef | 2.75E-13 | 5.30E-13 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of milk | 2.53E-12 | 5.34E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of fish | 1.23E-11 | 6.22E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of soil | 9.01E-11 | 5.77E-11 | 1.47E-16 | 0.00E+00 | 9.76E-17 | 6.19E-19 | 9.85E-17 |
| Cancer Risk for consumption of above-ground vegetables | 6.56E-11 | 3.05E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of below-ground vegetables | 2.89E-09 | 4.51E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of drinking water | 1.13E-12 | 1.32E-11 | 1.73E-12 | 0.00E+00 | 8.37E-13 | 1.82E-12 | 7.52E-13 |
| Cancer Risk for inhalation | 1.50E-10 | 8.11E-09 | 7.69E-10 | 0.00E+00 | 2.93E-10 | 0.00E+00 | 8.56E-10 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 3.21E-09 | 1.28E-08 | 7.70E-10 | 0.00E+00 | 2.94E-10 | 1.82E-12 | 8.56E-10 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Notes:

| | |
|---|---|
| BEHP | Bis(2-ethylhexyl)phthalate |
| HCBZ | Hexachlorobenzene |
| BZ | Benzene |
| BM | Bromomethane |
| CCl4 | Carbon tetrachloride |
| DCDFM | Dichlorodifluoromethane |
| T13DCP | Trans-1,3-Dichloropropene |

Table 7-1a
Noncarcinogenic Hazard Index - Child Resident
North Resident Location - Refined Evaluation
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | TCFM | VCL | HCP | 2-NA | 2,4-DNT | 2,6-DNT | CLMTHN |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Child Resident** | | | | | | | |
| **Total HI = 2.25E-01** | | | | | | | |
| Hazard Index for consumption of beef | 0.00E+00 | 0.00E+00 | 8.22E-12 | 8.30E-11 | 1.16E-11 | 3.48E-11 | 0.00E+00 |
| Hazard Index for consumption of milk | 0.00E+00 | 0.00E+00 | 8.54E-11 | 9.71E-10 | 1.36E-10 | 4.09E-10 | 0.00E+00 |
| Hazard Index for consumption of fish | 0.00E+00 | 0.00E+00 | 8.31E-08 | 1.50E-05 | 4.88E-07 | 2.05E-06 | 0.00E+00 |
| Hazard Index for consumption of soil | 3.95E-14 | 5.92E-14 | 1.89E-09 | 2.76E-06 | 3.12E-07 | 1.13E-06 | 1.37E-13 |
| Hazard Index for consumption of above-ground vegetables | 0.00E+00 | 0.00E+00 | 2.20E-09 | 1.82E-04 | 1.74E-05 | 7.04E-05 | 0.00E+00 |
| Hazard Index for consumption of below-ground vegetables | 0.00E+00 | 0.00E+00 | 4.32E-07 | 1.37E-03 | 1.36E-04 | 5.39E-04 | 0.00E+00 |
| Hazard Index for consumption of drinking water | 2.04E-09 | 1.93E-07 | 1.00E-07 | 3.51E-05 | 1.22E-06 | 5.03E-06 | 1.38E-07 |
| Hazard Index for inhalation | 1.17E-06 | 8.19E-06 | 3.61E-03 | 1.80E-03 | 2.57E-05 | 1.03E-04 | 9.10E-06 |
| **Total Hazard Index - All Potential Exposure Pathways** | 1.17E-06 | 8.38E-06 | 3.61E-03 | 3.41E-03 | 1.81E-04 | 7.21E-04 | 9.24E-06 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.014 | 0.014 | 0.001 | 0.003 | 0.000 |
| **Total Cancer Risk - Child Resident** | | | | | | | |
| **Total Risk = 3.61E-07** | | | | | | | |
| Cancer Risk for consumption of beef | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.41E-16 | 8.11E-16 | 0.00E+00 |
| Cancer Risk for consumption of milk | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 6.33E-15 | 9.53E-15 | 0.00E+00 |
| Cancer Risk for consumption of fish | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.27E-11 | 4.76E-11 | 0.00E+00 |
| Cancer Risk for consumption of soil | 0.00E+00 | 9.12E-18 | 0.00E+00 | 0.00E+00 | 1.46E-11 | 2.62E-11 | 2.44E-19 |
| Cancer Risk for consumption of above-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 8.10E-10 | 1.64E-09 | 0.00E+00 |
| Cancer Risk for consumption of below-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 6.34E-09 | 1.26E-08 | 0.00E+00 |
| Cancer Risk for consumption of drinking water | 0.00E+00 | 2.97E-11 | 0.00E+00 | 0.00E+00 | 5.68E-11 | 1.17E-10 | 2.46E-13 |
| Cancer Risk for inhalation | 0.00E+00 | 5.63E-10 | 0.00E+00 | 0.00E+00 | 2.73E-09 | 5.48E-09 | 1.15E-10 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 0.00E+00 | 5.93E-10 | 0.00E+00 | 0.00E+00 | 9.98E-09 | 1.99E-08 | 1.15E-10 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.002 | 0.000 |

Notes:

| | |
|---|---|
| TCFM | Trichlorofluoromethane |
| VCL | Vinyl Chloride |
| HCP | Hexachlorocyclopentadiene |
| 2-NA | 2-Nitroaniline |
| 2,4-DNT | 2,4-Dinitrotoluene |
| 2,6-DNT | 2,6-Dinitrotoluene |
| CLMTHN | Chloromethane |

Table 7-1a
Noncarcinogenic Hazard Index - Child Resident
North Resident Location - Refined Evaluation
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | PCP | 1,1-DCE | 1,1,2,2-TCA | CLFM | 1,3-BUT | HCBU |
|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Child Resident** | | | | | | |
| **Total HI = 2.25E-01** | | | | | | |
| Hazard Index for consumption of beef | 3.42E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.03E-12 |
| Hazard Index for consumption of milk | 4.00E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.39E-11 |
| Hazard Index for consumption of fish | 3.01E-07 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.52E-07 |
| Hazard Index for consumption of soil | 2.46E-08 | 7.85E-13 | 1.76E-11 | 1.40E-11 | 0.00E+00 | 1.42E-09 |
| Hazard Index for consumption of above-ground vegetables | 6.79E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.06E-09 |
| Hazard Index for consumption of below-ground vegetables | 1.44E-04 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.26E-07 |
| Hazard Index for consumption of drinking water | 9.30E-08 | 2.23E-08 | 5.29E-09 | 6.28E-08 | 0.00E+00 | 1.49E-07 |
| Hazard Index for inhalation | 6.88E-06 | 8.58E-06 | 1.31E-06 | 2.73E-03 | 0.00E+00 | 5.15E-05 |
| **Total Hazard Index - All Potential Exposure Pathways** | 1.52E-04 | 8.60E-06 | 1.31E-06 | 2.73E-03 | 0.00E+00 | 5.25E-05 |
| **Fraction of 0.25 Benchmark** | 0.001 | 0.000 | 0.000 | 0.011 | 0.000 | 0.000 |
| **Total Cancer Risk - Child Resident** | | | | | | |
| **Total Risk = 3.61E-07** | | | | | | |
| Cancer Risk for consumption of beef | 4.21E-13 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.15E-18 |
| Cancer Risk for consumption of milk | 4.94E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.34E-17 |
| Cancer Risk for consumption of fish | 3.71E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.42E-13 |
| Cancer Risk for consumption of soil | 3.03E-12 | 1.45E-16 | 7.21E-15 | 0.00E+00 | 0.00E+00 | 7.57E-16 |
| Cancer Risk for consumption of above-ground vegetables | 8.37E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.10E-15 |
| Cancer Risk for consumption of below-ground vegetables | 1.78E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.74E-13 |
| Cancer Risk for consumption of drinking water | 1.15E-11 | 4.13E-12 | 2.17E-12 | 0.00E+00 | 0.00E+00 | 7.98E-14 |
| Cancer Risk for inhalation | 1.93E-09 | 1.07E-09 | 1.22E-09 | 1.48E-09 | 3.29E-08 | 6.28E-11 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 1.98E-08 | 1.08E-09 | 1.23E-09 | 1.48E-09 | 3.29E-08 | 6.33E-11 |
| **Fraction of 1E-05 Benchmark** | 0.002 | 0.000 | 0.000 | 0.000 | 0.003 | 0.000 |

Notes:

| | |
|---|---|
| PCP | Pentachlorophenol |
| 1,1-DCE | 1,1-Dichloroethylene |
| 1,1,2,2-TCA | 1,1,2,2-Tetrachloroethane |
| CLFM | Chloroform |
| 1,3-BUT | 1,3-Butadiene |
| HCBU | Hexachlorobutadiene |

Table 7-1a
Noncarcinogenic Hazard Index - Child Resident
North Resident Location - Refined Evaluation
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | Hg | HgCl | MeHg | Total by Pathway |
|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Child Resident** | | | | |
| **Total HI = 2.25E-01** | | | | |
| Hazard Index for consumption of beef | 0.00E+00 | 1.39E-06 | 8.27E-08 | 1.15E-05 |
| Hazard Index for consumption of milk | 0.00E+00 | 1.52E-05 | 1.28E-06 | 6.29E-05 |
| Hazard Index for consumption of fish | 0.00E+00 | 0.00E+00 | 1.78E-01 | 1.78E-01 |
| Hazard Index for consumption of soil | 0.00E+00 | 2.93E-04 | 1.56E-05 | 3.96E-04 |
| Hazard Index for consumption of above-ground vegetables | 0.00E+00 | 3.49E-04 | 2.76E-04 | 9.15E-04 |
| Hazard Index for consumption of below-ground vegetables | 0.00E+00 | 5.49E-05 | 8.82E-06 | 2.66E-03 |
| Hazard Index for consumption of drinking water | 0.00E+00 | 1.14E-05 | 5.85E-06 | 6.50E-05 |
| Hazard Index for inhalation | 1.09E-05 | 3.86E-04 | 0.00E+00 | 4.29E-02 |
| **Total Hazard Index - All Potential Exposure Pathways** | 1.09E-05 | 1.11E-03 | 1.78E-01 | 2.25E-01 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.004 | 0.714 | 0.901 |
| **Total Cancer Risk - Child Resident** | | | | |
| **Total Risk = 3.61E-07** | | | | |
| Cancer Risk for consumption of beef | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.57E-09 |
| Cancer Risk for consumption of milk | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.39E-08 |
| Cancer Risk for consumption of fish | 0.00E+00 | 0.00E+00 | 0.00E+00 | 9.69E-09 |
| Cancer Risk for consumption of soil | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.42E-08 |
| Cancer Risk for consumption of above-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.73E-09 |
| Cancer Risk for consumption of below-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.80E-08 |
| Cancer Risk for consumption of drinking water | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.46E-10 |
| Cancer Risk for inhalation | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.49E-07 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.61E-07 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.000 | 0.000 | 0.036 |

Notes:

Hg Elemental Mercury
HgCl Mercuric Chlorid
MeHg Methyl Mercury

Table 7-1b
Noncarcinogenic Hazard Index and Cancer Risk - Child Resident
South Resident Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | As | Sb | Ba | Be | Cd | Total Cr | Cr VI |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Child Resident** | | | | | | | |
| **Total HI = 1.80E-01** | | | | | | | |
| Hazard Index for consumption of beef | 1.78E-07 | 1.35E-08 | 2.04E-11 | 9.29E-10 | 1.63E-09 | 4.09E-11 | 4.00E-09 |
| Hazard Index for consumption of milk | 2.02E-07 | 5.08E-08 | 1.79E-09 | 2.83E-11 | 3.30E-09 | 3.68E-10 | 4.14E-08 |
| Hazard Index for consumption of fish | 7.46E-07 | 2.27E-07 | 3.60E-08 | 2.07E-08 | 1.32E-06 | 1.49E-12 | 9.01E-10 |
| Hazard Index for consumption of soil | 1.06E-05 | 2.42E-06 | 2.24E-08 | 9.20E-07 | 3.55E-06 | 8.69E-09 | 5.76E-08 |
| Hazard Index for consumption of above-ground vegetables | 6.23E-06 | 2.13E-06 | 2.07E-08 | 5.95E-08 | 7.68E-06 | 5.88E-10 | 4.61E-08 |
| Hazard Index for consumption of below-ground vegetables | 1.31E-06 | 1.06E-06 | 4.97E-09 | 8.32E-09 | 2.88E-06 | 2.03E-10 | 4.02E-09 |
| Hazard Index for consumption of drinking water | 1.39E-06 | 2.05E-07 | 2.07E-09 | 1.07E-08 | 1.83E-07 | 3.85E-12 | 1.14E-08 |
| Hazard Index for inhalation | 4.52E-07 | 6.50E-08 | 3.29E-07 | 1.33E-06 | 5.16E-07 | 1.50E-06 | 3.72E-07 |
| **Total Hazard Index - All Potential Exposure Pathways** | 2.11E-05 | 6.18E-06 | 4.17E-07 | 2.35E-06 | 1.61E-05 | 1.51E-06 | 5.38E-07 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Child Resident** | | | | | | | |
| **Total Risk = 5.18E-08** | | | | | | | |
| Cancer Risk for consumption of beef | 2.75E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of milk | 3.12E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of fish | 1.15E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of soil | 1.64E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of above-ground vegetables | 9.59E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of below-ground vegetables | 2.01E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of drinking water | 2.14E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for inhalation | 1.59E-10 | 0.00E+00 | 0.00E+00 | 5.00E-12 | 1.45E-11 | 0.00E+00 | 2.53E-10 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 4.77E-10 | 0.00E+00 | 0.00E+00 | 5.00E-12 | 1.45E-11 | 0.00E+00 | 2.53E-10 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Notes:

| | |
|---|---|
| As | Arsenic |
| Sb | Antimony |
| Ba | Barium |
| Be | Beryllium |
| Cd | Cadmium |
| Total Cr | Total Chromium |
| Cr VI | Chromium VI |

Table 7-1b
Noncarcinogenic Hazard Index and Cancer Risk - Child Resident
South Resident Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | Pb | Ni | Se | Ag | Tl | Zn | TCDD-TEQ |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Child Resident** | | | | | | | |
| **Total HI = 1.80E-01** | | | | | | | |
| Hazard Index for consumption of beef | 0.00E+00 | 3.35E-08 | 6.70E-10 | 1.18E-08 | 4.49E-06 | 8.51E-11 | 5.17E-06 |
| Hazard Index for consumption of milk | 0.00E+00 | 2.07E-07 | 6.62E-08 | 3.02E-06 | 8.32E-06 | 1.15E-09 | 3.31E-05 |
| Hazard Index for consumption of fish | 0.00E+00 | 1.89E-07 | 1.54E-08 | 3.22E-07 | 4.93E-08 | 7.98E-07 | 1.99E-05 |
| Hazard Index for consumption of soil | 0.00E+00 | 1.43E-06 | 6.34E-09 | 1.37E-07 | 3.15E-05 | 2.20E-07 | 2.32E-05 |
| Hazard Index for consumption of above-ground vegetables | 0.00E+00 | 5.20E-07 | 1.91E-08 | 5.86E-07 | 6.45E-06 | 3.16E-07 | 2.67E-08 |
| Hazard Index for consumption of below-ground vegetables | 0.00E+00 | 1.53E-07 | 2.17E-09 | 2.13E-07 | 1.63E-07 | 1.31E-07 | 2.85E-06 |
| Hazard Index for consumption of drinking water | 0.00E+00 | 8.48E-08 | 4.66E-09 | 6.12E-08 | 1.71E-06 | 1.36E-08 | 1.18E-07 |
| Hazard Index for inhalation | 0.00E+00 | 9.56E-05 | 1.49E-09 | 1.95E-08 | 5.51E-07 | 4.39E-09 | 1.54E-07 |
| **Total Hazard Index - All Potential Exposure Pathways** | 0.00E+00 | 9.82E-05 | 1.16E-07 | 4.37E-06 | 5.33E-05 | 1.48E-06 | 8.44E-05 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Child Resident** | | | | | | | |
| **Total Risk = 5.18E-08** | | | | | | | |
| Cancer Risk for consumption of beef | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.46E-09 |
| Cancer Risk for consumption of milk | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.26E-08 |
| Cancer Risk for consumption of fish | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 9.39E-09 |
| Cancer Risk for consumption of soil | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 6.00E-09 |
| Cancer Risk for consumption of above-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.71E-11 |
| Cancer Risk for consumption of below-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.86E-09 |
| Cancer Risk for consumption of drinking water | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 7.81E-11 |
| Cancer Risk for inhalation | 0.00E+00 | 3.58E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.07E-10 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 0.00E+00 | 3.58E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.35E-08 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.004 |

Notes:

| | |
|---|---|
| Pb | Lead |
| Ni | Nickel |
| Se | Selenium |
| Ag | Silver |
| Tl | Thallium |
| Zn | Zinc |
| TCDD-TEQ | 2,3,7,8-TCDD Toxicity Equivalents |

Table 7-1b
Noncarcinogenic Hazard Index and Cancer Risk - Child Resident
South Resident Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | BAA | BAP | BBF | BKF | CHRYS | DBAHA | INDENO |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Child Resident** | | | | | | | |
| **Total HI = 1.80E-01** | | | | | | | |
| Hazard Index for consumption of beef | 3.76E-11 | 4.94E-10 | 2.41E-09 | 6.52E-10 | 8.51E-10 | 6.33E-09 | 7.43E-08 |
| Hazard Index for consumption of milk | 3.66E-10 | 5.58E-09 | 2.40E-08 | 7.44E-09 | 8.78E-09 | 7.43E-08 | 8.72E-07 |
| Hazard Index for consumption of fish | 4.05E-09 | 5.93E-09 | 6.89E-08 | 3.70E-09 | 6.13E-08 | 7.55E-10 | 7.88E-10 |
| Hazard Index for consumption of soil | 3.95E-10 | 1.53E-09 | 7.17E-09 | 1.35E-09 | 6.18E-09 | 1.03E-09 | 1.44E-09 |
| Hazard Index for consumption of above-ground vegetables | 1.08E-10 | 1.58E-10 | 7.85E-10 | 1.36E-10 | 1.07E-09 | 8.81E-11 | 1.33E-10 |
| Hazard Index for consumption of below-ground vegetables | 8.72E-09 | 1.07E-08 | 9.42E-08 | 1.22E-08 | 8.81E-08 | 7.66E-09 | 8.92E-09 |
| Hazard Index for consumption of drinking water | 1.71E-11 | 1.55E-11 | 1.57E-10 | 1.19E-11 | 1.77E-10 | 4.16E-12 | 3.27E-12 |
| Hazard Index for inhalation | 2.26E-12 | 3.76E-12 | 2.53E-11 | 3.38E-12 | 1.80E-11 | 2.56E-12 | 3.58E-12 |
| **Total Hazard Index - All Potential Exposure Pathways** | 1.37E-08 | 2.44E-08 | 1.98E-07 | 2.55E-08 | 1.66E-07 | 9.02E-08 | 9.57E-07 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Child Resident** | | | | | | | |
| **Total Risk = 5.18E-08** | | | | | | | |
| Cancer Risk for consumption of beef | 2.81E-14 | 3.69E-12 | 1.80E-12 | 4.88E-14 | 6.34E-15 | 4.75E-11 | 5.57E-11 |
| Cancer Risk for consumption of milk | 2.74E-13 | 4.18E-11 | 1.80E-11 | 5.57E-13 | 6.56E-14 | 5.57E-10 | 6.54E-10 |
| Cancer Risk for consumption of fish | 3.02E-12 | 4.32E-11 | 5.10E-11 | 2.69E-13 | 4.51E-13 | 5.49E-12 | 5.72E-13 |
| Cancer Risk for consumption of soil | 2.94E-13 | 1.11E-11 | 5.28E-12 | 9.75E-14 | 4.52E-14 | 7.38E-12 | 1.04E-12 |
| Cancer Risk for consumption of above-ground vegetables | 7.94E-14 | 1.15E-12 | 5.71E-13 | 9.94E-15 | 7.76E-15 | 6.48E-13 | 9.83E-14 |
| Cancer Risk for consumption of below-ground vegetables | 6.38E-12 | 7.71E-11 | 6.84E-11 | 8.79E-13 | 6.37E-13 | 5.51E-11 | 6.41E-12 |
| Cancer Risk for consumption of drinking water | 1.28E-14 | 1.14E-13 | 1.17E-13 | 8.76E-16 | 1.31E-15 | 3.09E-14 | 2.43E-15 |
| Cancer Risk for inhalation | 1.11E-14 | 1.85E-14 | 1.24E-13 | 1.66E-14 | 8.83E-14 | 1.26E-14 | 1.76E-14 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 1.01E-11 | 1.78E-10 | 1.45E-10 | 1.88E-12 | 1.30E-12 | 6.73E-10 | 7.18E-10 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Notes:

| | |
|---|---|
| BAA | Benzo(a)anthracene |
| BAP | Benzo(a)pyrene |
| BBF | Benzo(b)fluoranthene |
| BKF | Benzo(k)fluoranthene |
| CHRYS | Chrysene |
| DBAHA | Dibenz(a,h)anthracene |
| INDENO | Indeno(1,2,3-c,d)pyrene |

Table 7-1b
Noncarcinogenic Hazard Index and Cancer Risk - Child Resident
South Resident Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | BEHP | HCBZ | BZ | BM | CCl4 | DCDFM |
|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Child Resident** | | | | | | |
| **Total HI = 1.80E-01** | | | | | | |
| Hazard Index for consumption of beef | 2.87E-08 | 1.21E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Index for consumption of milk | 2.64E-07 | 1.22E-07 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Index for consumption of fish | 1.28E-06 | 1.42E-06 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Index for consumption of soil | 1.09E-06 | 1.47E-07 | 2.90E-12 | 4.30E-13 | 3.49E-12 | 1.20E-16 |
| Hazard Index for consumption of above-ground vegetables | 8.06E-07 | 7.31E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Index for consumption of below-ground vegetables | 3.52E-05 | 1.14E-05 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Index for consumption of drinking water | 1.18E-07 | 3.02E-07 | 3.05E-07 | 4.17E-07 | 2.68E-07 | 3.16E-09 |
| Hazard Index for inhalation | 2.06E-08 | 2.43E-07 | 5.93E-07 | 4.91E-07 | 3.72E-07 | 1.23E-08 |
| **Total Hazard Index - All Potential Exposure Pathways** | 3.89E-05 | 1.38E-05 | 8.99E-07 | 9.08E-07 | 6.40E-07 | 1.54E-08 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Child Resident** | | | | | | |
| **Total Risk = 5.18E-08** | | | | | | |
| Cancer Risk for consumption of beef | 2.75E-13 | 5.30E-13 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of milk | 2.53E-12 | 5.34E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of fish | 1.23E-11 | 6.22E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of soil | 1.05E-11 | 6.43E-12 | 1.64E-17 | 0.00E+00 | 1.09E-17 | 6.89E-20 |
| Cancer Risk for consumption of above-ground vegetables | 7.69E-12 | 3.20E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of below-ground vegetables | 3.36E-10 | 5.02E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of drinking water | 1.13E-12 | 1.32E-11 | 1.73E-12 | 0.00E+00 | 8.37E-13 | 1.82E-12 |
| Cancer Risk for inhalation | 4.50E-13 | 2.43E-11 | 2.30E-12 | 0.00E+00 | 8.79E-13 | 0.00E+00 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 3.71E-10 | 6.17E-10 | 4.03E-12 | 0.00E+00 | 1.72E-12 | 1.82E-12 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Notes:

| | |
|---|---|
| BEHP | Bis(2-ethylhexyl)phthalate |
| HCBZ | Hexachlorobenzene |
| BZ | Benzene |
| BM | Bromomethane |
| CCl4 | Carbon tetrachloride |
| DCDFM | Dichlorodifluoromethane |

Table 7-1b
Noncarcinogenic Hazard Index and Cancer Risk - Child Resident
South Resident Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | T13DCP | TCFM | VCL | HCP | 2-NA | 2,4-DNT | 2,6-DNT | CLMTHN |
|---|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Child Resident** | | | | | | | | |
| **Total HI = 1.80E-01** | | | | | | | | |
| Hazard Index for consumption of beef | 0.00E+00 | 0.00E+00 | 0.00E+00 | 8.22E-12 | 8.30E-11 | 1.16E-11 | 3.48E-11 | 0.00E+00 |
| Hazard Index for consumption of milk | 0.00E+00 | 0.00E+00 | 0.00E+00 | 8.54E-11 | 9.71E-10 | 1.36E-10 | 4.09E-10 | 0.00E+00 |
| Hazard Index for consumption of fish | 0.00E+00 | 0.00E+00 | 0.00E+00 | 8.31E-08 | 1.50E-05 | 4.88E-07 | 2.05E-06 | 0.00E+00 |
| Hazard Index for consumption of soil | 1.07E-13 | 4.39E-15 | 6.59E-15 | 2.10E-10 | 3.07E-07 | 3.50E-08 | 1.25E-07 | 1.52E-14 |
| Hazard Index for consumption of above-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.31E-10 | 1.97E-05 | 1.87E-06 | 7.68E-06 | 0.00E+00 |
| Hazard Index for consumption of below-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.81E-08 | 1.52E-04 | 1.52E-05 | 6.00E-05 | 0.00E+00 |
| Hazard Index for consumption of drinking water | 7.32E-09 | 2.04E-09 | 1.93E-07 | 1.00E-07 | 3.51E-05 | 1.22E-06 | 5.03E-06 | 1.38E-07 |
| Hazard Index for inhalation | 4.10E-08 | 3.51E-09 | 2.45E-08 | 1.08E-05 | 5.41E-06 | 7.71E-08 | 3.09E-07 | 2.73E-08 |
| **Total Hazard Index - All Potential Exposure Pathways** | 4.84E-08 | 5.55E-09 | 2.17E-07 | 1.10E-05 | 2.28E-04 | 1.89E-05 | 7.52E-05 | 1.65E-07 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Child Resident** | | | | | | | | |
| **Total Risk = 5.18E-08** | | | | | | | | |
| Cancer Risk for consumption of beef | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.41E-16 | 8.11E-16 | 0.00E+00 |
| Cancer Risk for consumption of milk | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 6.33E-15 | 9.53E-15 | 0.00E+00 |
| Cancer Risk for consumption of fish | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.27E-11 | 4.76E-11 | 0.00E+00 |
| Cancer Risk for consumption of soil | 1.10E-17 | 0.00E+00 | 1.01E-18 | 0.00E+00 | 0.00E+00 | 1.63E-12 | 2.92E-12 | 2.71E-20 |
| Cancer Risk for consumption of above-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 8.69E-11 | 1.79E-10 | 0.00E+00 |
| Cancer Risk for consumption of below-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 7.10E-10 | 1.40E-09 | 0.00E+00 |
| Cancer Risk for consumption of drinking water | 7.52E-13 | 0.00E+00 | 2.97E-11 | 0.00E+00 | 0.00E+00 | 5.68E-11 | 1.17E-10 | 2.46E-13 |
| Cancer Risk for inhalation | 2.56E-12 | 0.00E+00 | 1.69E-12 | 0.00E+00 | 0.00E+00 | 8.19E-12 | 1.64E-11 | 3.45E-13 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 3.32E-12 | 0.00E+00 | 3.14E-11 | 0.00E+00 | 0.00E+00 | 8.86E-10 | 1.76E-09 | 5.91E-13 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Notes:

| | |
|---|---|
| T13DCP | Trans-1,3-Dichloropropene |
| TCFM | Trichlorofluoromethane |
| VCL | Vinyl Chloride |
| HCP | Hexachlorocyclopentadiene |
| 2-NA | 2-Nitroaniline |
| 2,4-DNT | 2,4-Dinitrotoluene |
| 2,6-DNT | 2,6-Dinitrotoluene |
| CLMTHN | Chloromethane |

Table 7-1b
Noncarcinogenic Hazard Index and Cancer Risk - Child Resident
South Resident Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | PCP | 1,1-DCE | 1,1,2,2-TCA | CLFM | 1,3-BUT | HCBU |
|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Child Resident** | | | | | | |
| **Total HI = 1.80E-01** | | | | | | |
| Hazard Index for consumption of beef | 3.42E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.03E-12 |
| Hazard Index for consumption of milk | 4.00E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.39E-11 |
| Hazard Index for consumption of fish | 3.01E-07 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.52E-07 |
| Hazard Index for consumption of soil | 2.74E-09 | 8.74E-14 | 1.95E-12 | 1.56E-12 | 0.00E+00 | 1.58E-10 |
| Hazard Index for consumption of above-ground vegetables | 2.52E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.19E-10 |
| Hazard Index for consumption of below-ground vegetables | 1.61E-05 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.63E-08 |
| Hazard Index for consumption of drinking water | 9.30E-08 | 2.23E-08 | 5.29E-09 | 6.28E-08 | 0.00E+00 | 1.49E-07 |
| Hazard Index for inhalation | 2.06E-08 | 2.57E-08 | 3.92E-09 | 8.18E-06 | 0.00E+00 | 1.54E-07 |
| **Total Hazard Index - All Potential Exposure Pathways** | 1.65E-05 | 4.80E-08 | 9.20E-09 | 8.24E-06 | 0.00E+00 | 7.93E-07 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Child Resident** | | | | | | |
| **Total Risk = 5.18E-08** | | | | | | |
| Cancer Risk for consumption of beef | 4.21E-13 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.15E-18 |
| Cancer Risk for consumption of milk | 4.94E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.34E-17 |
| Cancer Risk for consumption of fish | 3.71E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.42E-13 |
| Cancer Risk for consumption of soil | 3.37E-13 | 1.62E-17 | 8.03E-16 | 0.00E+00 | 0.00E+00 | 8.43E-17 |
| Cancer Risk for consumption of above-ground vegetables | 3.11E-13 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.17E-16 |
| Cancer Risk for consumption of below-ground vegetables | 1.98E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.94E-14 |
| Cancer Risk for consumption of drinking water | 1.15E-11 | 4.13E-12 | 2.17E-12 | 0.00E+00 | 0.00E+00 | 7.98E-14 |
| Cancer Risk for inhalation | 5.79E-12 | 3.21E-12 | 3.67E-12 | 4.44E-12 | 9.86E-11 | 1.88E-13 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 2.04E-09 | 7.34E-12 | 5.84E-12 | 4.44E-12 | 9.86E-11 | 5.29E-13 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Notes:

| | |
|---|---|
| PCP | Pentachlorophenol |
| 1,1-DCE | 1,1-Dichloroethylene |
| 1,1,2,2-TCA | 1,1,2,2-Tetrachloroethane |
| CLFM | Chloroform |
| 1,3-BUT | 1,3-Butadiene |

Table 7-1b
Noncarcinogenic Hazard Index and Cancer Risk - Child Resident
South Resident Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | Hg | HgCl | MeHg | Total by Pathway |
|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Child Resident** | | | | |
| **Total HI = 1.80E-01** | | | | |
| Hazard Index for consumption of beef | 0.00E+00 | 1.39E-06 | 8.27E-08 | 1.15E-05 |
| Hazard Index for consumption of milk | 0.00E+00 | 1.52E-05 | 1.28E-06 | 6.29E-05 |
| Hazard Index for consumption of fish | 0.00E+00 | 0.00E+00 | 1.78E-01 | 1.78E-01 |
| Hazard Index for consumption of soil | 0.00E+00 | 6.46E-04 | 3.44E-05 | 7.56E-04 |
| Hazard Index for consumption of above-ground vegetables | 0.00E+00 | 6.38E-05 | 9.76E-06 | 1.28E-04 |
| Hazard Index for consumption of below-ground vegetables | 0.00E+00 | 1.21E-04 | 1.94E-05 | 4.39E-04 |
| Hazard Index for consumption of drinking water | 0.00E+00 | 1.14E-05 | 5.85E-06 | 6.46E-05 |
| Hazard Index for inhalation | 3.27E-08 | 1.16E-06 | 0.00E+00 | 1.29E-04 |
| **Total Hazard Index - All Potential Exposure Pathways** | 3.27E-08 | 8.60E-04 | 1.78E-01 | 1.80E-01 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.003 | 0.713 | 0.719 |
| **Total Cancer Risk - Child Resident** | | | | |
| **Total Risk = 5.18E-08** | | | | |
| Cancer Risk for consumption of beef | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.57E-09 |
| Cancer Risk for consumption of milk | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.39E-08 |
| Cancer Risk for consumption of fish | 0.00E+00 | 0.00E+00 | 0.00E+00 | 9.69E-09 |
| Cancer Risk for consumption of soil | 0.00E+00 | 0.00E+00 | 0.00E+00 | 6.21E-09 |
| Cancer Risk for consumption of above-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.92E-10 |
| Cancer Risk for consumption of below-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 7.02E-09 |
| Cancer Risk for consumption of drinking water | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.41E-10 |
| Cancer Risk for inhalation | 0.00E+00 | 0.00E+00 | 0.00E+00 | 7.47E-10 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.18E-08 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.000 | 0.000 | 0.005 |

Notes:

Hg Mercury
HgCl Mercuric Chloride
MeHg Methyl Mercury

Table 7-2a
Noncarcinogenic Hazard Index and Cancer Risk - Adult Resident
North Resident Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | As | Sb | Ba | Be | Cd | Total Cr | Cr VI |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Adult Resident** | | | | | | | |
| **Total HI = 2.88E-01** | | | | | | | |
| Hazard Index for consumption of beef | 8.57E-08 | 6.50E-09 | 9.82E-12 | 4.47E-10 | 7.86E-10 | 1.97E-11 | 1.92E-09 |
| Hazard Index for consumption of milk | 2.58E-08 | 6.48E-09 | 2.29E-10 | 3.61E-12 | 4.22E-10 | 4.70E-11 | 5.29E-09 |
| Hazard Index for consumption of fish | 1.01E-06 | 3.08E-07 | 4.89E-08 | 2.82E-08 | 1.80E-06 | 2.02E-12 | 1.22E-09 |
| Hazard Index for consumption of soil | 6.55E-08 | 1.49E-08 | 1.38E-10 | 5.66E-09 | 2.18E-08 | 5.35E-11 | 3.54E-10 |
| Hazard Index for consumption of above-ground vegetables | 3.32E-06 | 9.79E-07 | 9.54E-09 | 3.08E-08 | 3.20E-06 | 2.88E-10 | 2.53E-08 |
| Hazard Index for consumption of below-ground vegetables | 4.77E-07 | 3.87E-07 | 1.81E-09 | 3.04E-09 | 1.05E-06 | 7.40E-11 | 1.47E-09 |
| Hazard Index for consumption of drinking water | 6.58E-07 | 7.74E-08 | 7.82E-10 | 4.04E-09 | 6.90E-08 | 1.45E-12 | 4.30E-09 |
| Hazard Index for inhalation | 1.50E-04 | 2.16E-05 | 1.10E-04 | 4.44E-04 | 1.72E-04 | 5.00E-04 | 1.24E-04 |
| **Total Hazard Index - All Potential Exposure Pathways** | 1.56E-04 | 2.34E-05 | 1.10E-04 | 4.44E-04 | 1.78E-04 | 5.00E-04 | 1.24E-04 |
| **Fraction of 0.25 Benchmark** | 0.001 | 0.000 | 0.000 | 0.002 | 0.001 | 0.002 | 0.000 |
| **Total Cancer Risk - Adult Resident** | | | | | | | |
| **Total Risk = 2.08E-06** | | | | | | | |
| Cancer Risk for consumption of beef | 1.58E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of milk | 4.77E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of fish | 1.75E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of soil | 1.12E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of above-ground vegetables | 5.93E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of below-ground vegetables | 6.89E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of drinking water | 1.19E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for inhalation | 2.78E-07 | 0.00E+00 | 0.00E+00 | 8.75E-09 | 2.53E-08 | 0.00E+00 | 4.43E-07 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 2.79E-07 | 0.00E+00 | 0.00E+00 | 8.75E-09 | 2.53E-08 | 0.00E+00 | 4.43E-07 |
| **Fraction of 1E-05 Benchmark** | 0.028 | 0.000 | 0.000 | 0.001 | 0.003 | 0.000 | 0.044 |

Notes:

| | |
|---|---|
| As | Arsenic |
| Sb | Antimony |
| Ba | Barium |
| Be | Beryllium |
| Cd | Cadmium |
| Total Cr | Total Chromium |
| Cr VI | Chromium VI |

Table 7-2a
Noncarcinogenic Hazard Index and Cancer Risk - Adult Resident
North Resident Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | Pb | Ni | Se | Ag | Tl | Zn | TCDD-TEQ |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Adult Resident** | | | | | | | |
| **Total HI = 2.88E-01** | | | | | | | |
| Hazard Index for consumption of beef | 0.00E+00 | 1.61E-08 | 3.22E-10 | 5.69E-09 | 2.16E-06 | 4.09E-11 | 2.48E-06 |
| Hazard Index for consumption of milk | 0.00E+00 | 2.65E-08 | 8.45E-09 | 3.85E-07 | 1.06E-06 | 1.47E-10 | 4.21E-06 |
| Hazard Index for consumption of fish | 0.00E+00 | 2.56E-07 | 2.09E-08 | 4.37E-07 | 6.69E-08 | 1.08E-06 | 2.70E-05 |
| Hazard Index for consumption of soil | 0.00E+00 | 8.82E-09 | 3.90E-11 | 8.42E-10 | 1.94E-07 | 1.36E-09 | 7.95E-07 |
| Hazard Index for consumption of above-ground vegetables | 0.00E+00 | 2.59E-07 | 1.04E-08 | 2.72E-07 | 3.59E-06 | 1.35E-07 | 1.42E-07 |
| Hazard Index for consumption of below-ground vegetables | 0.00E+00 | 5.57E-08 | 7.93E-10 | 7.77E-08 | 5.98E-08 | 4.78E-08 | 5.12E-06 |
| Hazard Index for consumption of drinking water | 0.00E+00 | 3.20E-08 | 1.76E-09 | 2.31E-08 | 6.46E-07 | 5.14E-09 | 4.45E-08 |
| Hazard Index for inhalation | 0.00E+00 | 3.18E-02 | 4.95E-07 | 6.49E-06 | 1.83E-04 | 1.46E-06 | 2.23E-05 |
| **Total Hazard Index - All Potential Exposure Pathways** | 0.00E+00 | 3.18E-02 | 5.37E-07 | 7.69E-06 | 1.91E-04 | 2.74E-06 | 6.20E-05 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.127 | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 |
| **Total Cancer Risk - Adult Resident** | | | | | | | |
| **Total Risk = 2.08E-06** | | | | | | | |
| Cancer Risk for consumption of beef | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.99E-08 |
| Cancer Risk for consumption of milk | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.45E-08 |
| Cancer Risk for consumption of fish | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.53E-07 |
| Cancer Risk for consumption of soil | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.40E-09 |
| Cancer Risk for consumption of above-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.67E-09 |
| Cancer Risk for consumption of below-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.60E-08 |
| Cancer Risk for consumption of drinking water | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.14E-10 |
| Cancer Risk for inhalation | 0.00E+00 | 6.27E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.86E-07 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 0.00E+00 | 6.27E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.36E-07 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.006 | 0.000 | 0.000 | 0.000 | 0.000 | 0.044 |

Notes:

| | |
|---|---|
| Pb | Lead |
| Ni | Nickel |
| Se | Selenium |
| Ag | Silver |
| Tl | Thallium |
| Zn | Zinc |
| TCDD-TEQ | 2,3,7,8-TCDD Toxicity Equivalents |

Table 7-2a
Noncarcinogenic Hazard Index and Cancer Risk - Adult Resident
North Resident Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | BAA | BAP | BBF | BKF | CHRYS | DBAHA | INDENO |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Adult Resident** | | | | | | | |
| **Total HI = 2.88E-01** | | | | | | | |
| Hazard Index for consumption of beef | 1.81E-11 | 2.38E-10 | 1.16E-09 | 3.14E-10 | 4.09E-10 | 3.04E-09 | 3.57E-08 |
| Hazard Index for consumption of milk | 4.67E-11 | 7.13E-10 | 3.07E-09 | 9.49E-10 | 1.12E-09 | 9.49E-09 | 1.11E-07 |
| Hazard Index for consumption of fish | 5.49E-09 | 8.05E-09 | 9.36E-08 | 5.02E-09 | 8.33E-08 | 1.03E-09 | 1.07E-09 |
| Hazard Index for consumption of soil | 5.01E-11 | 7.99E-11 | 8.68E-10 | 4.56E-11 | 7.09E-10 | 9.38E-12 | 1.21E-11 |
| Hazard Index for consumption of above-ground vegetables | 9.45E-10 | 9.25E-10 | 7.39E-09 | 8.39E-10 | 9.39E-09 | 3.00E-09 | 1.50E-08 |
| Hazard Index for consumption of below-ground vegetables | 6.56E-08 | 3.31E-08 | 6.77E-07 | 2.44E-08 | 6.00E-07 | 4.15E-09 | 4.43E-09 |
| Hazard Index for consumption of drinking water | 6.45E-12 | 5.86E-12 | 5.94E-11 | 4.47E-12 | 6.69E-11 | 1.57E-12 | 1.23E-12 |
| Hazard Index for inhalation | 7.55E-10 | 1.25E-09 | 8.42E-09 | 1.12E-09 | 5.99E-09 | 8.52E-10 | 1.19E-09 |
| **Total Hazard Index - All Potential Exposure Pathways** | 7.29E-08 | 4.44E-08 | 7.91E-07 | 3.27E-08 | 7.01E-07 | 2.16E-08 | 1.69E-07 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Adult Resident** | | | | | | | |
| **Total Risk = 2.08E-06** | | | | | | | |
| Cancer Risk for consumption of beef | 1.45E-13 | 2.01E-11 | 9.20E-12 | 2.73E-13 | 3.26E-14 | 2.73E-10 | 3.21E-10 |
| Cancer Risk for consumption of milk | 3.89E-13 | 6.20E-11 | 2.57E-11 | 8.40E-13 | 9.34E-14 | 8.53E-10 | 1.00E-09 |
| Cancer Risk for consumption of fish | 3.73E-11 | 4.07E-10 | 5.56E-10 | 2.53E-12 | 4.66E-12 | 5.23E-11 | 5.47E-12 |
| Cancer Risk for consumption of soil | 3.26E-13 | 3.72E-12 | 4.86E-12 | 2.10E-14 | 3.71E-14 | 4.23E-13 | 5.44E-14 |
| Cancer Risk for consumption of above-ground vegetables | 5.26E-12 | 6.55E-11 | 4.32E-11 | 6.64E-13 | 5.25E-13 | 2.68E-10 | 1.35E-10 |
| Cancer Risk for consumption of below-ground vegetables | 3.45E-10 | 1.51E-09 | 3.30E-09 | 1.11E-11 | 2.85E-11 | 1.87E-10 | 2.00E-11 |
| Cancer Risk for consumption of drinking water | 5.05E-14 | 4.02E-13 | 4.25E-13 | 3.22E-15 | 4.51E-15 | 1.27E-13 | 1.00E-14 |
| Cancer Risk for inhalation | 1.95E-11 | 3.24E-11 | 2.18E-10 | 2.91E-11 | 1.55E-10 | 2.20E-11 | 3.08E-11 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 4.08E-10 | 2.10E-09 | 4.16E-09 | 4.45E-11 | 1.89E-10 | 1.66E-09 | 1.51E-09 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Notes:

| | |
|---|---|
| BAA | Benzo(a)anthracene |
| BAP | Benzo(a)pyrene |
| BBF | Benzo(b)fluoranthene |
| BKF | Benzo(k)fluoranthene |
| CHRYS | Chrysene |
| DBAHA | Dibenz(a,h)anthracene |
| INDENO | Indeno(1,2,3-c,d)pyrene |

Table 7-2a
Noncarcinogenic Hazard Index and Cancer Risk - Adult Resident
North Resident Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | BEHP | HCBZ | BZ | BM | CCl4 | DCDFM | T13DCP |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Adult Resident** | | | | | | | |
| **Total HI = 2.88E-01** | | | | | | | |
| Hazard Index for consumption of beef | 1.38E-08 | 5.81E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Index for consumption of milk | 3.37E-08 | 1.56E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Index for consumption of fish | 1.74E-06 | 1.93E-06 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Index for consumption of soil | 1.44E-07 | 2.02E-08 | 4.01E-13 | 5.93E-14 | 4.81E-13 | 1.65E-17 | 1.47E-14 |
| Hazard Index for consumption of above-ground vegetables | 6.91E-06 | 7.00E-07 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Index for consumption of below-ground vegetables | 2.76E-04 | 9.37E-05 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Index for consumption of drinking water | 4.43E-08 | 1.14E-07 | 1.15E-07 | 1.57E-07 | 1.01E-07 | 1.19E-09 | 2.76E-09 |
| Hazard Index for inhalation | 6.87E-06 | 8.11E-05 | 1.98E-04 | 1.64E-04 | 1.24E-04 | 4.10E-06 | 1.37E-05 |
| **Total Hazard Index - All Potential Exposure Pathways** | 2.92E-04 | 1.78E-04 | 1.98E-04 | 1.64E-04 | 1.24E-04 | 4.10E-06 | 1.37E-05 |
| **Fraction of 0.25 Benchmark** | 0.001 | 0.001 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Adult Resident** | | | | | | | |
| **Total Risk = 2.08E-06** | | | | | | | |
| Cancer Risk for consumption of beef | 1.50E-12 | 3.06E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of milk | 3.70E-12 | 8.18E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of fish | 1.83E-10 | 1.01E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of soil | 1.51E-11 | 1.06E-11 | 2.72E-17 | 0.00E+00 | 1.80E-17 | 1.14E-19 | 1.82E-17 |
| Cancer Risk for consumption of above-ground vegetables | 6.00E-10 | 3.68E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of below-ground vegetables | 2.38E-08 | 4.93E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of drinking water | 4.96E-12 | 5.98E-11 | 7.81E-12 | 0.00E+00 | 3.79E-12 | 8.23E-12 | 3.40E-12 |
| Cancer Risk for inhalation | 7.91E-10 | 4.27E-08 | 4.04E-09 | 0.00E+00 | 1.54E-09 | 0.00E+00 | 4.50E-09 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 2.54E-08 | 9.34E-08 | 4.05E-09 | 0.00E+00 | 1.55E-09 | 8.23E-12 | 4.51E-09 |
| **Fraction of 1E-05 Benchmark** | 0.003 | 0.009 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Notes:

| | |
|---|---|
| BEHP | Bis(2-ethylhexyl)phthalate |
| HCBZ | Hexachlorobenzene |
| BZ | Benzene |
| BM | Bromomethane |
| CCl4 | Carbon tetrachloride |
| DCDFM | Dichlorodifluoromethane |
| T13DCP | Trans-1,3-Dichloropropene |

Table 7-2a
Noncarcinogenic Hazard Index and Cancer Risk - Adult Resident
North Resident Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | TCFM | VCL | HCP | 2-NA | 2,4-DNT | 2,6-DNT | CLMTHN |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Adult Resident** | | | | | | | |
| **Total HI = 2.88E-01** | | | | | | | |
| Hazard Index for consumption of beef | 0.00E+00 | 0.00E+00 | 3.95E-12 | 3.99E-11 | 5.59E-12 | 1.67E-11 | 0.00E+00 |
| Hazard Index for consumption of milk | 0.00E+00 | 0.00E+00 | 1.09E-11 | 1.24E-10 | 1.74E-11 | 5.22E-11 | 0.00E+00 |
| Hazard Index for consumption of fish | 0.00E+00 | 0.00E+00 | 1.13E-07 | 2.03E-05 | 6.63E-07 | 2.78E-06 | 0.00E+00 |
| Hazard Index for consumption of soil | 6.06E-16 | 9.09E-16 | 2.90E-11 | 4.24E-08 | 4.80E-09 | 1.73E-08 | 2.10E-15 |
| Hazard Index for consumption of above-ground vegetables | 0.00E+00 | 0.00E+00 | 2.21E-09 | 1.83E-04 | 1.75E-05 | 7.08E-05 | 0.00E+00 |
| Hazard Index for consumption of below-ground vegetables | 0.00E+00 | 0.00E+00 | 3.94E-07 | 1.24E-03 | 1.24E-04 | 4.91E-04 | 0.00E+00 |
| Hazard Index for consumption of drinking water | 7.70E-10 | 7.27E-08 | 3.78E-08 | 1.33E-05 | 4.60E-07 | 1.90E-06 | 5.20E-08 |
| Hazard Index for inhalation | 1.17E-06 | 8.19E-06 | 3.61E-03 | 1.80E-03 | 2.57E-05 | 1.03E-04 | 9.10E-06 |
| **Total Hazard Index - All Potential Exposure Pathways** | 1.17E-06 | 8.26E-06 | 3.61E-03 | 3.27E-03 | 1.68E-04 | 6.70E-04 | 9.15E-06 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.014 | 0.013 | 0.001 | 0.003 | 0.000 |
| **Total Cancer Risk - Adult Resident** | | | | | | | |
| **Total Risk = 2.08E-06** | | | | | | | |
| Cancer Risk for consumption of beef | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.12E-15 | 4.68E-15 | 0.00E+00 |
| Cancer Risk for consumption of milk | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 9.70E-15 | 1.46E-14 | 0.00E+00 |
| Cancer Risk for consumption of fish | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.70E-10 | 7.76E-10 | 0.00E+00 |
| Cancer Risk for consumption of soil | 0.00E+00 | 1.68E-18 | 0.00E+00 | 0.00E+00 | 2.68E-12 | 4.83E-12 | 4.49E-20 |
| Cancer Risk for consumption of above-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 9.78E-09 | 1.98E-08 | 0.00E+00 |
| Cancer Risk for consumption of below-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 6.93E-08 | 1.37E-07 | 0.00E+00 |
| Cancer Risk for consumption of drinking water | 0.00E+00 | 1.34E-10 | 0.00E+00 | 0.00E+00 | 2.57E-10 | 5.30E-10 | 1.11E-12 |
| Cancer Risk for inhalation | 0.00E+00 | 2.96E-09 | 0.00E+00 | 0.00E+00 | 1.44E-08 | 2.88E-08 | 6.06E-10 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 0.00E+00 | 3.10E-09 | 0.00E+00 | 0.00E+00 | 9.41E-08 | 1.87E-07 | 6.07E-10 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.009 | 0.019 | 0.000 |

Notes:

| | |
|---|---|
| TCFM | Trichlorofluoromethane |
| VCL | Vinyl Chloride |
| HCP | Hexachlorocyclopentadiene |
| 2-NA | 2-Nitroaniline |
| 2,4-DNT | 2,4-Dinitrotoluene |
| 2,6-DNT | 2,6-Dinitrotoluene |
| CLMTHN | Chloromethane |

Table 7-2a
Noncarcinogenic Hazard Index and Cancer Risk - Adult Resident
North Resident Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | PCP | 1,1-DCE | 1,1,2,2-TCA | CLFM | 1,3-BUT | HCBU | Hg | HgCl | MeHg | Total by Pathway |
|---|---|---|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Adult Resident** | | | | | | | | | | |
| **Total HI = 2.88E-01** | | | | | | | | | | |
| Hazard Index for consumption of beef | 1.64E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.94E-12 | 0.00E+00 | 6.69E-07 | 3.98E-08 | 5.52E-06 |
| Hazard Index for consumption of milk | 5.11E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.60E-12 | 0.00E+00 | 1.95E-06 | 1.64E-07 | 8.03E-06 |
| Hazard Index for consumption of fish | 4.09E-07 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 6.14E-07 | 0.00E+00 | 0.00E+00 | 2.42E-01 | 2.42E-01 |
| Hazard Index for consumption of soil | 3.78E-10 | 1.21E-14 | 2.70E-13 | 2.15E-13 | 0.00E+00 | 2.18E-11 | 0.00E+00 | 4.51E-06 | 2.40E-07 | 6.09E-06 |
| Hazard Index for consumption of above-ground vegetables | 6.83E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.07E-09 | 0.00E+00 | 3.51E-04 | 2.77E-04 | 9.20E-04 |
| Hazard Index for consumption of below-ground vegetables | 1.31E-04 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.97E-07 | 0.00E+00 | 5.00E-05 | 8.03E-06 | 2.43E-03 |
| Hazard Index for consumption of drinking water | 3.51E-08 | 8.42E-09 | 1.99E-09 | 2.37E-08 | 0.00E+00 | 5.63E-08 | 0.00E+00 | 4.30E-06 | 2.21E-06 | 2.45E-05 |
| Hazard Index for inhalation | 6.88E-06 | 8.58E-06 | 1.31E-06 | 2.73E-03 | 0.00E+00 | 5.15E-05 | 1.09E-05 | 3.86E-04 | 0.00E+00 | 4.29E-02 |
| **Total Hazard Index - All Potential Exposure Pathways** | 1.39E-04 | 8.58E-06 | 1.31E-06 | 2.73E-03 | 0.00E+00 | 5.25E-05 | 1.09E-05 | 7.99E-04 | 2.42E-01 | 2.88E-01 |
| **Fraction of 0.25 Benchmark** | 0.001 | 0.000 | 0.000 | 0.011 | 0.000 | 0.000 | 0.000 | 0.003 | 0.968 | 1.152 |
| **Total Cancer Risk - Adult Resident** | | | | | | | | | | |
| **Total Risk = 2.08E-06** | | | | | | | | | | |
| Cancer Risk for consumption of beef | 2.43E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.24E-17 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.05E-08 |
| Cancer Risk for consumption of milk | 7.56E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.59E-17 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.65E-08 |
| Cancer Risk for consumption of fish | 6.05E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.94E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.57E-07 |
| Cancer Risk for consumption of soil | 5.59E-13 | 2.68E-17 | 1.33E-15 | 0.00E+00 | 0.00E+00 | 1.40E-16 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.46E-09 |
| Cancer Risk for consumption of above-ground vegetables | 1.01E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.32E-14 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.34E-08 |
| Cancer Risk for consumption of below-ground vegetables | 1.94E-07 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.91E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.16E-07 |
| Cancer Risk for consumption of drinking water | 5.19E-11 | 1.87E-11 | 9.83E-12 | 0.00E+00 | 0.00E+00 | 3.61E-13 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.53E-09 |
| Cancer Risk for inhalation | 1.02E-08 | 5.64E-09 | 6.44E-09 | 7.79E-09 | 1.73E-07 | 3.30E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.31E-06 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 2.05E-07 | 5.66E-09 | 6.45E-09 | 7.79E-09 | 1.73E-07 | 3.37E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.08E-06 |
| **Fraction of 1E-05 Benchmark** | 0.021 | 0.001 | 0.001 | 0.001 | 0.017 | 0.000 | 0.000 | 0.000 | 0.000 | 0.208 |

Notes:

| | |
|---|---|
| PCP | Pentachlorophenol |
| 1,1-DCE | 1,1-Dichloroethylene |
| 1,1,2,2-TCA | 1,1,2,2-Tetrachloroethane |
| CLFM | Chloroform |
| 1,3-BUT | 1,3-Butadiene |
| Hg | Elemental Mercury |
| HgCl | Mercuric Chlorid |
| MeHg | Methyl Mercury |

Table 7-2b
Noncarcinogenic Hazard Index and Cancer Risk - Adult Resident
South Resident Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | As | Sb | Ba | Be | Cd | Total Cr | Cr VI |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Adult Resident** | | | | | | | |
| **Total HI = 2.43E-01** | | | | | | | |
| Hazard Index for consumption of beef | 8.57E-08 | 6.50E-09 | 9.82E-12 | 4.47E-10 | 7.86E-10 | 1.97E-11 | 1.92E-09 |
| Hazard Index for consumption of milk | 2.58E-08 | 6.48E-09 | 2.29E-10 | 3.61E-12 | 4.22E-10 | 4.70E-11 | 5.29E-09 |
| Hazard Index for consumption of fish | 1.01E-06 | 3.08E-07 | 4.89E-08 | 2.82E-08 | 1.80E-06 | 2.02E-12 | 1.22E-09 |
| Hazard Index for consumption of soil | 1.64E-07 | 3.72E-08 | 3.43E-10 | 1.41E-08 | 5.45E-08 | 1.33E-10 | 8.85E-10 |
| Hazard Index for consumption of above-ground vegetables | 6.26E-06 | 2.15E-06 | 2.08E-08 | 5.98E-08 | 7.73E-06 | 5.91E-10 | 4.64E-08 |
| Hazard Index for consumption of below-ground vegetables | 1.19E-06 | 9.66E-07 | 4.53E-09 | 7.58E-09 | 2.63E-06 | 1.85E-10 | 3.67E-09 |
| Hazard Index for consumption of drinking water | 5.24E-07 | 7.74E-08 | 7.82E-10 | 4.04E-09 | 6.90E-08 | 1.45E-12 | 4.30E-09 |
| Hazard Index for inhalation | 4.52E-07 | 6.50E-08 | 3.29E-07 | 1.33E-06 | 5.16E-07 | 1.50E-06 | 3.72E-07 |
| **Total Hazard Index - All Potential Exposure Pathways** | 9.71E-06 | 3.61E-06 | 4.05E-07 | 1.45E-06 | 1.28E-05 | 1.50E-06 | 4.36E-07 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Adult Resident** | | | | | | | |
| **Total Risk = 3.02E-07** | | | | | | | |
| Cancer Risk for consumption of beef | 1.58E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of milk | 4.77E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of fish | 1.75E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of soil | 2.79E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of above-ground vegetables | 1.11E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of below-ground vegetables | 1.72E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of drinking water | 9.45E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for inhalation | 8.35E-10 | 0.00E+00 | 0.00E+00 | 2.63E-11 | 7.61E-11 | 0.00E+00 | 1.33E-09 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 2.43E-09 | 0.00E+00 | 0.00E+00 | 2.63E-11 | 7.61E-11 | 0.00E+00 | 1.33E-09 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Notes:

| | |
|---|---|
| As | Arsenic |
| Sb | Antimony |
| Ba | Barium |
| Be | Beryllium |
| Cd | Cadmium |
| Total Cr | Total Chromium |
| Cr VI | Chromium VI |

Table 7-2b
Noncarcinogenic Hazard Index and Cancer Risk - Adult Resident
South Resident Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | Pb | Ni | Se | Ag | Tl | Zn | TCDD-TEQ |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Adult Resident** | | | | | | | |
| **Total HI = 2.43E-01** | | | | | | | |
| Hazard Index for consumption of beef | 0.00E+00 | 1.61E-08 | 3.22E-10 | 5.69E-09 | 2.16E-06 | 4.09E-11 | 2.48E-06 |
| Hazard Index for consumption of milk | 0.00E+00 | 2.65E-08 | 8.45E-09 | 3.85E-07 | 1.06E-06 | 1.47E-10 | 4.21E-06 |
| Hazard Index for consumption of fish | 0.00E+00 | 2.56E-07 | 2.09E-08 | 4.37E-07 | 6.69E-08 | 1.08E-06 | 2.70E-05 |
| Hazard Index for consumption of soil | 0.00E+00 | 2.20E-08 | 9.75E-11 | 2.10E-09 | 4.84E-07 | 3.38E-09 | 2.00E-07 |
| Hazard Index for consumption of above-ground vegetables | 0.00E+00 | 5.23E-07 | 1.92E-08 | 5.89E-07 | 6.49E-06 | 3.18E-07 | 2.96E-08 |
| Hazard Index for consumption of below-ground vegetables | 0.00E+00 | 1.39E-07 | 1.98E-09 | 1.94E-07 | 1.49E-07 | 1.19E-07 | 2.87E-06 |
| Hazard Index for consumption of drinking water | 0.00E+00 | 3.20E-08 | 1.76E-09 | 2.31E-08 | 6.46E-07 | 5.14E-09 | 4.45E-08 |
| Hazard Index for inhalation | 0.00E+00 | 9.56E-05 | 1.49E-09 | 1.95E-08 | 5.51E-07 | 4.39E-09 | 6.69E-08 |
| **Total Hazard Index - All Potential Exposure Pathways** | 0.00E+00 | 9.66E-05 | 5.42E-08 | 1.66E-06 | 1.16E-05 | 1.53E-06 | 3.69E-05 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Adult Resident** | | | | | | | |
| **Total Risk = 3.02E-07** | | | | | | | |
| Cancer Risk for consumption of beef | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.99E-08 |
| Cancer Risk for consumption of milk | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.45E-08 |
| Cancer Risk for consumption of fish | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.53E-07 |
| Cancer Risk for consumption of soil | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.11E-09 |
| Cancer Risk for consumption of above-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.02E-10 |
| Cancer Risk for consumption of below-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.25E-08 |
| Cancer Risk for consumption of drinking water | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.14E-10 |
| Cancer Risk for inhalation | 0.00E+00 | 1.88E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.59E-10 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 0.00E+00 | 1.88E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.32E-07 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.023 |

Notes:

| | |
|---|---|
| Pb | Lead |
| Ni | Nickel |
| Se | Selenium |
| Ag | Silver |
| Tl | Thallium |
| Zn | Zinc |
| TCDD-TEQ | 2,3,7,8-TCDD Toxicity Equivalents |

Table 7-2b
Noncarcinogenic Hazard Index and Cancer Risk - Adult Resident
South Resident Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | BAA | BAP | BBF | BKF | CHRYS | DBAHA | INDENO |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Adult Resident** | | | | | | | |
| **Total HI = 2.43E-01** | | | | | | | |
| Hazard Index for consumption of beef | 1.81E-11 | 2.38E-10 | 1.16E-09 | 3.14E-10 | 4.09E-10 | 3.04E-09 | 3.57E-08 |
| Hazard Index for consumption of milk | 4.67E-11 | 7.13E-10 | 3.07E-09 | 9.49E-10 | 1.12E-09 | 9.49E-09 | 1.11E-07 |
| Hazard Index for consumption of fish | 5.49E-09 | 8.05E-09 | 9.36E-08 | 5.02E-09 | 8.33E-08 | 1.03E-09 | 1.07E-09 |
| Hazard Index for consumption of soil | 6.06E-12 | 2.35E-11 | 1.10E-10 | 2.08E-11 | 9.49E-11 | 1.58E-11 | 2.21E-11 |
| Hazard Index for consumption of above-ground vegetables | 1.09E-10 | 1.59E-10 | 7.89E-10 | 1.37E-10 | 1.08E-09 | 8.86E-11 | 1.33E-10 |
| Hazard Index for consumption of below-ground vegetables | 7.95E-09 | 9.76E-09 | 8.59E-08 | 1.11E-08 | 8.03E-08 | 6.98E-09 | 8.13E-09 |
| Hazard Index for consumption of drinking water | 6.45E-12 | 5.86E-12 | 5.94E-11 | 4.47E-12 | 6.69E-11 | 1.57E-12 | 1.23E-12 |
| Hazard Index for inhalation | 2.26E-12 | 3.76E-12 | 2.53E-11 | 3.38E-12 | 1.80E-11 | 2.56E-12 | 3.58E-12 |
| **Total Hazard Index - All Potential Exposure Pathways** | 1.36E-08 | 1.90E-08 | 1.85E-07 | 1.76E-08 | 1.66E-07 | 2.06E-08 | 1.56E-07 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Adult Resident** | | | | | | | |
| **Total Risk = 3.02E-07** | | | | | | | |
| Cancer Risk for consumption of beef | 1.45E-13 | 2.01E-11 | 9.20E-12 | 2.73E-13 | 3.26E-14 | 2.73E-10 | 3.21E-10 |
| Cancer Risk for consumption of milk | 3.89E-13 | 6.20E-11 | 2.57E-11 | 8.40E-13 | 9.34E-14 | 8.53E-10 | 1.00E-09 |
| Cancer Risk for consumption of fish | 3.73E-11 | 4.07E-10 | 5.56E-10 | 2.53E-12 | 4.66E-12 | 5.23E-11 | 5.47E-12 |
| Cancer Risk for consumption of soil | 3.95E-14 | 1.10E-12 | 6.17E-13 | 9.58E-15 | 4.96E-15 | 7.12E-13 | 9.98E-14 |
| Cancer Risk for consumption of above-ground vegetables | 5.89E-13 | 9.11E-12 | 4.14E-12 | 8.17E-14 | 5.39E-14 | 6.05E-12 | 1.04E-12 |
| Cancer Risk for consumption of below-ground vegetables | 4.18E-11 | 4.44E-10 | 4.19E-10 | 5.05E-12 | 3.81E-12 | 3.15E-10 | 3.66E-11 |
| Cancer Risk for consumption of drinking water | 5.05E-14 | 4.02E-13 | 4.25E-13 | 3.22E-15 | 4.51E-15 | 1.27E-13 | 1.00E-14 |
| Cancer Risk for inhalation | 5.86E-14 | 9.73E-14 | 6.54E-13 | 8.75E-14 | 4.65E-13 | 6.63E-14 | 9.27E-14 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 8.03E-11 | 9.44E-10 | 1.02E-09 | 8.87E-12 | 9.12E-12 | 1.50E-09 | 1.37E-09 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Notes:

| | |
|---|---|
| BAA | Benzo(a)anthracene |
| BAP | Benzo(a)pyrene |
| BBF | Benzo(b)fluoranthene |
| BKF | Benzo(k)fluoranthene |
| CHRYS | Chrysene |
| DBAHA | Dibenz(a,h)anthracene |
| INDENO | Indeno(1,2,3-c,d)pyrene |

Table 7-2b
Noncarcinogenic Hazard Index and Cancer Risk - Adult Resident
South Resident Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | BEHP | HCBZ | BZ | BM | CCl4 | DCDFM |
|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Adult Resident** | | | | | | |
| **Total HI = 2.43E-01** | | | | | | |
| Hazard Index for consumption of beef | 1.38E-08 | 5.81E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Index for consumption of milk | 3.37E-08 | 1.56E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Index for consumption of fish | 1.74E-06 | 1.93E-06 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Index for consumption of soil | 1.68E-08 | 2.25E-09 | 4.46E-14 | 6.60E-15 | 5.36E-14 | 1.84E-18 |
| Hazard Index for consumption of above-ground vegetables | 8.10E-07 | 7.35E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Index for consumption of below-ground vegetables | 3.21E-05 | 1.04E-05 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Index for consumption of drinking water | 4.43E-08 | 1.14E-07 | 1.15E-07 | 1.57E-07 | 1.01E-07 | 1.19E-09 |
| Hazard Index for inhalation | 2.06E-08 | 2.43E-07 | 5.93E-07 | 4.91E-07 | 3.72E-07 | 1.23E-08 |
| **Total Hazard Index - All Potential Exposure Pathways** | 3.48E-05 | 1.28E-05 | 7.08E-07 | 6.48E-07 | 4.73E-07 | 1.35E-08 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Adult Resident** | | | | | | |
| **Total Risk = 3.02E-07** | | | | | | |
| Cancer Risk for consumption of beef | 1.50E-12 | 3.06E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of milk | 3.70E-12 | 8.18E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of fish | 1.83E-10 | 1.01E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of soil | 1.75E-12 | 1.18E-12 | 3.02E-18 | 0.00E+00 | 2.00E-18 | 1.27E-20 |
| Cancer Risk for consumption of above-ground vegetables | 7.05E-11 | 3.87E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of below-ground vegetables | 2.77E-09 | 5.49E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of drinking water | 4.97E-12 | 5.98E-11 | 7.81E-12 | 0.00E+00 | 3.79E-12 | 8.23E-12 |
| Cancer Risk for inhalation | 2.37E-12 | 1.28E-10 | 1.21E-11 | 0.00E+00 | 4.63E-12 | 0.00E+00 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 3.04E-09 | 6.74E-09 | 1.99E-11 | 0.00E+00 | 8.41E-12 | 8.23E-12 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 |

Notes:

| | |
|---|---|
| BEHP | Bis(2-ethylhexyl)phthalate |
| HCBZ | Hexachlorobenzene |
| BZ | Benzene |
| BM | Bromomethane |
| CCl4 | Carbon tetrachloride |
| DCDFM | Dichlorodifluoromethane |

Table 7-2b
Noncarcinogenic Hazard Index and Cancer Risk - Adult Resident
South Resident Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | T13DCP | TCFM | VCL | HCP | 2-NA | 2,4-DNT | 2,6-DNT | CLMTHN |
|---|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Adult Resident** | | | | | | | | |
| **Total HI = 2.43E-01** | | | | | | | | |
| Hazard Index for consumption of beef | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.95E-12 | 3.99E-11 | 5.59E-12 | 1.67E-11 | 0.00E+00 |
| Hazard Index for consumption of milk | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.09E-11 | 1.24E-10 | 1.74E-11 | 5.22E-11 | 0.00E+00 |
| Hazard Index for consumption of fish | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.13E-07 | 2.03E-05 | 6.63E-07 | 2.78E-06 | 0.00E+00 |
| Hazard Index for consumption of soil | 1.64E-15 | 6.75E-17 | 1.01E-16 | 3.23E-12 | 4.72E-09 | 5.38E-10 | 1.92E-09 | 2.34E-16 |
| Hazard Index for consumption of above-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.33E-10 | 1.98E-05 | 1.88E-06 | 7.72E-06 | 0.00E+00 |
| Hazard Index for consumption of below-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.38E-08 | 1.39E-04 | 1.39E-05 | 5.47E-05 | 0.00E+00 |
| Hazard Index for consumption of drinking water | 2.76E-09 | 7.70E-10 | 7.27E-08 | 3.78E-08 | 1.33E-05 | 4.60E-07 | 1.90E-06 | 5.20E-08 |
| Hazard Index for inhalation | 4.10E-08 | 3.51E-09 | 2.45E-08 | 1.08E-05 | 5.41E-06 | 7.71E-08 | 3.09E-07 | 2.73E-08 |
| **Total Hazard Index - All Potential Exposure Pathways** | 4.38E-08 | 4.28E-09 | 9.72E-08 | 1.10E-05 | 1.97E-04 | 1.70E-05 | 6.74E-05 | 7.93E-08 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Adult Resident** | | | | | | | | |
| **Total Risk = 3.02E-07** | | | | | | | | |
| Cancer Risk for consumption of beef | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.12E-15 | 4.68E-15 | 0.00E+00 |
| Cancer Risk for consumption of milk | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 9.70E-15 | 1.46E-14 | 0.00E+00 |
| Cancer Risk for consumption of fish | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.70E-10 | 7.76E-10 | 0.00E+00 |
| Cancer Risk for consumption of soil | 2.02E-18 | 0.00E+00 | 1.87E-19 | 0.00E+00 | 0.00E+00 | 3.01E-13 | 5.38E-13 | 5.00E-21 |
| Cancer Risk for consumption of above-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.05E-09 | 2.16E-09 | 0.00E+00 |
| Cancer Risk for consumption of below-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 7.77E-09 | 1.53E-08 | 0.00E+00 |
| Cancer Risk for consumption of drinking water | 3.40E-12 | 0.00E+00 | 1.34E-10 | 0.00E+00 | 0.00E+00 | 2.57E-10 | 5.30E-10 | 1.11E-12 |
| Cancer Risk for inhalation | 1.35E-11 | 0.00E+00 | 8.88E-12 | 0.00E+00 | 0.00E+00 | 4.31E-11 | 8.63E-11 | 1.82E 12 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 1.69E-11 | 0.00E+00 | 1.43E-10 | 0.00E+00 | 0.00E+00 | 9.49E-09 | 1.88E-08 | 2.93E-12 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.002 | 0.000 |

Notes:

| | |
|---|---|
| T13DCP | Trans-1,3-Dichloropropene |
| TCFM | Trichlorofluoromethane |
| VCL | Vinyl Chloride |
| HCP | Hexachlorocyclopentadiene |
| 2-NA | 2-Nitroaniline |
| 2,4-DNT | 2,4-Dinitrotoluene |
| 2,6-DNT | 2,6-Dinitrotoluene |
| CLMTHN | Chloromethane |

Table 7-2b
Noncarcinogenic Hazard Index and Cancer Risk - Adult Resident
South Resident Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | PCP | 1,1-DCE | 1,1,2,2-TCA | CLFM | 1,3-BUT | HCBU |
|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Adult Resident** | | | | | | |
| **Total HI = 2.43E-01** | | | | | | |
| Hazard Index for consumption of beef | 1.64E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.94E-12 |
| Hazard Index for consumption of milk | 5.11E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.60E-12 |
| Hazard Index for consumption of fish | 4.09E-07 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 6.14E-07 |
| Hazard Index for consumption of soil | 4.21E-11 | 1.34E-15 | 3.00E-14 | 2.39E-14 | 0.00E+00 | 2.42E-12 |
| Hazard Index for consumption of above-ground vegetables | 2.54E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.21E-10 |
| Hazard Index for consumption of below-ground vegetables | 1.46E-05 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.31E-08 |
| Hazard Index for consumption of drinking water | 3.51E-08 | 8.42E-09 | 1.99E-09 | 2.37E-08 | 0.00E+00 | 5.63E-08 |
| Hazard Index for inhalation | 2.06E-08 | 2.57E-08 | 3.92E-09 | 8.18E-06 | 0.00E+00 | 1.54E-07 |
| **Total Hazard Index - All Potential Exposure Pathways** | 1.51E-05 | 3.41E-08 | 5.91E-09 | 8.21E-06 | 0.00E+00 | 8.58E-07 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Adult Resident** | | | | | | |
| **Total Risk = 3.02E-07** | | | | | | |
| Cancer Risk for consumption of beef | 2.43E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.24E-17 |
| Cancer Risk for consumption of milk | 7.56E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.59E-17 |
| Cancer Risk for consumption of fish | 6.05E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.94E-12 |
| Cancer Risk for consumption of soil | 6.22E-14 | 2.98E-18 | 1.48E-16 | 0.00E+00 | 0.00E+00 | 1.55E-17 |
| Cancer Risk for consumption of above-ground vegetables | 3.75E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.41E-15 |
| Cancer Risk for consumption of below-ground vegetables | 2.16E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.12E-13 |
| Cancer Risk for consumption of drinking water | 5.19E-11 | 1.87E-11 | 9.83E-12 | 0.00E+00 | 0.00E+00 | 3.61E-13 |
| Cancer Risk for inhalation | 3.05E-11 | 1.69E-11 | 1.93E-11 | 2.33E-11 | 5.19E-10 | 9.90E-13 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 2.23E-08 | 3.56E-11 | 2.91E-11 | 2.33E-11 | 5.19E-10 | 5.50E-12 |
| **Fraction of 1E-05 Benchmark** | 0.002 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Notes:

| | |
|---|---|
| PCP | Pentachlorophenol |
| 1,1-DCE | 1,1-Dichloroethylene |
| 1,1,2,2-TCA | 1,1,2,2-Tetrachloroethane |
| CLFM | Chloroform |
| 1,3-BUT | 1,3-Butadiene |
| HCBU | Hexachlorobutadiene |

Table 7-2b
Noncarcinogenic Hazard Index and Cancer Risk - Adult Resident
South Resident Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | Hg | HgCl | MeHg | Total by Pathway |
|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Adult Resident** | | | | |
| **Total HI = 2.43E-01** | | | | |
| Hazard Index for consumption of beef | 0.00E+00 | 6.69E-07 | 3.98E-08 | 5.52E-06 |
| Hazard Index for consumption of milk | 0.00E+00 | 1.95E-06 | 1.64E-07 | 8.03E-06 |
| Hazard Index for consumption of fish | 0.00E+00 | 0.00E+00 | 2.42E-01 | 2.42E-01 |
| Hazard Index for consumption of soil | 0.00E+00 | 9.92E-06 | 5.29E-07 | 1.15E-05 |
| Hazard Index for consumption of above-ground vegetables | 0.00E+00 | 6.42E-05 | 9.81E-06 | 1.29E-04 |
| Hazard Index for consumption of below-ground vegetables | 0.00E+00 | 1.10E-04 | 1.77E-05 | 4.01E-04 |
| Hazard Index for consumption of drinking water | 0.00E+00 | 4.30E-06 | 2.21E-06 | 2.44E-05 |
| Hazard Index for inhalation | 3.27E-08 | 1.16E-06 | 0.00E+00 | 1.29E-04 |
| **Total Hazard Index - All Potential Exposure Pathways** | 3.27E-08 | 1.92E-04 | 2.42E-01 | 2.43E-01 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.001 | 0.967 | 0.970 |
| **Total Cancer Risk - Adult Resident** | | | | |
| **Total Risk = 3.02E-07** | | | | |
| Cancer Risk for consumption of beef | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.05E-08 |
| Cancer Risk for consumption of milk | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.65E-08 |
| Cancer Risk for consumption of fish | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.57E-07 |
| Cancer Risk for consumption of soil | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.14E-09 |
| Cancer Risk for consumption of above-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.75E-09 |
| Cancer Risk for consumption of below-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 7.69E-08 |
| Cancer Risk for consumption of drinking water | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.50E-09 |
| Cancer Risk for inhalation | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.93E-09 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.02E-07 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.000 | 0.000 | 0.030 |

Notes:

Hg Mercury
HgCl Mercuric Chloride
MeHg Methyl Mercury

Table 7-3a
Noncarcinogenic Hazard Index and Cancer Risk - Subsistence Farmer
Beef Farm Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | As | Sb | Ba | Be | Cd | Total Cr | Cr VI |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Farmer** | | | | | | | |
| **Total HI = 2.44E-01** | | | | | | | |
| Hazard Quotient for consumption of beef | 8.57E-07 | 6.50E-08 | 9.82E-11 | 4.47E-09 | 7.86E-09 | 1.97E-10 | 1.92E-08 |
| Hazard Quotient for consumption of milk | 2.79E-07 | 7.01E-08 | 2.48E-09 | 3.90E-11 | 4.55E-09 | 5.07E-10 | 5.73E-08 |
| Hazard Quotient for consumption of fish | 1.01E-06 | 3.08E-07 | 4.89E-08 | 2.82E-08 | 1.80E-06 | 2.02E-12 | 1.22E-09 |
| Hazard Quotient for consumption of soil | 2.13E-08 | 4.84E-09 | 4.47E-11 | 1.84E-09 | 7.10E-09 | 1.74E-11 | 1.15E-10 |
| Hazard Quotient for consumption of above-ground vegetables | 4.24E-07 | 1.37E-07 | 1.33E-09 | 4.01E-09 | 4.78E-07 | 3.88E-11 | 3.17E-09 |
| Hazard Quotient for consumption of below-ground vegetables | 7.25E-08 | 5.88E-08 | 2.76E-10 | 4.62E-10 | 1.60E-07 | 1.12E-11 | 2.23E-10 |
| Hazard Quotient for consumption of drinking water | 6.58E-07 | 7.74E-08 | 7.82E-10 | 4.04E-09 | 6.90E-08 | 1.45E-12 | 4.30E-09 |
| Hazard Quotient for inhalation | 6.13E-06 | 8.82E-07 | 4.47E-06 | 1.81E-05 | 7.00E-06 | 2.04E-05 | 5.05E-06 |
| **Total Hazard Index - All Potential Exposure Pathways** | 9.46E-06 | 1.60E-06 | 4.52E-06 | 1.81E-05 | 9.53E-06 | 2.04E-05 | 5.14E-06 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Farmer** | | | | | | | |
| **Total Risk = 1.15E-06** | | | | | | | |
| Cancer Risk for consumption of beef | 2.10E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of milk | 6.87E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of fish | 1.93E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of soil | 3.93E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of above-ground vegetables | 9.91E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of below-ground vegetables | 1.28E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of drinking water | 1.52E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for inhalation | 1.51E-08 | 0.00E+00 | 0.00E+00 | 4.76E-10 | 1.38E-09 | 0.00E+00 | 2.41E-08 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 1.59E-08 | 0.00E+00 | 0.00E+00 | 4.76E-10 | 1.38E-09 | 0.00E+00 | 2.41E-08 |
| **Fraction of 1E-05 Benchmark** | 0.002 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.002 |

Notes:

| | |
|---|---|
| As | Arsenic |
| Sb | Antimony |
| Ba | Barium |
| Be | Beryllium |
| Cd | Cadmium |
| Total Cr | Total Chromium |
| Cr VI | Chromium VI |

Table 7-3a
Noncarcinogenic Hazard Index and Cancer Risk - Subsistence Farmer
Beef Farm Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | Pb | Ni | Se | Ag | Tl | Zn | TCDD-TEQ |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Farmer** | | | | | | | |
| **Total HI = 2.44E-01** | | | | | | | |
| Hazard Quotient for consumption of beef | 0.00E+00 | 1.61E-07 | 3.22E-09 | 5.69E-08 | 2.16E-05 | 4.09E-10 | 2.48E-05 |
| Hazard Quotient for consumption of milk | 0.00E+00 | 2.87E-07 | 9.15E-08 | 4.17E-06 | 1.15E-05 | 1.58E-09 | 4.70E-05 |
| Hazard Quotient for consumption of fish | 0.00E+00 | 2.56E-07 | 2.09E-08 | 4.37E-07 | 6.69E-08 | 1.08E-06 | 2.70E-05 |
| Hazard Quotient for consumption of soil | 0.00E+00 | 2.87E-09 | 1.27E-11 | 2.73E-10 | 6.30E-08 | 4.40E-10 | 1.43E-07 |
| Hazard Quotient for consumption of above-ground vegetables | 0.00E+00 | 3.45E-08 | 1.31E-09 | 3.79E-08 | 4.47E-07 | 1.98E-08 | 1.13E-08 |
| Hazard Quotient for consumption of below-ground vegetables | 0.00E+00 | 8.47E-09 | 1.21E-10 | 1.18E-08 | 9.06E-09 | 7.26E-09 | 4.67E-07 |
| Hazard Quotient for consumption of drinking water | 0.00E+00 | 3.20E-08 | 1.76E-09 | 2.31E-08 | 6.46E-07 | 5.14E-09 | 4.45E-08 |
| Hazard Quotient for Inhalation | 0.00E+00 | 1.30E-03 | 2.02E-08 | 2.65E-07 | 7.48E-06 | 5.96E-08 | 9.01E-07 |
| **Total Hazard Index - All Potential Exposure Pathways** | 0.00E+00 | 1.30E-03 | 1.39E-07 | 5.00E-06 | 4.18E-05 | 1.18E-06 | 1.00E-04 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.005 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Farmer** | | | | | | | |
| **Total Risk = 1.15E-06** | | | | | | | |
| Cancer Risk for consumption of beef | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.66E-07 |
| Cancer Risk for consumption of milk | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.15E-07 |
| Cancer Risk for consumption of fish | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.08E-07 |
| Cancer Risk for consumption of soil | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.08E-09 |
| Cancer Risk for consumption of above-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.54E-10 |
| Cancer Risk for consumption of below-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.50E-09 |
| Cancer Risk for consumption of drinking water | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.27E-10 |
| Cancer Risk for Inhalation | 0.00E+00 | 3.41E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.00E-08 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 0.00E+00 | 3.41E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.00E-06 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.100 |

Notes:

| | |
|---|---|
| Cr Vi | Chromium Vi |
| Pb | Lead |
| Ni | Nickel |
| Se | Selenium |
| Ag | Silver |
| Tl | Thallium |
| Zn | Zinc |

Table 7-3a
Noncarcinogenic Hazard Index and Cancer Risk - Subsistence Farmer
Beef Farm Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | BAA | BAP | BBF | BKF | CHRYS | DBAHA | INDENO |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Farmer** | | | | | | | |
| **Total HI = 2.44E-01** | | | | | | | |
| Hazard Quotient for consumption of beef | 1.81E-10 | 2.38E-09 | 1.16E-08 | 3.14E-09 | 4.09E-09 | 3.04E-08 | 3.57E-07 |
| Hazard Quotient for consumption of milk | 5.20E-10 | 7.95E-09 | 3.42E-08 | 1.06E-08 | 1.25E-08 | 1.06E-07 | 1.24E-06 |
| Hazard Quotient for consumption of fish | 5.49E-09 | 8.05E-09 | 9.36E-08 | 5.02E-09 | 8.33E-08 | 1.03E-09 | 1.07E-09 |
| Hazard Quotient for consumption of soil | 8.82E-12 | 1.49E-11 | 1.53E-10 | 8.92E-12 | 1.26E-10 | 2.50E-12 | 3.33E-12 |
| Hazard Quotient for consumption of above-ground vegetables | 7.81E-11 | 7.74E-11 | 6.09E-10 | 6.99E-11 | 7.75E-10 | 2.39E-10 | 1.19E-09 |
| Hazard Quotient for consumption of below-ground vegetables | 5.41E-09 | 2.89E-09 | 5.59E-08 | 2.23E-09 | 4.97E-08 | 5.19E-10 | 5.72E-10 |
| Hazard Quotient for consumption of drinking water | 6.45E-12 | 5.86E-12 | 5.94E-11 | 4.47E-12 | 6.69E-11 | 1.57E-12 | 1.23E-12 |
| Hazard Quotient for inhalation | 3.09E-11 | 5.09E-11 | 3.45E-10 | 4.56E-11 | 2.45E-10 | 3.45E-11 | 4.83E-11 |
| **Total Hazard Index - All Potential Exposure Pathways** | 1.17E-08 | 2.14E-08 | 1.96E-07 | 2.11E-08 | 1.51E-07 | 1.38E-07 | 1.60E-06 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Farmer** | | | | | | | |
| **Total Risk = 1.15E-06** | | | | | | | |
| Cancer Risk for consumption of beef | 1.91E-12 | 2.72E-10 | 1.24E-10 | 3.67E-12 | 4.43E-13 | 3.65E-09 | 4.29E-09 |
| Cancer Risk for consumption of milk | 5.75E-12 | 9.30E-10 | 3.85E-10 | 1.25E-11 | 1.41E-12 | 1.27E-08 | 1.49E-08 |
| Cancer Risk for consumption of fish | 4.72E-11 | 6.25E-10 | 7.64E-10 | 3.90E-12 | 6.66E-12 | 8.10E-11 | 8.47E-12 |
| Cancer Risk for consumption of soil | 7.40E-14 | 1.12E-12 | 1.22E-12 | 6.72E-15 | 9.77E-15 | 1.88E-13 | 2.50E-14 |
| Cancer Risk for consumption of above-ground vegetables | 6.36E-13 | 7.72E-12 | 5.25E-12 | 7.54E-14 | 6.54E-14 | 2.85E-11 | 1.42E-11 |
| Cancer Risk for consumption of below-ground vegetables | 4.22E-11 | 2.17E-10 | 4.27E-10 | 1.68E-12 | 3.77E-12 | 3.89E-11 | 4.29E-12 |
| Cancer Risk for consumption of drinking water | 6.63E-14 | 5.73E-13 | 5.79E-13 | 4.53E-15 | 6.30E-15 | 1.73E-13 | 1.37E-14 |
| Cancer Risk for inhalation | 1.07E-12 | 1.76E-12 | 1.19E-11 | 1.58E-12 | 8.45E-12 | 1.19E-12 | 1.67E-12 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 9.89E-11 | 2.06E-09 | 1.72E-09 | 2.35E-11 | 2.08E-11 | 1.65E-08 | 1.92E-08 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.002 | 0.002 |

Notes:

TCDD TEQ 2,3,7,8-TCDD Toxicity Equivalents
BAA Benzo(a)anthracene
BAP Benzo(a)pyrene
BBF Benzo(b)fluoranthene
BKF Benzo(k)fluoranthene
CHRYS Chrysene
DBAHA Dibenz(a,h)anthracene

Table 7-3a
Noncarcinogenic Hazard Index and Cancer Risk - Subsistence Farmer
Beef Farm Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | BEHP | HCBZ | BZ | BM | CCl4 | DCDFM | T13DCP |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Farmer** | | | | | | | |
| Total HI = 2.44E-01 | | | | | | | |
| Hazard Quotient for consumption of beef | 1.38E-07 | 5.81E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Quotient for consumption of milk | 3.75E-07 | 1.73E-07 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Quotient for consumption of fish | 1.74E-06 | 1.93E-06 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Quotient for consumption of soil | 2.54E-08 | 3.55E-09 | 7.04E-14 | 1.04E-14 | 8.45E-14 | 2.90E-18 | 2.59E-15 |
| Hazard Quotient for consumption of above-ground vegetables | 5.72E-07 | 5.77E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Quotient for consumption of below-ground vegetables | 2.27E-05 | 7.70E-06 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Quotient for consumption of drinking water | 4.43E-08 | 1.14E-07 | 1.15E-07 | 1.57E-07 | 1.01E-07 | 1.19E-09 | 2.76E-09 |
| Hazard Quotient for inhalation | 2.82E-07 | 3.33E-06 | 8.12E-06 | 6.72E-06 | 5.09E-06 | 1.68E-07 | 5.62E-07 |
| **Total Hazard Index - All Potential Exposure Pathways** | 2.59E-05 | 1.34E-05 | 8.24E-06 | 6.88E-06 | 5.19E-06 | 1.69E-07 | 5.65E-07 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Farmer** | | | | | | | |
| Total Risk = 1.15E-06 | | | | | | | |
| Cancer Risk for consumption of beef | 1.79E-11 | 3.72E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of milk | 5.02E-11 | 1.14E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of fish | 2.03E-10 | 1.19E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of soil | 2.92E-12 | 1.87E-12 | 4.77E-18 | 0.00E+00 | 3.16E-18 | 2.00E-20 | 3.19E-18 |
| Cancer Risk for consumption of above-ground vegetables | 6.26E-11 | 3.09E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of below-ground vegetables | 2.47E-09 | 4.05E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of drinking water | 8.29E-12 | 7.95E-11 | 1.04E-11 | 0.00E+00 | 5.05E-12 | 1.10E-11 | 4.54E-12 |
| Cancer Risk for inhalation | 4.32E-11 | 2.33E-09 | 2.21E-10 | 0.00E+00 | 8.44E-11 | 0.00E+00 | 2.46E-10 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 2.86E-09 | 7.83E-09 | 2.32E-10 | 0.00E+00 | 8.95E-11 | 1.10E-11 | 2.51E-10 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Notes:

| | |
|---|---|
| INDENO | indeno(1,2,3-c,d)pyrene |
| Not Used | Not Used |
| HCBZ | Hexachlorobenzene |
| BZ | Benzene |
| BM | Bromomethane |
| CCl4 | Carbon tetrachloride |
| DCDFM | Dichlorodifluoromethane |

Table 7-3a
Noncarcinogenic Hazard Index and Cancer Risk - Subsistence Farmer
Beef Farm Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | TCFM | VCL | HCP | 2-NA | 2,4-DNT | 2,6-DNT | CLMTHN |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Farmer** | | | | | | | |
| **Total HI = 2.44E-01** | | | | | | | |
| Hazard Quotient for consumption of beef | 0.00E+00 | 0.00E+00 | 3.95E-11 | 3.99E-10 | 5.59E-11 | 1.67E-10 | 0.00E+00 |
| Hazard Quotient for consumption of milk | 0.00E+00 | 0.00E+00 | 1.22E-10 | 1.38E-09 | 1.93E-10 | 5.80E-10 | 0.00E+00 |
| Hazard Quotient for consumption of fish | 0.00E+00 | 0.00E+00 | 1.13E-07 | 2.03E-05 | 6.63E-07 | 2.78E-06 | 0.00E+00 |
| Hazard Quotient for consumption of soil | 1.07E-16 | 1.60E-16 | 5.10E-12 | 7.45E-09 | 8.44E-10 | 3.04E-09 | 3.69E-16 |
| Hazard Quotient for consumption of above-ground vegetables | 0.00E+00 | 0.00E+00 | 1.82E-10 | 1.51E-05 | 1.44E-06 | 5.85E-06 | 0.00E+00 |
| Hazard Quotient for consumption of below-ground vegetables | 0.00E+00 | 0.00E+00 | 3.24E-08 | 1.02E-04 | 1.02E-05 | 4.04E-05 | 0.00E+00 |
| Hazard Quotient for consumption of drinking water | 7.70E-10 | 7.27E-08 | 3.78E-08 | 1.33E-05 | 4.60E-07 | 1.90E-06 | 5.20E-08 |
| Hazard Quotient for inhalation | 4.80E-08 | 3.36E-07 | 1.48E-04 | 7.40E-05 | 1.06E-06 | 4.23E-06 | 3.73E-07 |
| **Total Hazard Index - All Potential Exposure Pathways** | 4.88E-08 | 4.09E-07 | 1.48E-04 | 2.25E-04 | 1.38E-05 | 5.51E-05 | 4.25E-07 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Farmer** | | | | | | | |
| **Total Risk = 1.15E-06** | | | | | | | |
| Cancer Risk for consumption of beef | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.22E-14 | 4.71E-14 | 0.00E+00 |
| Cancer Risk for consumption of milk | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.11E-13 | 1.63E-13 | 0.00E+00 |
| Cancer Risk for consumption of fish | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.76E-10 | 7.87E-10 | 0.00E+00 |
| Cancer Risk for consumption of soil | 0.00E+00 | 2.95E-19 | 0.00E+00 | 0.00E+00 | 4.71E-13 | 8.49E-13 | 7.89E-21 |
| Cancer Risk for consumption of above-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 8.20E-10 | 1.65E-09 | 0.00E+00 |
| Cancer Risk for consumption of below-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.70E-09 | 1.13E-08 | 0.00E+00 |
| Cancer Risk for consumption of drinking water | 0.00E+00 | 1.79E-10 | 0.00E+00 | 0.00E+00 | 2.85E-10 | 5.86E-10 | 1.48E-12 |
| Cancer Risk for inhalation | 0.00E+00 | 1.62E-10 | 0.00E+00 | 0.00E+00 | 7.87E-10 | 1.58E-09 | 3.31E-11 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 0.00E+00 | 3.41E-10 | 0.00E+00 | 0.00E+00 | 7.97E-09 | 1.59E-08 | 3.46E-11 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.002 | 0.000 |

Notes:

| | |
|---|---|
| T13DCP | Trans-1,3-Dichloropropene |
| TCFM | Trichlorofluoromethane |
| VCL | Vinyl Chloride |
| HCP | Hexachlorocyclopentadiene |
| 2-NA | 2-Nitroaniline |
| 2,4-DNT | 2,4-Dinitrotoluene |
| 2,6-DNT | 2,6-Dinitrotoluene |

Table 7-3a
Noncarcinogenic Hazard Index and Cancer Risk - Subsistence Farmer
Beef Farm Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | PCP | 1,1-DCE | 1,1,2,2-TCA | CLFM | 1,3-BUT | HCBU | Hg | HgCl | MeHg | Total by Pathway |
|---|---|---|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Farmer** | | | | | | | | | | |
| **Total HI = 2.44E-01** | | | | | | | | | | |
| Hazard Quotient for consumption of beef | 1.64E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.94E-11 | 0.00E+00 | 6.69E-06 | 3.98E-07 | 5.53E-05 |
| Hazard Quotient for consumption of milk | 5.71E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 6.25E-11 | 0.00E+00 | 2.12E-05 | 1.82E-06 | 8.85E-05 |
| Hazard Quotient for consumption of fish | 4.09E-07 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 6.14E-07 | 0.00E+00 | 0.00E+00 | 2.42E-01 | 2.42E-01 |
| Hazard Quotient for consumption of soil | 6.64E-11 | 2.12E-15 | 4.74E-14 | 3.78E-14 | 0.00E+00 | 3.83E-12 | 0.00E+00 | 1.46E-06 | 7.79E-08 | 1.82E-06 |
| Hazard Quotient for consumption of above-ground vegetables | 5.47E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.71E-10 | 0.00E+00 | 2.98E-05 | 2.22E-05 | 7.67E-05 |
| Hazard Quotient for consumption of below-ground vegetables | 1.08E-05 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.44E-08 | 0.00E+00 | 7.58E-06 | 1.22E-06 | 2.04E-04 |
| Hazard Quotient for consumption of drinking water | 3.51E-08 | 6.42E-09 | 1.99E-09 | 2.37E-08 | 0.00E+00 | 5.63E-08 | 0.00E+00 | 4.30E-06 | 2.21E-06 | 2.45E-05 |
| Hazard Quotient for inhalation | 2.82E-07 | 3.52E-07 | 5.36E-08 | 1.12E-04 | 0.00E+00 | 2.11E-06 | 4.47E-07 | 1.58E-05 | 0.00E+00 | 1.75E-03 |
| **Total Hazard Index - All Potential Exposure Pathways** | 1.16E-05 | 3.60E-07 | 5.56E-08 | 1.12E-04 | 0.00E+00 | 2.81E-06 | 4.47E-07 | 8.68E-05 | 2.42E-01 | 2.44E-01 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.967 | 0.976 |
| **Total Cancer Risk - Farmer** | | | | | | | | | | |
| **Total Risk = 1.15E-06** | | | | | | | | | | |
| Cancer Risk for consumption of beef | 3.23E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.53E-16 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.74E-07 |
| Cancer Risk for consumption of milk | 1.12E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.02E-16 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.44E-07 |
| Cancer Risk for consumption of fish | 6.77E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.24E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.13E-07 |
| Cancer Risk for consumption of soil | 9.82E-14 | 4.70E-18 | 2.34E-16 | 0.00E+00 | 0.00E+00 | 2.45E-17 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.09E-09 |
| Cancer Risk for consumption of above-ground vegetables | 9.92E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.11E-15 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.88E-09 |
| Cancer Risk for consumption of below-ground vegetables | 1.60E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.57E-13 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.47E-08 |
| Cancer Risk for consumption of drinking water | 6.77E-11 | 2.49E-11 | 1.31E-11 | 0.00E+00 | 0.00E+00 | 4.81E-13 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.86E-09 |
| Cancer Risk for inhalation | 5.56E-10 | 3.08E-10 | 3.52E-10 | 4.26E-10 | 9.47E-09 | 1.81E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 7.11E-08 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 1.74E-08 | 3.33E-10 | 3.66E-10 | 4.26E-10 | 9.47E-09 | 2.39E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.15E-06 |
| **Fraction of 1E-05 Benchmark** | 0.002 | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.115 |

Notes:

| | |
|---|---|
| CLMTHN | Chloromethane |
| PCP | Pentachlorophenol |
| 1,1-DCE | 1,1-Dichloroethylene |
| 1,1,2,2-TCA | 1,1,2,2-Tetrachloroethane |
| CLFM | Chloroform |
| 1,3-BUT | 1,3-Butadiene |
| Hg | Elemental Mercury |
| HgCl | Mercuric Chlorid |
| MeHg | Methyl Mercury |

Table 7-3b
Noncarcinogenic Hazard Index and Cancer Risk - Subsistence Farmer
Dairy Farm Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | As | Sb | Ba | Be | Cd | Total Cr | Cr VI |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Farmer** | | | | | | | |
| **Total HI = 2.44E-01** | | | | | | | |
| Hazard Quotient for consumption of beef | 7.92E-07 | 6.01E-08 | 9.08E-11 | 4.15E-09 | 7.29E-09 | 1.83E-10 | 1.78E-08 |
| Hazard Quotient for consumption of milk | 2.58E-07 | 6.48E-08 | 2.29E-09 | 3.61E-11 | 4.22E-09 | 4.70E-10 | 5.29E-08 |
| Hazard Quotient for consumption of fish | 1.01E-06 | 3.08E-07 | 4.89E-08 | 2.82E-08 | 1.80E-06 | 2.02E-12 | 1.22E-09 |
| Hazard Quotient for consumption of soil | 2.02E-08 | 4.61E-09 | 4.25E-11 | 1.75E-09 | 6.75E-09 | 1.65E-11 | 1.10E-10 |
| Hazard Quotient for consumption of above-ground vegetables | 3.94E-07 | 1.29E-07 | 1.25E-09 | 3.73E-09 | 4.54E-07 | 3.63E-11 | 2.94E-09 |
| Hazard Quotient for consumption of below-ground vegetables | 6.90E-08 | 5.60E-08 | 2.62E-10 | 4.39E-10 | 1.52E-07 | 1.07E-11 | 2.12E-10 |
| Hazard Quotient for consumption of drinking water | 5.24E-07 | 7.74E-08 | 7.82E-10 | 4.04E-09 | 6.90E-08 | 1.45E-12 | 4.30E-09 |
| Hazard Quotient for inhalation | 5.46E-06 | 7.86E-07 | 3.98E-06 | 1.61E-05 | 6.24E-06 | 1.82E-05 | 4.50E-06 |
| **Total Hazard Index - All Potential Exposure Pathways** | 8.53E-06 | 1.49E-06 | 4.04E-06 | 1.62E-05 | 8.73E-06 | 1.82E-05 | 4.58E-06 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Farmer** | | | | | | | |
| **Total Risk = 1.06E-06** | | | | | | | |
| Cancer Risk for consumption of beef | 1.94E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of milk | 6.34E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of fish | 1.93E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of soil | 3.74E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of above-ground vegetables | 9.19E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of below-ground vegetables | 1.22E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of drinking water | 1.19E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for inhalation | 1.35E-08 | 0.00E+00 | 0.00E+00 | 4.24E-10 | 1.23E-09 | 0.00E+00 | 2.15E-08 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 1.42E-08 | 0.00E+00 | 0.00E+00 | 4.24E-10 | 1.23E-09 | 0.00E+00 | 2.15E-08 |
| **Fraction of 1E-05 Benchmark** | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.002 |

Notes:

| | |
|---|---|
| As | Arsenic |
| Sb | Antimony |
| Ba | Barium |
| Be | Beryllium |
| Cd | Cadmium |
| Total Cr | Total Chromium |
| Cr VI | Chromium VI |

Table 7-3b
Noncarcinogenic Hazard Index and Cancer Risk - Subsistence Farmer
Dairy Farm Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | Pb | Ni | Se | Ag | Tl | Zn | TCDD-TEQ |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Farmer** | | | | | | | |
| **Total HI = 2.44E-01** | | | | | | | |
| Hazard Quotient for consumption of beef | 0.00E+00 | 1.49E-07 | 2.97E-09 | 5.26E-08 | 2.00E-05 | 3.79E-10 | 2.22E-05 |
| Hazard Quotient for consumption of milk | 0.00E+00 | 2.65E-07 | 8.45E-08 | 3.85E-06 | 1.06E-05 | 1.47E-09 | 4.21E-05 |
| Hazard Quotient for consumption of fish | 0.00E+00 | 2.56E-07 | 2.09E-08 | 4.37E-07 | 6.69E-08 | 1.08E-06 | 2.70E-05 |
| Hazard Quotient for consumption of soil | 0.00E+00 | 2.73E-09 | 1.21E-11 | 2.60E-10 | 6.00E-08 | 4.19E-10 | 1.29E-07 |
| Hazard Quotient for consumption of above-ground vegetables | 0.00E+00 | 3.22E-08 | 1.22E-09 | 3.56E-08 | 4.14E-07 | 1.88E-08 | 1.09E-08 |
| Hazard Quotient for consumption of below-ground vegetables | 0.00E+00 | 8.06E-09 | 1.15E-10 | 1.12E-08 | 8.61E-09 | 6.91E-09 | 4.56E-07 |
| Hazard Quotient for consumption of drinking water | 0.00E+00 | 3.20E-08 | 1.76E-09 | 2.31E-08 | 6.46E-07 | 5.14E-09 | 4.45E-08 |
| Hazard Quotient for inhalation | 0.00E+00 | 1.16E-03 | 1.80E-08 | 2.36E-07 | 6.66E-06 | 5.31E-08 | 8.06E-07 |
| **Total Hazard Index - All Potential Exposure Pathways** | 0.00E+00 | 1.16E-03 | 1.29E-07 | 4.65E-06 | 3.85E-05 | 1.17E-06 | 9.28E-05 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.005 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Farmer** | | | | | | | |
| **Total Risk = 1.06E-06** | | | | | | | |
| Cancer Risk for consumption of beef | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.38E-07 |
| Cancer Risk for consumption of milk | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.61E-07 |
| Cancer Risk for consumption of fish | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.08E-07 |
| Cancer Risk for consumption of soil | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 9.77E-10 |
| Cancer Risk for consumption of above-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.49E-10 |
| Cancer Risk for consumption of below-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.44E-09 |
| Cancer Risk for consumption of drinking water | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.27E-10 |
| Cancer Risk for inhalation | 0.00E+00 | 3.04E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 8.98E-09 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 0.00E+00 | 3.04E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 9.22E-07 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.092 |

Notes:

| | |
|---|---|
| Pb | Lead |
| Ni | Nickel |
| Se | Selenium |
| Ag | Silver |
| Tl | Thallium |
| Zn | Zinc |
| TCDD-TEQ | 2,3,7,8-TCDD Toxicity Equivalents |

Table 7-3b
Noncarcinogenic Hazard Index and Cancer Risk - Subsistence Farmer
Dairy Farm Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | BAA | BAP | BBF | BKF | CHRYS | DBAHA | INDENO |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Farmer** | | | | | | | |
| **Total HI = 2.44E-01** | | | | | | | |
| Hazard Quotient for consumption of beef | 1.62E-10 | 2.13E-09 | 1.04E-08 | 2.81E-09 | 3.67E-09 | 2.73E-08 | 3.20E-07 |
| Hazard Quotient for consumption of milk | 4.67E-10 | 7.13E-09 | 3.07E-08 | 9.49E-09 | 1.12E-08 | 9.49E-08 | 1.11E-06 |
| Hazard Quotient for consumption of fish | 5.49E-09 | 8.05E-09 | 9.36E-08 | 5.02E-09 | 8.33E-08 | 1.03E-09 | 1.07E-09 |
| Hazard Quotient for consumption of soil | 7.95E-12 | 1.35E-11 | 1.38E-10 | 8.12E-12 | 1.13E-10 | 2.33E-12 | 3.11E-12 |
| Hazard Quotient for consumption of above-ground vegetables | 7.04E-11 | 6.97E-11 | 5.48E-10 | 6.29E-11 | 6.98E-10 | 2.14E-10 | 1.06E-09 |
| Hazard Quotient for consumption of below-ground vegetables | 4.88E-09 | 2.62E-09 | 5.04E-08 | 2.03E-09 | 4.48E-08 | 4.83E-10 | 5.34E-10 |
| Hazard Quotient for consumption of drinking water | 6.45E-12 | 5.86E-12 | 5.94E-11 | 4.47E-12 | 6.69E-11 | 1.57E-12 | 1.23E-12 |
| Hazard Quotient for inhalation | 2.77E-11 | 4.55E-11 | 3.09E-10 | 4.08E-11 | 2.19E-10 | 3.08E-11 | 4.31E-11 |
| **Total Hazard Index - All Potential Exposure Pathways** | 1.11E-08 | 2.01E-08 | 1.86E-07 | 1.95E-08 | 1.44E-07 | 1.24E-07 | 1.44E-06 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Farmer** | | | | | | | |
| **Total Risk = 1.06E-06** | | | | | | | |
| Cancer Risk for consumption of beef | 1.72E-12 | 2.44E-10 | 1.12E-10 | 3.29E-12 | 3.98E-13 | 3.27E-09 | 3.84E-09 |
| Cancer Risk for consumption of milk | 5.15E-12 | 8.34E-10 | 3.46E-10 | 1.12E-11 | 1.26E-12 | 1.14E-08 | 1.34E-08 |
| Cancer Risk for consumption of fish | 4.72E-11 | 6.25E-10 | 7.64E-10 | 3.90E-12 | 6.66E-12 | 8.10E-11 | 8.47E-12 |
| Cancer Risk for consumption of soil | 6.67E-14 | 1.02E-12 | 1.10E-12 | 6.12E-15 | 8.81E-15 | 1.75E-13 | 2.33E-14 |
| Cancer Risk for consumption of above-ground vegetables | 5.73E-13 | 6.94E-12 | 4.73E-12 | 6.78E-14 | 5.88E-14 | 2.55E-11 | 1.27E-11 |
| Cancer Risk for consumption of below-ground vegetables | 3.80E-11 | 1.97E-10 | 3.85E-10 | 1.53E-12 | 3.40E-12 | 3.62E-11 | 4.00E-12 |
| Cancer Risk for consumption of drinking water | 6.63E-14 | 5.73E-13 | 5.79E-13 | 4.53E-15 | 6.30E-15 | 1.73E-13 | 1.37E-14 |
| Cancer Risk for inhalation | 9.56E-13 | 1.57E-12 | 1.07E-11 | 1.41E-12 | 7.56E-12 | 1.06E-12 | 1.49E-12 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 9.38E-11 | 1.91E-09 | 1.62E-09 | 2.15E-11 | 1.94E-11 | 1.48E-08 | 1.72E-08 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.002 |

Notes:

| | |
|---|---|
| BAA | Benzo(a)anthracene |
| BAP | Benzo(a)pyrene |
| BBF | Benzo(b)fluoranthene |
| BKF | Benzo(k)fluoranthene |
| CHRYS | Chrysene |
| DBAHA | Dibenz(a,h)anthracene |
| INDENO | Indeno(1,2,3-c,d)pyrene |

Table 7-3b
Noncarcinogenic Hazard Index and Cancer Risk - Subsistence Farmer
Dairy Farm Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | BEHP | HCBZ | BZ | BM | CCl4 | DCDFM |
|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Farmer** | | | | | | |
| **Total HI = 2.44E-01** | | | | | | |
| Hazard Quotient for consumption of beef | 1.24E-07 | 5.22E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Quotient for consumption of milk | 3.37E-07 | 1.56E-07 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Quotient for consumption of fish | 1.74E-06 | 1.93E-06 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Quotient for consumption of soil | 2.29E-08 | 3.20E-09 | 6.34E-14 | 9.39E-15 | 7.62E-14 | 2.62E-18 |
| Hazard Quotient for consumption of above-ground vegetables | 5.16E-07 | 5.20E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Quotient for consumption of below-ground vegetables | 2.05E-05 | 6.94E-06 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Quotient for consumption of drinking water | 4.43E-08 | 1.14E-07 | 1.15E-07 | 1.57E-07 | 1.01E-07 | 1.19E-09 |
| Hazard Quotient for inhalation | 2.52E-07 | 2.98E-06 | 7.27E-06 | 6.02E-06 | 4.56E-06 | 1.50E-07 |
| **Total Hazard Index - All Potential Exposure Pathways** | 2.35E-05 | 1.22E-05 | 7.38E-06 | 6.17E-06 | 4.66E-06 | 1.52E-07 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Farmer** | | | | | | |
| **Total Risk = 1.06E-06** | | | | | | |
| Cancer Risk for consumption of beef | 1.61E-11 | 3.33E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of milk | 4.51E-11 | 1.02E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of fish | 2.03E-10 | 1.19E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of soil | 2.63E-12 | 1.69E-12 | 4.30E-18 | 0.00E+00 | 2.85E-18 | 1.81E-20 |
| Cancer Risk for consumption of above-ground vegetables | 5.64E-11 | 2.79E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of below-ground vegetables | 2.23E-09 | 3.65E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of drinking water | 6.30E-12 | 7.95E-11 | 1.04E-11 | 0.00E+00 | 5.05E-12 | 1.10E-11 |
| Cancer Risk for inhalation | 3.87E-11 | 2.09E-09 | 1.98E-10 | 0.00E+00 | 7.56E-11 | 0.00E+00 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 2.60E-09 | 7.17E-09 | 2.08E-10 | 0.00E+00 | 8.06E-11 | 1.10E-11 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 |

Notes:

| | |
|---|---|
| BEHP | Bis(2-ethylhexyl)phthalate |
| HCBZ | Hexachlorobenzene |
| BZ | Benzene |
| BM | Bromomethane |
| CCl4 | Carbon tetrachloride |
| DCDFM | Dichlorodifluoromethane |

Table 7-3b
Noncarcinogenic Hazard Index and Cancer Risk - Subsistence Farmer
Dairy Farm Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | T13DCP | TCFM | VCL | HCP | 2-NA | 2,4-DNT | 2,6-DNT | CLMTHN |
|---|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Farmer** | | | | | | | | |
| **Total HI = 2.44E-01** | | | | | | | | |
| Hazard Quotient for consumption of beef | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.54E-11 | 3.60E-10 | 5.04E-11 | 1.51E-10 | 0.00E+00 |
| Hazard Quotient for consumption of milk | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.09E-10 | 1.24E-09 | 1.74E-10 | 5.22E-10 | 0.00E+00 |
| Hazard Quotient for consumption of fish | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.13E-07 | 2.03E-05 | 6.63E-07 | 2.78E-06 | 0.00E+00 |
| Hazard Quotient for consumption of soil | 2.33E-15 | 9.60E-17 | 1.44E-16 | 4.60E-12 | 6.71E-09 | 7.60E-10 | 2.74E-09 | 3.33E-16 |
| Hazard Quotient for consumption of above-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.64E-10 | 1.36E-05 | 1.30E-06 | 5.27E-06 | 0.00E+00 |
| Hazard Quotient for consumption of below-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.92E-08 | 9.22E-05 | 9.19E-06 | 3.64E-05 | 0.00E+00 |
| Hazard Quotient for consumption of drinking water | 2.76E-09 | 7.70E-10 | 7.27E-08 | 3.78E-08 | 1.33E-05 | 4.60E-07 | 1.90E-06 | 5.20E-08 |
| Hazard Quotient for inhalation | 5.03E-07 | 4.30E-08 | 3.01E-07 | 1.33E-04 | 6.63E-05 | 9.45E-07 | 3.79E-06 | 3.34E-07 |
| **Total Hazard Index - All Potential Exposure Pathways** | 5.06E-07 | 4.37E-08 | 3.73E-07 | 1.33E-04 | 2.06E-04 | 1.26E-05 | 5.01E-05 | 3.86E-07 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.000 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Farmer** | | | | | | | | |
| **Total Risk = 1.06E-06** | | | | | | | | |
| Cancer Risk for consumption of beef | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.90E-14 | 4.24E-14 | 0.00E+00 |
| Cancer Risk for consumption of milk | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 9.99E-14 | 1.47E-13 | 0.00E+00 |
| Cancer Risk for consumption of fish | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.76E-10 | 7.87E-10 | 0.00E+00 |
| Cancer Risk for consumption of soil | 2.88E-18 | 0.00E+00 | 2.66E-19 | 0.00E+00 | 0.00E+00 | 4.25E-13 | 7.65E-13 | 7.11E-21 |
| Cancer Risk for consumption of above-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 7.38E-10 | 1.48E-09 | 0.00E+00 |
| Cancer Risk for consumption of below-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.14E-09 | 1.02E-08 | 0.00E+00 |
| Cancer Risk for consumption of drinking water | 4.54E-12 | 0.00E+00 | 1.79E-10 | 0.00E+00 | 0.00E+00 | 2.85E-10 | 5.86E-10 | 1.48E-12 |
| Cancer Risk for inhalation | 2.20E-10 | 0.00E+00 | 1.45E-10 | 0.00E+00 | 0.00E+00 | 7.04E-10 | 1.41E-09 | 2.97E-11 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 2.25E-10 | 0.00E+00 | 3.24E-10 | 0.00E+00 | 0.00E+00 | 7.24E-09 | 1.44E-08 | 3.11E-11 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.001 | 0.000 |

Notes:

| | |
|---|---|
| T13DCP | Trans-1,3-Dichloropropene |
| TCFM | Trichlorofluoromethane |
| VCL | Vinyl Chloride |
| HCP | Hexachlorocyclopentadiene |
| 2-NA | 2-Nitroaniline |
| 2,4-DNT | 2,4-Dinitrotoluene |
| 2,6-DNT | 2,6-Dinitrotoluene |
| CLMTHN | Chloromethane |

Table 7-3b
Noncarcinogenic Hazard Index and Cancer Risk - Subsistence Farmer
Dairy Farm Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | PCP | 1,1-DCE | 1,1,2,2-TCA | CLFM | 1,3-BUT | HCBU |
|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Farmer** | | | | | | |
| **Total HI = 2.44E-01** | | | | | | |
| Hazard Quotient for consumption of beef | 1.47E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.74E-11 |
| Hazard Quotient for consumption of milk | 5.11E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.60E-11 |
| Hazard Quotient for consumption of fish | 4.09E-07 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 6.14E-07 |
| Hazard Quotient for consumption of soil | 5.98E-11 | 1.91E-15 | 4.27E-14 | 3.41E-14 | 0.00E+00 | 3.45E-12 |
| Hazard Quotient for consumption of above-ground vegetables | 4.91E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.54E-10 |
| Hazard Quotient for consumption of below-ground vegetables | 9.74E-06 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.20E-08 |
| Hazard Quotient for consumption of drinking water | 3.51E-08 | 8.42E-09 | 1.99E-09 | 2.37E-08 | 0.00E+00 | 5.63E-08 |
| Hazard Quotient for inhalation | 2.52E-07 | 3.15E-07 | 4.80E-08 | 1.00E-04 | 0.00E+00 | 1.89E-06 |
| **Total Hazard Index - All Potential Exposure Pathways** | 1.05E-05 | 3.23E-07 | 5.00E-08 | 1.00E-04 | 0.00E+00 | 2.58E-06 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Farmer** | | | | | | |
| **Total Risk = 1.06E-06** | | | | | | |
| Cancer Risk for consumption of beef | 2.89E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.38E-16 |
| Cancer Risk for consumption of milk | 1.01E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.50E-16 |
| Cancer Risk for consumption of fish | 6.77E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.24E-12 |
| Cancer Risk for consumption of soil | 8.85E-14 | 4.24E-18 | 2.11E-16 | 0.00E+00 | 0.00E+00 | 2.21E-17 |
| Cancer Risk for consumption of above-ground vegetables | 8.89E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 9.98E-16 |
| Cancer Risk for consumption of below-ground vegetables | 1.44E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.41E-13 |
| Cancer Risk for consumption of drinking water | 6.77E-11 | 2.49E-11 | 1.31E-11 | 0.00E+00 | 0.00E+00 | 4.81E-13 |
| Cancer Risk for inhalation | 4.98E-10 | 2.76E-10 | 3.16E-10 | 3.81E-10 | 8.48E-09 | 1.62E-11 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 1.58E-08 | 3.01E-10 | 3.29E-10 | 3.81E-10 | 8.48E-09 | 2.20E-11 |
| **Fraction of 1E-05 Benchmark** | 0.002 | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 |

Notes:

| | |
|---|---|
| PCP | Pentachlorophenol |
| 1,1-DCE | 1,1-Dichloroethylene |
| 1,1,2,2-TCA | 1,1,2,2-Tetrachloroethane |
| CLFM | Chloroform |
| 1,3-BUT | 1,3-Butadiene |

Table 7-3b
Noncarcinogenic Hazard Index and Cancer Risk - Subsistence Farmer
Dairy Farm Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | Hg | HgCl | MeHg | Total by Pathway |
|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Farmer** | | | | |
| **Total HI = 2.44E-01** | | | | |
| Hazard Quotient for consumption of beef | 0.00E+00 | 6.24E-06 | 3.60E-07 | 5.04E-05 |
| Hazard Quotient for consumption of milk | 0.00E+00 | 1.95E-05 | 1.64E-06 | 8.03E-05 |
| Hazard Quotient for consumption of fish | 0.00E+00 | 0.00E+00 | 2.42E-01 | 2.42E-01 |
| Hazard Quotient for consumption of soil | 0.00E+00 | 1.40E-06 | 7.47E-08 | 1.74E-06 |
| Hazard Quotient for consumption of above-ground vegetables | 0.00E+00 | 2.70E-05 | 1.99E-05 | 6.91E-05 |
| Hazard Quotient for consumption of below-ground vegetables | 0.00E+00 | 7.27E-06 | 1.17E-08 | 1.84E-04 |
| Hazard Quotient for consumption of drinking water | 0.00E+00 | 4.30E-06 | 2.21E-08 | 2.44E-05 |
| Hazard Quotient for inhalation | 4.00E-07 | 1.42E-05 | 0.00E+00 | 1.56E-03 |
| **Total Hazard Index - All Potential Exposure Pathways** | 4.00E-07 | 7.98E-05 | 2.42E-01 | 2.44E-01 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.967 | 0.975 |
| **Total Cancer Risk - Farmer** | | | | |
| **Total Risk = 1.06E-06** | | | | |
| Cancer Risk for consumption of beef | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.46E-07 |
| Cancer Risk for consumption of milk | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.87E-07 |
| Cancer Risk for consumption of fish | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.13E-07 |
| Cancer Risk for consumption of soil | 0.00E+00 | 0.00E+00 | 0.00E+00 | 9.89E-10 |
| Cancer Risk for consumption of above-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.61E-09 |
| Cancer Risk for consumption of below-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.07E-08 |
| Cancer Risk for consumption of drinking water | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.82E-09 |
| Cancer Risk for inhalation | 0.00E+00 | 0.00E+00 | 0.00E+00 | 6.35E-08 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.06E-06 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.000 | 0.000 | 0.106 |

Notes:

Hg Mercury
HgCl Mercuric Chloride
MeHg Methyl Mercury

Table 7-4
Noncarcinogenic Hazard Index and Cancer Risk - Subsistence Fisher
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | As | Sb | Ba | Be | Cd | Total Cr | Cr VI |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Subsistence Fisher** | | | | | | | |
| **Total HI = 2.07E-01** | | | | | | | |
| Hazard Index for consumption of beef | 8.57E-08 | 6.50E-09 | 9.82E-12 | 4.47E-10 | 7.86E-10 | 1.97E-11 | 1.92E-09 |
| Hazard Index for consumption of milk | 2.58E-08 | 6.48E-09 | 2.29E-10 | 3.61E-12 | 4.22E-10 | 4.70E-11 | 5.29E-09 |
| Hazard Index for consumption of fish | 6.37E-07 | 1.82E-07 | 2.89E-08 | 1.62E-08 | 1.05E-06 | 6.64E-12 | 7.28E-10 |
| Hazard Index for consumption of soil | 6.55E-08 | 1.49E-08 | 1.38E-10 | 5.66E-09 | 2.18E-08 | 5.35E-11 | 3.54E-10 |
| Hazard Index for consumption of above-ground vegetables | 3.32E-06 | 9.79E-07 | 9.54E-09 | 3.08E-08 | 3.20E-06 | 2.88E-10 | 2.53E-08 |
| Hazard Index for consumption of below-ground vegetables | 4.77E-07 | 3.87E-07 | 1.81E-09 | 3.04E-09 | 1.05E-06 | 7.40E-11 | 1.47E-09 |
| Hazard Index for consumption of drinking water | 6.58E-07 | 7.74E-08 | 7.82E-10 | 4.04E-09 | 6.90E-08 | 1.45E-12 | 4.30E-09 |
| Hazard Index for Inhalation | 1.50E-04 | 2.16E-05 | 1.10E-04 | 4.44E-04 | 1.72E-04 | 5.00E-04 | 1.24E-04 |
| **Total Hazard Index - All Potential Exposure Pathways** | 1.56E-04 | 2.33E-05 | 1.10E-04 | 4.44E-04 | 1.77E-04 | 5.00E-04 | 1.24E-04 |
| **Fraction of 0.25 Benchmark** | 0.001 | 0.000 | 0.000 | 0.002 | 0.001 | 0.002 | 0.000 |
| **Total Cancer Risk - Subsistence Fisher** | | | | | | | |
| **Total Risk = 2.15E-06** | | | | | | | |
| Cancer Risk for consumption of beef | 1.58E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of milk | 4.77E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of fish | 1.09E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of soil | 1.12E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of above-ground vegetables | 5.93E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of below-ground vegetables | 6.89E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of drinking water | 1.19E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for Inhalation | 2.78E-07 | 0.00E+00 | 0.00E+00 | 8.75E-09 | 2.53E-08 | 0.00E+00 | 4.43E-07 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 2.79E-07 | 0.00E+00 | 0.00E+00 | 8.75E-09 | 2.53E-08 | 0.00E+00 | 4.43E-07 |
| **Fraction of 1E-05 Benchmark** | 0.028 | 0.000 | 0.000 | 0.001 | 0.003 | 0.000 | 0.044 |

Notes:

| | |
|---|---|
| As | Arsenic |
| Sb | Antimony |
| Ba | Barium |
| Be | Beryllium |
| Cd | Cadmium |
| Total Cr | Total Chromium |
| Cr VI | Chromium VI |

Table 7-4
Noncarcinogenic Hazard Index and Cancer Risk - Subsistence Fisher
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | Pb | Ni | Se | Ag | Tl | Zn | TCDD-TEQ |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Subsistence Fisher** | | | | | | | |
| **Total HI = 2.07E-01** | | | | | | | |
| Hazard Index for consumption of beef | 0.00E+00 | 1.61E-08 | 3.22E-10 | 5.69E-09 | 2.16E-06 | 4.09E-11 | 2.48E-06 |
| Hazard Index for consumption of milk | 0.00E+00 | 2.65E-08 | 8.45E-09 | 3.85E-07 | 1.06E-06 | 1.47E-10 | 4.21E-06 |
| Hazard Index for consumption of fish | 0.00E+00 | 1.50E-07 | 1.25E-08 | 2.61E-07 | 3.93E-08 | 6.37E-07 | 4.01E-05 |
| Hazard Index for consumption of soil | 0.00E+00 | 8.82E-09 | 3.90E-11 | 8.42E-10 | 1.94E-07 | 1.36E-09 | 7.95E-07 |
| Hazard Index for consumption of above-ground vegetables | 0.00E+00 | 2.59E-07 | 1.04E-08 | 2.72E-07 | 3.59E-06 | 1.35E-07 | 1.42E-07 |
| Hazard Index for consumption of below-ground vegetables | 0.00E+00 | 5.57E-08 | 7.93E-10 | 7.77E-08 | 5.96E-08 | 4.78E-08 | 5.12E-06 |
| Hazard Index for consumption of drinking water | 0.00E+00 | 3.20E-08 | 1.76E-09 | 2.31E-08 | 6.46E-07 | 5.14E-09 | 4.45E-08 |
| Hazard Index for inhalation | 0.00E+00 | 3.18E-02 | 4.95E-07 | 6.49E-06 | 1.83E-04 | 1.46E-06 | 2.23E-05 |
| **Total Hazard Index - All Potential Exposure Pathways** | 0.00E+00 | 3.18E-02 | 5.29E-07 | 7.51E-06 | 1.91E-04 | 2.29E-06 | 7.52E-05 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.127 | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 |
| **Total Cancer Risk - Subsistence Fisher** | | | | | | | |
| **Total Risk = 2.15E-06** | | | | | | | |
| Cancer Risk for consumption of beef | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.99E-08 |
| Cancer Risk for consumption of milk | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.45E-08 |
| Cancer Risk for consumption of fish | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.28E-07 |
| Cancer Risk for consumption of soil | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.40E-09 |
| Cancer Risk for consumption of above-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.67E-09 |
| Cancer Risk for consumption of below-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.60E-08 |
| Cancer Risk for consumption of drinking water | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.14E-10 |
| Cancer Risk for inhalation | 0.00E+00 | 6.27E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.86E-07 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 0.00E+00 | 6.27E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.11E-07 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.006 | 0.000 | 0.000 | 0.000 | 0.000 | 0.051 |

Notes:

| | |
|---|---|
| Pb | Lead |
| Ni | Nickel |
| Se | Selenium |
| Ag | Silver |
| Tl | Thallium |
| Zn | Zinc |
| TCDD-TEQ | 2,3,7,8-TCDD Toxicity Equivalents |

Table 7-4
Noncarcinogenic Hazard Index and Cancer Risk - Subsistence Fisher
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | BAA | BAP | BBF | BKF | CHRYS | DBAHA | INDENO |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Subsistence Fisher** | | | | | | | |
| **Total HI = 2.07E-01** | | | | | | | |
| Hazard Index for consumption of beef | 1.81E-11 | 2.38E-10 | 1.16E-09 | 3.14E-10 | 4.09E-10 | 3.04E-09 | 3.57E-08 |
| Hazard Index for consumption of milk | 4.67E-11 | 7.13E-10 | 3.07E-09 | 9.49E-10 | 1.12E-09 | 9.49E-09 | 1.11E-07 |
| Hazard Index for consumption of fish | 7.64E-09 | 1.65E-08 | 1.88E-07 | 9.77E-09 | 1.18E-07 | 2.31E-09 | 2.72E-09 |
| Hazard Index for consumption of soil | 5.01E-11 | 7.99E-11 | 8.68E-10 | 4.56E-11 | 7.09E-10 | 9.38E-12 | 1.21E-11 |
| Hazard Index for consumption of above-ground vegetables | 9.45E-10 | 9.25E-10 | 7.39E-09 | 8.39E-10 | 9.39E-09 | 3.00E-09 | 1.50E-08 |
| Hazard Index for consumption of below-ground vegetables | 6.56E-08 | 3.31E-08 | 6.77E-07 | 2.44E-08 | 6.00E-07 | 4.15E-09 | 4.43E-09 |
| Hazard Index for consumption of drinking water | 6.45E-12 | 5.86E-12 | 5.94E-11 | 4.47E-12 | 6.69E-11 | 1.57E-12 | 1.23E-12 |
| Hazard Index for inhalation | 7.55E-10 | 1.25E-09 | 8.42E-09 | 1.12E-09 | 5.99E-09 | 8.52E-10 | 1.19E-09 |
| **Total Hazard Index - All Potential Exposure Pathways** | 7.50E-08 | 5.28E-08 | 8.86E-07 | 3.74E-08 | 7.36E-07 | 2.29E-08 | 1.70E-07 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Subsistence Fisher** | | | | | | | |
| **Total Risk = 2.15E-06** | | | | | | | |
| Cancer Risk for consumption of beef | 1.45E-13 | 2.01E-11 | 9.20E-12 | 2.73E-13 | 3.26E-14 | 2.73E-10 | 3.21E-10 |
| Cancer Risk for consumption of milk | 3.89E-13 | 6.20E-11 | 2.57E-11 | 8.40E-13 | 9.34E-14 | 8.53E-10 | 1.00E-09 |
| Cancer Risk for consumption of fish | 5.13E-11 | 8.16E-10 | 1.10E-09 | 4.82E-12 | 6.51E-12 | 1.15E-10 | 1.37E-11 |
| Cancer Risk for consumption of soil | 3.26E-13 | 3.72E-12 | 4.86E-12 | 2.10E-14 | 3.71E-14 | 4.23E-13 | 5.44E-14 |
| Cancer Risk for consumption of above-ground vegetables | 5.26E-12 | 6.55E-11 | 4.32E-11 | 6.64E-13 | 5.25E-13 | 2.68E-10 | 1.35E-10 |
| Cancer Risk for consumption of below-ground vegetables | 3.45E-10 | 1.51E-09 | 3.30E-09 | 1.11E-11 | 2.85E-11 | 1.87E-10 | 2.00E-11 |
| Cancer Risk for consumption of drinking water | 5.05E-14 | 4.02E-13 | 4.25E-13 | 3.22E-15 | 4.51E-15 | 1.27E-13 | 1.00E-14 |
| Cancer Risk for inhalation | 1.95E-11 | 3.24E-11 | 2.18E-10 | 2.91E-11 | 1.55E-10 | 2.20E-11 | 3.08E-11 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 4.22E-10 | 2.51E-09 | 4.71E-09 | 4.68E-11 | 1.91E-10 | 1.72E-09 | 1.52E-09 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Notes:

BAA Benzo(a)anthracene
BAP Benzo(a)pyrene
BBF Benzo(b)fluoranthene
BKF Benzo(k)fluoranthene
CHRYS Chrysene
DBAHA Dibenz(a,h)anthracene
INDENO Indeno(1,2,3-c,d)pyrene

Table 7-4
Noncarcinogenic Hazard Index and Cancer Risk - Subsistence Fisher
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | BEHP | HCBZ | BZ | BM | CCl4 | DCDFM | T13DCP |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Subsistence Fisher** | | | | | | | |
| **Total HI = 2.07E-01** | | | | | | | |
| Hazard Index for consumption of beef | 1.38E-08 | 5.81E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Index for consumption of milk | 3.37E-08 | 1.56E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Index for consumption of fish | 1.94E-06 | 2.88E-06 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Index for consumption of soil | 1.44E-07 | 2.02E-08 | 4.01E-13 | 5.93E-14 | 4.81E-13 | 1.65E-17 | 1.47E-14 |
| Hazard Index for consumption of above-ground vegetables | 6.91E-06 | 7.00E-07 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Index for consumption of below-ground vegetables | 2.76E-04 | 9.37E-05 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Hazard Index for consumption of drinking water | 4.43E-08 | 1.14E-07 | 1.15E-07 | 1.57E-07 | 1.01E-07 | 1.19E-09 | 2.76E-09 |
| Hazard Index for inhalation | 6.87E-06 | 8.11E-05 | 1.98E-04 | 1.64E-04 | 1.24E-04 | 4.10E-06 | 1.37E-05 |
| **Total Hazard Index - All Potential Exposure Pathways** | 2.92E-04 | 1.79E-04 | 1.98E-04 | 1.64E-04 | 1.24E-04 | 4.10E-06 | 1.37E-05 |
| **Fraction of 0.25 Benchmark** | 0.001 | 0.001 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 |
| **Total Cancer Risk - Subsistence Fisher** | | | | | | | |
| **Total Risk = 2.15E-06** | | | | | | | |
| Cancer Risk for consumption of beef | 1.50E-12 | 3.06E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of milk | 3.70E-12 | 8.18E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of fish | 2.04E-10 | 1.51E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of soil | 1.51E-11 | 1.06E-11 | 2.72E-17 | 0.00E+00 | 1.80E-17 | 1.14E-19 | 1.82E-17 |
| Cancer Risk for consumption of above-ground vegetables | 6.00E-10 | 3.68E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of below-ground vegetables | 2.38E-08 | 4.93E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cancer Risk for consumption of drinking water | 4.96E-12 | 5.98E-11 | 7.81E-12 | 0.00E+00 | 3.79E-12 | 8.23E-12 | 3.40E-12 |
| Cancer Risk for inhalation | 7.91E-10 | 4.27E-08 | 4.04E-09 | 0.00E+00 | 1.54E-09 | 0.00E+00 | 4.50E-09 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 2.55E-08 | 9.39E-08 | 4.05E-09 | 0.00E+00 | 1.55E-09 | 8.23E-12 | 4.51E-09 |
| **Fraction of 1E-05 Benchmark** | 0.003 | 0.009 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Notes:

| | |
|---|---|
| BEHP | Bis(2-ethylhexyl)phthalate |
| HCBZ | Hexachlorobenzene |
| BZ | Benzene |
| BM | Bromomethane |
| CCl4 | Carbon tetrachloride |
| DCDFM | Dichlorodifluoromethane |
| T13DCP | Trans-1,3-Dichloropropene |

Table 7-4
Noncarcinogenic Hazard Index and Cancer Risk - Subsistence Fisher
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | TCFM | VCL | HCP | 2-NA | 2,4-DNT | 2,6-DNT | CLMTHN |
|---|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Subsistence Fisher** | | | | | | | |
| **Total HI = 2.07E-01** | | | | | | | |
| Hazard Index for consumption of beef | 0.00E+00 | 0.00E+00 | 3.95E-12 | 3.99E-11 | 5.59E-12 | 1.67E-11 | 0.00E+00 |
| Hazard Index for consumption of milk | 0.00E+00 | 0.00E+00 | 1.09E-11 | 1.24E-10 | 1.74E-11 | 5.22E-11 | 0.00E+00 |
| Hazard Index for consumption of fish | 0.00E+00 | 0.00E+00 | 1.53E-07 | 1.52E-05 | 4.94E-07 | 2.07E-06 | 0.00E+00 |
| Hazard Index for consumption of soil | 6.06E-16 | 9.09E-16 | 2.90E-11 | 4.24E-08 | 4.80E-09 | 1.73E-08 | 2.10E-15 |
| Hazard Index for consumption of above-ground vegetables | 0.00E+00 | 0.00E+00 | 2.21E-09 | 1.83E-04 | 1.75E-05 | 7.08E-05 | 0.00E+00 |
| Hazard Index for consumption of below-ground vegetables | 0.00E+00 | 0.00E+00 | 3.94E-07 | 1.24E-03 | 1.24E-04 | 4.91E-04 | 0.00E+00 |
| Hazard Index for consumption of drinking water | 7.70E-10 | 7.27E-08 | 3.78E-08 | 1.33E-05 | 4.60E-07 | 1.90E-06 | 5.20E-08 |
| Hazard Index for inhalation | 1.17E-06 | 8.19E-06 | 3.61E-03 | 1.80E-03 | 2.57E-05 | 1.03E-04 | 9.10E-06 |
| **Total Hazard Index - All Potential Exposure Pathways** | 1.17E-06 | 8.26E-06 | 3.61E-03 | 3.26E-03 | 1.68E-04 | 6.69E-04 | 9.15E-06 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.000 | 0.014 | 0.013 | 0.001 | 0.003 | 0.000 |
| **Total Cancer Risk - Subsistence Fisher** | | | | | | | |
| **Total Risk = 2.15E-06** | | | | | | | |
| Cancer Risk for consumption of beef | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.12E-15 | 4.68E-15 | 0.00E+00 |
| Cancer Risk for consumption of milk | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 9.70E-15 | 1.46E-14 | 0.00E+00 |
| Cancer Risk for consumption of fish | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.76E-10 | 5.78E-10 | 0.00E+00 |
| Cancer Risk for consumption of soil | 0.00E+00 | 1.68E-18 | 0.00E+00 | 0.00E+00 | 2.68E-12 | 4.83E-12 | 4.49E-20 |
| Cancer Risk for consumption of above-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 9.78E-09 | 1.98E-08 | 0.00E+00 |
| Cancer Risk for consumption of below-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 6.93E-08 | 1.37E-07 | 0.00E+00 |
| Cancer Risk for consumption of drinking water | 0.00E+00 | 1.34E-10 | 0.00E+00 | 0.00E+00 | 2.57E-10 | 5.30E-10 | 1.11E-12 |
| Cancer Risk for inhalation | 0.00E+00 | 2.96E-09 | 0.00E+00 | 0.00E+00 | 1.44E-08 | 2.88E-08 | 6.06E-10 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 0.00E+00 | 3.10E-09 | 0.00E+00 | 0.00E+00 | 9.40E-08 | 1.87E-07 | 6.07E-10 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.000 | 0.000 | 0.000 | 0.009 | 0.019 | 0.000 |

Notes:

| | |
|---|---|
| TCFM | Trichlorofluoromethane |
| VCL | Vinyl Chloride |
| HCP | Hexachlorocyclopentadiene |
| 2-NA | 2-Nitroaniline |
| 2,4-DNT | 2,4-Dinitrotoluene |
| 2,6-DNT | 2,6-Dinitrotoluene |
| CLMTHN | Chloromethane |

Table 7-4
Noncarcinogenic Hazard Index and Cancer Risk - Subsistence Fisher
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | PCP | 1,1-DCE | 1,1,2,2-TCA | CLFM | 1,3-BUT | HCBU |
|---|---|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Subsistence Fisher** | | | | | | |
| **Total HI = 2.07E-01** | | | | | | |
| Hazard Index for consumption of beef | 1.64E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.94E-12 |
| Hazard Index for consumption of milk | 5.11E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.60E-12 |
| Hazard Index for consumption of fish | 3.97E-07 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 8.31E-07 |
| Hazard Index for consumption of soil | 3.78E-10 | 1.21E-14 | 2.70E-13 | 2.15E-13 | 0.00E+00 | 2.18E-11 |
| Hazard Index for consumption of above-ground vegetables | 6.83E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.07E-09 |
| Hazard Index for consumption of below-ground vegetables | 1.31E-04 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.97E-07 |
| Hazard Index for consumption of drinking water | 3.51E-08 | 8.42E-09 | 1.99E-09 | 2.37E-08 | 0.00E+00 | 5.63E-08 |
| Hazard Index for inhalation | 6.88E-06 | 8.58E-06 | 1.31E-06 | 2.73E-03 | 0.00E+00 | 5.15E-05 |
| **Total Hazard Index - All Potential Exposure Pathways** | 1.39E-04 | 8.58E-06 | 1.31E-06 | 2.73E-03 | 0.00E+00 | 5.27E-05 |
| **Fraction of 0.25 Benchmark** | 0.001 | 0.000 | 0.000 | 0.011 | 0.000 | 0.000 |
| **Total Cancer Risk - Subsistence Fisher** | | | | | | |
| **Total Risk = 2.15E-06** | | | | | | |
| Cancer Risk for consumption of beef | 2.43E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.24E-17 |
| Cancer Risk for consumption of milk | 7.56E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.59E-17 |
| Cancer Risk for consumption of fish | 5.88E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.33E-12 |
| Cancer Risk for consumption of soil | 5.59E-13 | 2.68E-17 | 1.33E-15 | 0.00E+00 | 0.00E+00 | 1.40E-16 |
| Cancer Risk for consumption of above-ground vegetables | 1.01E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.32E-14 |
| Cancer Risk for consumption of below-ground vegetables | 1.94E-07 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.91E-12 |
| Cancer Risk for consumption of drinking water | 5.19E-11 | 1.87E-11 | 9.83E-12 | 0.00E+00 | 0.00E+00 | 3.61E-13 |
| Cancer Risk for inhalation | 1.02E-08 | 5.64E-09 | 6.44E-09 | 7.79E-09 | 1.73E-07 | 3.30E-10 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 2.05E-07 | 5.66E-09 | 6.45E-09 | 7.79E-09 | 1.73E-07 | 3.38E-10 |
| **Fraction of 1E-05 Benchmark** | 0.021 | 0.001 | 0.001 | 0.001 | 0.017 | 0.000 |

Notes:

PCP Pentachlorophenol
1,1-DCE 1,1-Dichloroethylene
1,1,2,2-TCA 1,1,2,2-Tetrachloroethane
CLFM Chloroform
1,3-BUT 1,3-Butadiene
HCBU Hexachlorobutadiene

Table 7-4
Noncarcinogenic Hazard Index and Cancer Risk - Subsistence Fisher
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | Hg | HgCl | MeHg | Total by Pathway |
|---|---|---|---|---|
| **Total Noncarcinogenic Hazard Index - Subsistence Fisher** | | | | |
| **Total HI = 2.07E-01** | | | | |
| Hazard Index for consumption of beef | 0.00E+00 | 6.69E-07 | 3.98E-08 | 5.52E-06 |
| Hazard Index for consumption of milk | 0.00E+00 | 1.95E-06 | 1.64E-07 | 8.03E-06 |
| Hazard Index for consumption of fish | 0.00E+00 | 0.00E+00 | 1.61E-01 | 1.61E-01 |
| Hazard Index for consumption of soil | 0.00E+00 | 4.51E-06 | 2.40E-07 | 6.09E-06 |
| Hazard Index for consumption of above-ground vegetables | 0.00E+00 | 3.51E-04 | 2.77E-04 | 9.20E-04 |
| Hazard Index for consumption of below-ground vegetables | 0.00E+00 | 5.00E-05 | 8.03E-06 | 2.43E-03 |
| Hazard Index for consumption of drinking water | 0.00E+00 | 4.30E-06 | 2.21E-06 | 2.45E-05 |
| Hazard Index for inhalation | 1.09E-05 | 3.86E-04 | 0.00E+00 | 4.29E-02 |
| **Total Hazard Index - All Potential Exposure Pathways** | 1.09E-05 | 7.99E-04 | 1.61E-01 | 2.07E-01 |
| **Fraction of 0.25 Benchmark** | 0.000 | 0.003 | 0.644 | 0.828 |
| **Total Cancer Risk - Subsistence Fisher** | | | | |
| **Total Risk = 2.15E-06** | | | | |
| Cancer Risk for consumption of beef | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.05E-08 |
| Cancer Risk for consumption of milk | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.65E-08 |
| Cancer Risk for consumption of fish | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.33E-07 |
| Cancer Risk for consumption of soil | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.46E-09 |
| Cancer Risk for consumption of above-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.34E-08 |
| Cancer Risk for consumption of below-ground vegetables | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.16E-07 |
| Cancer Risk for consumption of drinking water | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.53E-09 |
| Cancer Risk for inhalation | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.31E-06 |
| **Total Cancer Risk - All Potential Exposure Pathways** | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.15E-06 |
| **Fraction of 1E-05 Benchmark** | 0.000 | 0.000 | 0.000 | 0.215 |

Notes:

Hg Elemental Mercury
HgCl Mercuric Chlorid
MeHg Methyl Mercury

Table 7-5a
Total Cancer Risk Summary - Primary Scenarios
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | North Resident Location: Child Resident Carcinogenic Risk | North Resident Location: Adult Resident Carcinogenic Risk | Subsistence Farmer Beef Farm Location Carcinogenic Risk | Subsistence Fisher Erie Canal Carcinogenic Risk |
|---|---|---|---|---|
| Cancer risk for consumption of beef | 3.57E-09 | 2.05E-08 | 2.74E-07 | 2.05E-08 |
| Cancer risk for consumption of milk | 2.39E-08 | 3.65E-08 | 5.44E-07 | 3.65E-08 |
| Cancer risk for consumption of fish | 9.69E-09 | 1.57E-07 | 2.13E-07 | 2.33E-07 |
| Cancer risk for ingestion of soil | 2.42E-08 | 4.46E-09 | 1.09E-09 | 4.46E-09 |
| Cancer risk for consumption of above-ground vegetables | 2.73E-09 | 3.34E-08 | 2.88E-09 | 3.34E-08 |
| Cancer risk for consumption of below-ground vegetables | 4.80E-08 | 5.16E-07 | 4.47E-08 | 5.16E-07 |
| Cancer risk for consumption of drinking water | 3.46E-10 | 1.53E-09 | 1.86E-09 | 1.53E-09 |
| Cancer risk for inhalation | 2.49E-07 | 1.31E-06 | 7.11E-08 | 1.31E-06 |
| Total Cancer Risk | 3.61E-07 | 2.08E-06 | 1.15E-06 | 2.15E-06 |
| Notes: | | | | |

Source: ENSR, 1999

RN: 0

4/8/02

Table 7-5b
Total Cancer Risk Summary - Alternative Scenarios
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | South Resident Location<br>Child Resident Carcinogenic Risk | South Resident Location<br>Adult Resident Carcinogenic Risk | Subsistence Farmer Dairy Farm Location Carcinogenic Risk |
|---|---|---|---|
| Cancer risk for consumption of beef | 3.57E-09 | 2.05E-08 | 2.46E-07 |
| Cancer risk for consumption of milk | 2.39E-08 | 3.65E-08 | 4.87E-07 |
| Cancer risk for consumption of fish | 9.69E-09 | 1.57E-07 | 2.13E-07 |
| Cancer risk for ingestion of soil | 6.21E-09 | 1.14E-09 | 9.89E-10 |
| Cancer risk for consumption of above-ground vegetables | 3.92E-10 | 4.75E-09 | 2.61E-09 |
| Cancer risk for consumption of below-ground vegetables | 7.02E-09 | 7.69E-08 | 4.07E-08 |
| Cancer risk for consumption of drinking water | 3.41E-10 | 1.50E-09 | 1.82E-09 |
| Cancer risk for inhalation | 7.47E-10 | 3.93E-09 | 6.35E-08 |
| Total Cancer Risk | 5.18E-08 | 3.02E-07 | 1.06E-06 |

Notes:

Source: ENSR, 1999 RN: 0

4/8/02

Table 7-6a
Total Noncarcinogenic Hazard Index - Summary
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | North Resident Location<br>Child Resident Noncarcinogenic Hazard Index | <br>Adult Resident Noncarcinogenic Hazard Index | Subsistence Farmer Beef Farm Location Noncarcinogenic Hazard Index | Subsistence Fisher Erie Canal Noncarcinogenic Hazard Index |
|---|---|---|---|---|
| Hazard Index for consumption of beef | 0.000012 | 0.0000055 | 0.000055 | 0.0000055 |
| Hazard Index for consumption of milk | 0.00006 | 0.000008 | 0.00009 | 0.000008 |
| Hazard Index for consumption of fish | 0.18 | 0.24 | 0.24 | 0.16 |
| Hazard Index for ingestion of soil | 0.00040 | 0.000006 | 0.00000182 | 0.000006 |
| Hazard Index for consumption of above-ground vegetables | 0.00091 | 0.00092 | 0.000077 | 0.00092 |
| Hazard Index for consumption of below-ground vegetables | 0.0027 | 0.0024 | 0.00020 | 0.0024 |
| Hazard Index for consumption of drinking water | 0.0001 | 0.00002 | 0.00002 | 0.00002 |
| Hazard Index for inhalation | 0.043 | 0.043 | 0.0018 | 0.043 |
| Total Noncarcinogenic Hazard Index | 0.23 | 0.29 | 0.24 | 0.21 |

Notes:

Source: ENSR, 1999

RN: 0

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Table 7-6b
Total Noncarcinogenic Hazard Index - Summary Alternative Scenarios
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Potential Exposure Pathway | South Resident Location<br>Child Resident Noncarcinogenic Hazard Index | South Resident Location<br>Adult Resident Noncarcinogenic Hazard Index | Subsistence Farmer Dairy Farm Location Noncarcinogenic Hazard Index |
|---|---|---|---|
| Hazard Index for consumption of beef | 0.000012 | 0.0000055 | 0.000050 |
| Hazard Index for consumption of milk | 0.00006 | 0.000008 | 0.00008 |
| Hazard Index for consumption of fish | 0.18 | 0.24 | 0.24 |
| Hazard Index for ingestion of soil | 0.00076 | 0.000011 | 0.00000174 |
| Hazard Index for consumption of above-ground vegetables | 0.000128 | 0.000129 | 0.000069 |
| Hazard Index for consumption of below-ground vegetables | 0.0004 | 0.0004 | 0.00018 |
| Hazard Index for consumption of drinking water | 0.0001 | 0.00002 | 0.00002 |
| Hazard Index for inhalation | 0.00013 | 0.00013 | 0.0016 |
| Total Noncarcinogenic Hazard Index | 0.18 | 0.24 | 0.24 |

Notes:

Source: ENSR, 1999

RN: 0

4/8/02

Table 7-7a
Evaluation of Infant Exposure to Dioxin - Primary Locations
Norlite Corporation Light Agregate Facility
Cohoes, NY

| | Average Daily Dose - Infant (pg/kg BW-day) |
|---|---|
| Beef Farm - Subsistence Farmer - Infant | 4.29E-01 |
| Subsistence Fisher - Infant | 2.28E-01 |
| North Resident Location - Infant | 1.72E-01 |

Table 7-7b
Evaluation of Infant Exposure to Dioxin - Alternative Locations
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| | Average Daily Dose - Infant (pg/kg BW-day) |
|---|---|
| Dairy Farm - Subsistence Farmer - Infant | 3.97E-01 |
| South Resident Location - Infant | 1.49E-01 |

Table 7-8a
Risk Evaluation for Lead - Child Resident North Resident Location
Norlite Corporation Light Aggregate Facility
Cohoes, NY

| Medium | Predicted Site and Intake Concentration | Slope Factor | Reference | Predicted Blood Lead Level (ug/dL) |
|---|---|---|---|---|
| Air | 0.000042 ug/m$^3$ | 1.97 ug/dL blood lead per ug/m$^3$ air lead | U. S. EPA, 1989c | 8.27E-05 |
| Drinking Water | 1.6881E-06 ug/L | 0.26 ug/dL blood lead per ug/L water lead (a) | U. S. EPA, 1991b | 4.39E-07 |
| Diet | 1.1611E-05 ug/day | 0.24 ug/dL blood lead per ug/day dietary lead (b) | U. S. EPA, 1989c | 2.79E-06 |
| Soil | 0.00031 ug/g | 0.0068 ug/dL blood lead per ug/g soil lead (c) | U. S. EPA, 1986b | 2.08E-06 |
| Total Predicted Blood Level = | | | | 0.000088 |

Notes:
(a) - Used value for children (0-6 months) at water concentrations below 15 ug/L.
(b) - Combined dietary intake from vegetables, fish, beef and dairy milk. Used value for children (0-8 months).
(c) - Used upper range value for children.

Source: ENSR, 2001 RN: 1
4/8/02

## TABLE 7-9
## Short-term Exposure Air Modeling Results

| COMPOUND | CAS # | Guideline Concentration (μg/m³) | Source | Averaging Period (hours) | Per Unit Emission Rate (g/sec) | Maximum 1-hour Conc.* (μg/m³) | Percent of Guideline |
|---|---|---|---|---|---|---|---|
| 1,1,1,2-TETRACHLOROETHANE | 630-20-6 | 5.15E+04 | TEEL-1 | 0.25 | 5.36E-05 | 7.40E-03 | 0.000% |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | 6.80E+04 | Air Guide 2000 SGC | 1 | 5.36E-05 | 7.40E-03 | 0.000% |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | 2.06E+04 | TEEL-1 | 1 | 5.36E-05 | 7.40E-03 | 0.000% |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | 1.64E+05 | TEEL-1 | 1 | 5.36E-05 | 7.40E-03 | 0.000% |
| 1,1-DICHLOROETHANE | 75-34-3 | 1.21E+06 | TEEL-1 | 1 | 5.36E-05 | 7.40E-03 | 0.000% |
| 1,1-DICHLOROETHYLENE | 75-35-4 | 7.93E+04 | TEEL-1 | 1 | 5.36E-05 | 7.40E-03 | 0.000% |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | 3.71E+04 | TEEL-1 | 1 | 8.52E-05 | 1.18E-02 | 0.000% |
| 1,2-DICHLOROBENZENE ** | 95-50-1 | 3.01E+05 | TEEL-1 | 1 | 5.14E-05 | 7.09E-03 | 0.000% |
| 1,2-DICHLOROETHANE | 107-06-2 | 8.09E+03 | TEEL-1 | 1 | 5.36E-05 | 7.40E-03 | 0.000% |
| 1,2-DICHLOROPROPANE | 78-87-5 | 5.08E+05 | TEEL-1 | 1 | 5.36E-05 | 7.40E-03 | 0.000% |
| 1,3-BUTADIENE | 106-99-0 | NA | NA | NA | 3.20E-04 | 4.42E-02 | NA |
| 1,3-DICHLOROBENZENE (a) | 541-73-1 | 3.00E+04 | Air Guide 2000 SGC | 1 | 4.67E-05 | 6.44E-03 | 0.000% |
| 1,4-DICHLOROBENZENE (a) | 106-46-7 | 6.61E+05 | TEEL-1 | 1 | 2.87E-05 | 3.96E-03 | 0.000% |
| 2,3,7,8-TCDD - TE | 1746-01-6 | 3.50E+00 | TEEL-1 | NA | 2.07E-09 | 2.86E-07 | 0.000% |
| 2,4,5-TRICHLOROPHENOL | 95-95-4 | 2.99E+04 | TEEL-1 | | 3.52E-05 | 4.86E-03 | 0.000% |
| 2,4,6-TRICHLOROPHENOL (a) | 88-06-2 | 3.00E+04 | TEEL-1 | 0.25 | 1.02E-04 | 1.41E-02 | 0.000% |
| 2,4-DICHLOROPHENOL | 120-83-2 | 3.00E+04 | TEEL-1 | 0.25 | 3.52E-05 | 4.86E-03 | 0.000% |
| 2,4-DIMETHYLPHENOL | 105-67-9 | NA | NA | NA | 3.52E-05 | 4.86E-03 | NA |
| 2,4-DINITROTOLUENE | 121-14-2 | 6.00E+02 | TEEL-1 | 0.25 | 3.52E-05 | 4.86E-03 | 0.001% |
| 2,6-DINITROTOLUENE | 606-20-2 | 6.00E+02 | TEEL-1 | 0.25 | 3.52E-05 | 4.86E-03 | 0.001% |
| 2-BUTANONE | 78-93-3 | 5.90E+01 | ATEL-1 | 1 | 1.01E-04 | 1.40E-02 | 0.024% |
| 2-CHLORONAPHTHALENE | 91-58-7 | 5.99E+02 | TEEL-1 | 0.25 | 7.04E-06 | 9.72E-04 | 0.000% |
| 2-CHLOROPHENOL | 95-57-8 | 5.26E+03 | TEEL-1 | 0.25 | 3.52E-05 | 4.86E-03 | 0.000% |
| 2-METHYLNAPHTHALENE (a) | 91-57-6 | NA | NA | NA | 1.03E-06 | 1.43E-04 | NA |
| 2-METHYLPHENOL | 95-48-7 | 2.40E+03 | Air Guide 1995 SGC | 1 | 3.97E-05 | 5.48E-03 | 0.000% |
| 2-NITROANILINE | 88-74-4 | NA | NA | NA | 7.04E-05 | 9.72E-03 | NA |
| 4-METHYL-2-PENTANONE | 108-10-1 | 3.07E+05 | TEEL-1 | 1 | 1.07E-04 | 1.48E-02 | 0.000% |
| 4-METHYLPHENOL | 106-44-5 | 2.40E+03 | Air Guide 1995 SGC | 1 | 4.79E-05 | 6.60E-03 | 0.000% |
| 4-NITROPHENOL | 100-02-7 | NA | NA | NA | 1.41E-04 | 1.94E-02 | NA |
| ACENAPHTHENE | 83-32-9 | NA | NA | NA | 9.16E-08 | 1.26E-05 | NA |
| ACENAPHTHYLENE | 208-96-8 | NA | NA | NA | 8.87E-07 | 1.22E-04 | NA |
| AMMONIA ** | 7664-41-7 | 2.40E+03 | Air Guide 2000 SGC | 1 | 1.34E-01 | 1.85E+01 | 0.771% |
| ANTHRACENE | 120-12-7 | 6.0E+03 | TEEL-1 | NA | 2.11E-07 | 2.92E-05 | 0.000% |
| ANTIMONY | 7440-36-0 | 1.49E+03 | TEEL-1 | 1 | 2.43E-06 | 3.35E-04 | 0.000% |
| ARSENIC | 7440-38-2 | 3.00E+01 | TEEL-1 | 1 | 6.17E-06 | 8.51E-04 | 0.003% |
| BARIUM | 7440-39-3 | 1.52E+03 | TEEL-1 | 1 | 6.88E-06 | 9.49E-04 | 0.000% |
| BENZENE | 71-43-2 | 1.60E+05 | ERPG-1 | 1 | 2.32E-04 | 3.20E-02 | 0.000% |
| BENZO(A)ANTHRACENE | 56-55-3 | 6.0E+02 | TEEL-1 | NA | 2.14E-09 | 2.95E-07 | 0.000% |
| BENZO(A)PYRENE | 50-32-8 | 7.50E+03 | TEEL-1 | 0.25 | 2.58E-08 | 3.56E-06 | 0.000% |
| BENZO(B)FLUORANTHENE | 205-99-2 | NA | NA | NA | 1.73E-08 | 2.39E-06 | NA |
| BENZO(E)PYRENE | 192-97-2 | NA | NA | NA | 8.81E-08 | 1.22E-05 | NA |
| BENZO(G,H,I)PERYLENE | 191-24-2 | NA | NA | NA | 6.36E-08 | 8.77E-06 | NA |
| BENZO(K)FLUORANTHENE | 207-08-9 | NA | NA | NA | 2.32E-10 | 3.20E-08 | NA |
| BERYLLIUM | 7440-41-7 | 5.00E+00 | TEEL-1 | 1 | 6.07E-07 | 8.38E-05 | 0.002% |
| BIS(2-ETHYLHEXYL)PHTHALATE | 117-81-7 | 1.20E+03 | Air Guide 1995 SGC | 1 | 9.39E-05 | 1.30E-02 | 0.001% |
| BROMODICHLOROMETHANE | 75-27-4 | 4.0E+03 | TEEL-1 | NA | 6.01E-05 | 8.29E-03 | 0.000% |
| BROMOFORM | 75-25-2 | 1.55E+04 | TEEL-1 | 1 | 6.01E-05 | 8.29E-03 | 0.000% |
| BROMOMETHANE | 74-83-9 | 5.83E+04 | TEEL-1 | 1 | 3.20E-04 | 4.42E-02 | 0.000% |
| BUTYLBENZYLPHTHALATE | 85-68-7 | 5.00E+05 | TEEL-1 | 1 | 3.52E-05 | 4.86E-03 | 0.000% |
| CADMIUM | 7440-43-9 | 2.99E+01 | TEEL-1 | 1 | 2.43E-06 | 3.35E-04 | 0.001% |
| CARBON TETRACHLORIDE | 56-23-5 | 1.28E+05 | ERPG-1 | 1 | 4.84E-05 | 6.69E-03 | 0.000% |
| CHLORINE ** | 7782-50-5 | 2.90E+02 | Air Guide 2000 SGC | 1 | 6.69E-03 | 9.23E-01 | 0.318% |
| CHLOROBENZENE | 108-90-7 | 1.38E+05 | TEEL-1 | 1 | 1.34E-04 | 1.85E-02 | 0.000% |
| CHLOROFORM | 67-66-3 | 9.77E+03 | TEEL-1 | 1 | 1.60E-04 | 2.21E-02 | 0.000% |
| CHLOROMETHANE | 74-87-3 | 2.06E+05 | TEEL-1 | 1 | 3.20E-04 | 4.42E-02 | 0.000% |
| CHROMIUM (TOTAL) | 7440-47-3 | 1.49E+03 | TEEL-1 | 1 | 7.08E-06 | 9.77E-04 | 0.000% |
| CHROMIUM (VI) ** | 18540-29-9 | NA | TEEL-1 | 0.25 | 1.85E-06 | 2.55E-04 | NA |
| CHRYSENE | 218-01-9 | 2.00E+02 | TEEL-1 | 0.25 | 1.23E-10 | 1.70E-08 | 0.000% |
| CIS-1,3-DICHLOROPROPENE (a) | 10061-01-5 | 1.36E+04 | TEEL-1 | 0.25 | 5.25E-05 | 7.25E-03 | 0.000% |
| COPPER | 7440-50-8 | 1.00E+02 | Air Guide 2000 SGC | 1 | 4.90E-05 | 6.76E-03 | 0.007% |
| DIBENZ(A,H)ANTHRACENE | 53-70-3 | 3.01E+04 | TEEL-1 | 0.25 | 1.76E-08 | 2.43E-06 | 0.000% |

## TABLE 7-9
## Short-term Exposure Air Modeling Results

| COMPOUND | CAS # | Guideline Concentration (µg/m³) | Source | Averaging Period (hours) | Per Unit Emission Rate (g/sec) | Maximum 1-hour Conc.* (µg/m³) | Percent of Guideline |
|---|---|---|---|---|---|---|---|
| DIBROMOMETHANE | 74-95-3 | NA | NA | NA | 5.36E-05 | 7.40E-03 | NA |
| DICHLORODIFLUOROMETHANE | 75-71-8 | 1.48E+07 | TEEL-1 | 1 | 3.20E-04 | 4.42E-02 | 0.000% |
| DIETHYLPHTHALATE | 84-66-2 | 1.50E+04 | TEEL-1 | 1 | 2.76E-05 | 3.81E-03 | 0.000% |
| DIMETHYLPHTHALATE | 131-11-3 | 1.20E+03 | Air Guide 2000 SGC | 1 | 3.52E-05 | 4.86E-03 | 0.000% |
| DI-N-BUTYLPHTHALATE | 84-74-2 | 1.20E+03 | Air Guide 1995 SGC | 1 | 3.52E-05 | 4.86E-03 | 0.000% |
| DI-N-OCTYLPHTHALATE | 117-84-0 | NA | NA | NA | 3.52E-05 | 4.86E-03 | NA |
| ETHYLBENZENE | 100-41-4 | 5.43E+05 | TEEL-1 | 1 | 5.36E-05 | 7.40E-03 | 0.000% |
| FLUORANTHENE | 206-44-0 | 3.0E+01 | TEEL-1 | NA | 4.23E-07 | 5.83E-05 | 0.000% |
| FLUORENE | 86-73-7 | NA | NA | NA | 6.34E-07 | 8.75E-05 | NA |
| HEXACHLOROBENZENE | 118-74-1 | 7.45E+01 | TEEL-1 | 1 | 4.44E-05 | 6.12E-03 | 0.008% |
| HEXACHLOROBUTADIENE | 87-68-3 | 3.20E+04 | ERPG-1 | 1 | 7.04E-06 | 9.72E-04 | 0.000% |
| HEXACHLOROCYCLOPENTADIENE | 77-47-4 | 2.23E+02 | TEEL-1 | 1 | 1.41E-04 | 1.94E-02 | 0.009% |
| HEXACHLOROETHANE | 67-72-1 | 2.90E+04 | TEEL-1 | 1 | 7.04E-06 | 9.72E-04 | 0.000% |
| HYDROGEN BROMIDE ** | 10035-10-6 | 9.90E+02 | Air Guide 2000 SGC | 1 | 2.59E-02 | 3.57E+00 | 0.361% |
| HYDROGEN CHLORIDE ** | 7647-01-0 | 1.50E+02 | Air Guide 2000 SGC | 1 | 1.16E+00 | 1.60E+02 | 106.720% |
| HYDROGEN FLUORIDE ** | 7664-39-3 | 7.50E+00 | Air Guide 2000 SGC | 1 | 5.18E-03 | 7.15E-01 | 9.531% |
| INDENO(1,2,3-CD)PYRENE | 193-39-5 | NA | NA | NA | 2.46E-09 | 3.40E-07 | NA |
| LEAD | 7439-92-1 | 1.50E+02 | TEEL-1 | 1 | 4.13E-06 | 5.70E-04 | 0.000% |
| M/P-XYLENE | 1330-20-7 | 4.30E+03 | Air Guide 2000 SGC | 1 | 5.21E-05 | 7.19E-03 | 0.000% |
| MERCURY (NON-CHLORIDE) | 7439-97-6 | 1.00E+02 | TEEL-1 | 1 | 9.30E-05 | 1.28E-02 | 0.013% |
| MERCURY CHLORIDE | 07487-94-7 | 2.40E+00 | Air Guide 2000 SGC | 1 | 4.25E-05 | 5.87E-03 | 0.244% |
| METHYLENE CHLORIDE | 75-09-2 | 6.96E+05 | ERPG-1 | 1 | 1.96E-04 | 2.70E-02 | 0.000% |
| METHYLMERCURY | 22967-92-6 | NA | NA | NA | NA | NA | NA |
| NAPHTHALENE | 91-20-3 | 7.86E+04 | TEEL-1 | 1 | 2.12E-05 | 2.93E-03 | 0.000% |
| NICKEL | 7440-02-0 | 1.56E+00 | ATEL-1 | 1 | 8.50E-05 | 1.17E-02 | 0.752% |
| NITROBENZENE | 98-95-3 | 1.51E+04 | TEEL-1 | 1 | 7.04E-06 | 9.72E-04 | 0.000% |
| O-XYLENE | 95-47-6 | 4.30E+03 | Air Guide 2000 SGC | 1 | 5.36E-05 | 7.40E-03 | 0.000% |
| PARTICULATE MATTER ** | - | 3.80E+02 | NAAQS | 24 | 1.80E-01 | 2.48E+01 | 6.537% |
| PENTACHLOROPHENOL | 87-86-5 | 1.53E+03 | TEEL-1 | 1 | 1.41E-04 | 1.94E-02 | 0.001% |
| PERYLENE (a) | 198-55-0 | NA | NA | NA | 2.20E-08 | 3.03E-06 | .NA |
| PHENANTHRENE | 85-01-8 | NA | NA | NA | 1.23E-06 | 1.70E-04 | NA |
| PHENOL | 108-95-2 | 3.85E+04 | ERPG-1 | 1 | 5.25E-05 | 7.25E-03 | 0.000% |
| PYRENE | 129-00-0 | NA | NA | NA | 2.96E-07 | 4.08E-05 | NA |
| SELENIUM | 7782-49-2 | 2.94E+00 | ATEL-1 | 1 | 3.04E-06 | 4.20E-04 | 0.014% |
| SILVER | 7440-22-4 | 3.00E+02 | TEEL-1 | 1 | 1.29E-06 | 1.78E-04 | 0.000% |
| STYRENE | 100-42-5 | 2.13E+05 | ERPG-1 | 1 | 4.26E-05 | 5.88E-03 | 0.000% |
| TETRACHLOROETHYLENE | 127-18-4 | 6.78E+05 | ERPG-1 | 1 | 6.13E-05 | 8.46E-03 | 0.000% |
| THALLIUM | 7440-28-0 | 3.00E+02 | TEEL-1 | 1 | 3.04E-06 | 4.20E-04 | 0.000% |
| TOLUENE | 108-88-3 | 1.88E+05 | ERPG-1 | 1 | 8.53E-05 | 1.18E-02 | 0.000% |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | 5.30E+04 | AEGL-1 | 0.25 | 5.36E-05 | 7.40E-03 | 0.000% |
| TRANS-1,3-DICHLOROPROPENE (a) | 10061-02-6 | 1.36E+04 | TEEL-1 | 0.25 | 5.36E-05 | 7.40E-03 | 0.000% |
| TRICHLOROETHYLENE | 79-01-6 | 5.38E+05 | ERPG-1 | 1 | 4.80E-05 | 6.63E-03 | 0.000% |
| TRICHLOROFLUOROMETHANE | 75-69-4 | 2.81E+06 | TEEL-1 | 1 | 3.20E-04 | 4.42E-02 | 0.000% |
| VINYL CHLORIDE | 75-01-4 | 2.07E+05 | ATEL-1 | 1 | 3.20E-04 | 4.42E-02 | 0.000% |
| ZINC | 7440-66-6 | NA | NA | NA | 1.44E-04 | 1.99E-02 | NA |

* For two kilns operating simultaneously.
** Emission result from 1999 testing used, because parameter not measured in 2000 program.
NA = not available

## TABLE 7-10
## Long-term Exposure Air Modeling Results

| COMPOUND | CAS # | Guideline Concentration (µg/m³) | Source | Averaging Period (hours) | Per Unit Emission Rate (g/sec) | Maximum Annual Conc.* (µg/m³) | Percent of Guideline |
|---|---|---|---|---|---|---|---|
| 1,1,1,2-TETRACHLOROETHANE | 630-20-6 | 1.40E-01 | NA | NA | 5.36E-05 | 3.52E-04 | NA |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | 1.00E+03 | Air Guide 2000 AGC | Annual | 5.36E-05 | 3.52E-04 | 0.000% |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | 1.70E-02 | Air Guide 2000 AGC | Annual | 5.36E-05 | 3.52E-04 | 2.068% |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | 6.30E-02 | Air Guide 2000 AGC | Annual | 5.36E-05 | 3.52E-04 | 0.558% |
| 1,1-DICHLOROETHANE | 75-34-3 | 2.00E+01 | Air Guide 2000 AGC | Annual | 5.36E-05 | 3.52E-04 | 0.002% |
| 1,1-DICHLOROETHYLENE | 75-35-4 | 2.00E-02 | Air Guide 2000 AGC | Annual | 5.36E-05 | 3.52E-04 | 1.758% |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | 9.00E+00 | Air Guide1995 AGC | Annual | 8.52E-05 | 5.59E-04 | 0.006% |
| 1,2-DICHLOROBENZENE ** | 95-50-1 | 3.60E+02 | Air Guide 2000 AGC | Annual | 5.14E-08 | 3.37E-07 | 0.000% |
| 1,2-DICHLOROETHANE | 107-06-2 | 3.80E-02 | Air Guide 2000 AGC | Annual | 5.36E-05 | 3.52E-04 | 0.925% |
| 1,2-DICHLOROPROPANE | 78-87-5 | 4.00E+00 | Air Guide 2000 AGC | Annual | 5.36E-05 | 3.52E-04 | 0.009% |
| 1,3-BUTADIENE | 106-99-0 | 3.60E-03 | Air Guide 2000 AGC | Annual | 3.20E-04 | 4.42E-04 | 12.278% |
| 1,3-DICHLOROBENZENE (a) | 541-73-1 | 3.60E+02 | Air Guide 2000 AGC | Annual | 4.67E-05 | 3.06E-04 | 0.000% |
| 1,4-DICHLOROBENZENE (a) | 106-46-7 | 9.00E-02 | Air Guide 2000 AGC | Annual | 2.87E-05 | 1.88E-04 | 0.209% |
| 2,3,7,8-TCDD - TE | 1746-01-6 | 3.0E-08 | Air Guide 2000 AGC | Annual | 2.07E-09 | 1.36E-08 | 45.264% |
| 2,4,5-TRICHLOROPHENOL | 95-95-4 | 3.50E+02 | Air Guide 2000 AGC | Annual | 3.52E-05 | 2.31E-04 | 0.000% |
| 2,4,6-TRICHLOROPHENOL (a) | 88-06-2 | 3.20E-01 | Air Guide 2000 AGC | Annual | 5.14E-05 | 3.37E-04 | 0.105% |
| 2,4-DICHLOROPHENOL | 120-83-2 | 1.10E+01 | Air Guide 1995 AGC | Annual | 3.52E-05 | 2.31E-04 | 0.002% |
| 2,4-DIMETHYLPHENOL | 105-67-9 | NA | NA | NA | 3.52E-05 | 2.31E-04 | NA |
| 2,4-DINITROTOLUENE | 121-14-2 | 5.00E-03 | Air Guide 2000 AGC | Annual | 3.52E-05 | 2.31E-04 | 4.621% |
| 2,6-DINITROTOLUENE | 606-20-2 | NA | NA | NA | 3.52E-05 | 2.31E-04 | NA |
| 2-BUTANONE | 78-93-3 | 1.00E+03 | Air Guide 2000 AGC | Annual | 1.01E-04 | 6.65E-04 | 0.000% |
| 2-CHLORONAPHTHALENE | 91-58-7 | NA | NA | NA | 7.04E-06 | 4.62E-05 | NA |
| 2-CHLOROPHENOL | 95-57-8 | NA | NA | NA | 3.52E-05 | 2.31E-04 | NA |
| 2-METHYLNAPHTHALENE (a) | 91-57-6 | NA | NA | NA | 1.03E-06 | 6.77E-06 | NA |
| 2-METHYLPHENOL | 95-48-7 | 1.80E+02 | Air Guide 2000 AGC | Annual | 3.97E-05 | 2.60E-04 | 0.000% |
| 2-NITROANILINE | 88-74-4 | NA | NA | NA | 7.04E-05 | 4.62E-04 | NA |
| 4-METHYL-2-PENTANONE | 108-10-1 | 4.90E+02 | Air Guide 2000 AGC | Annual | 1.07E-04 | 7.03E-04 | 0.000% |
| 4-METHYLPHENOL | 106-44-5 | 1.80E+02 | Air Guide 2000 AGC | Annual | 4.79E-05 | 3.14E-04 | 0.000% |
| 4-NITROPHENOL | 100-02-7 | 1.0E-01 | Air Guide 2000 AGC | Annual | 1.41E-04 | 9.24E-04 | 0.924% |
| ACENAPHTHENE | 83-32-9 | NA | NA | NA | 9.16E-08 | 6.01E-07 | NA |
| ACENAPHTHYLENE | 208-96-8 | NA | NA | NA | 8.87E-07 | 5.82E-06 | NA |
| AMMONIA ** | 7664-41-7 | 1.00E+02 | Air Guide 2000 AGC | Annual | 1.34E-01 | 8.79E-01 | 0.879% |
| ANTHRACENE | 120-12-7 | 2.0E-02 | Air Guide 2000 AGC | Annual | 2.11E-07 | 1.39E-06 | 0.007% |
| ANTIMONY | 7440-36-0 | 1.20E+00 | Air Guide 2000 AGC | Annual | 2.43E-06 | 1.59E-05 | 0.001% |
| ARSENIC | 7440-38-2 | 2.30E-04 | Air Guide 2000 AGC | Annual | 6.17E-06 | 4.05E-05 | 17.598% |
| BARIUM | 7440-39-3 | 1.20E+00 | Air Guide 2000 AGC | Annual | 6.88E-06 | 4.51E-05 | 0.004% |
| BENZENE | 71-43-2 | 1.30E-01 | Air Guide 2000 AGC | Annual | 2.32E-04 | 1.52E-03 | 1.172% |
| BENZO(A)ANTHRACENE | 56-55-3 | 2.00E-02 | Air Guide 2000 AGC | Annual | 1.55E-09 | 1.02E-08 | 0.000% |
| BENZO(A)PYRENE | 50-32-8 | 2.00E-03 | Air Guide 2000 AGC | Annual | 2.00E-08 | 1.31E-07 | 0.007% |
| BENZO(B)FLUORANTHENE | 205-99-2 | NA | NA | NA | 8.64E-09 | 5.67E-08 | NA |
| BENZO(E)PYRENE | 192-97-2 | NA | NA | NA | 8.81E-08 | 1.22E-05 | NA |
| BENZO(G,H,I)PERYLENE | 191-24-2 | NA | NA | NA | 6.36E-08 | 4.17E-07 | NA |
| BENZO(K)FLUORANTHENE | 207-08-9 | NA | NA | NA | 1.74E-10 | 1.14E-09 | NA |
| BERYLLIUM | 7440-41-7 | 4.20E-04 | Air Guide 2000 AGC | Annual | 6.07E-07 | 3.98E-06 | 0.948% |
| BIS(2-ETHYLHEXYL)PHTHALATE | 117-81-7 | 4.20E-01 | Air Guide 2000 AGC | Annual | 5.24E-05 | 3.43E-04 | 0.082% |
| BROMODICHLOROMETHANE | 75-27-4 | 2.00E-02 | Air Guide 2000 AGC | Annual | 6.01E-05 | 3.94E-04 | 1.970% |
| BROMOFORM | 75-25-2 | 9.00E-01 | Air Guide 2000 AGC | Annual | 6.01E-05 | 3.94E-04 | 0.044% |
| BROMOMETHANE | 74-83-9 | 5.00E+00 | Air Guide 2000 AGC | Annual | 1.60E-04 | 1.05E-03 | 0.021% |
| BUTYLBENZYLPHTHALATE | 85-68-7 | 4.20E-01 | Air Guide 2000 AGC | Annual | 3.52E-05 | 2.31E-04 | 0.055% |
| CADMIUM | 7440-43-9 | 5.00E-04 | Air Guide 2000 AGC | Annual | 2.43E-06 | 1.59E-05 | 3.188% |
| CARBON TETRACHLORIDE | 56-23-5 | 6.70E-02 | Air Guide 2000 AGC | Annual | 4.84E-05 | 3.18E-04 | 0.474% |
| CHLORINE ** | 7782-50-5 | 2.00E-01 | Air Guide 2000 AGC | Annual | 6.69E-03 | 4.39E-02 | 21.943% |
| CHLOROBENZENE | 108-90-7 | 1.10E+02 | Air Guide 2000 AGC | Annual | 1.34E-04 | 8.78E-04 | 0.001% |
| CHLOROFORM | 67-66-3 | 4.30E-02 | Air Guide 2000 AGC | Annual | 1.60E-04 | 1.05E-03 | 2.444% |
| CHLOROMETHANE | 74-87-3 | 7.70E+02 | Air Guide 2000 AGC | Annual | 4.10E-02 | 2.69E-01 | 0.035% |
| CHROMIUM (TOTAL) | 7440-47-3 | 1.20E+00 | Air Guide 2000 AGC | Annual | 7.08E-06 | 4.64E-05 | 0.004% |
| CHROMIUM (VI) ** | 18540-29-9 | 8.30E-05 | NA | NA | 1.85E-06 | 1.21E-05 | 14.582% |
| CHRYSENE | 218-01-9 | 2.00E-02 | Air Guide 2000 AGC | Annual | 6.17E-11 | 4.05E-10 | 0.000% |
| CIS-1,3-DICHLOROPROPENE (a) | 10061-01-5 | NA | NA | NA | 5.25E-05 | 3.44E-04 | NA |

## TABLE 7-10
## Long-term Exposure Air Modeling Results

| COMPOUND | CAS # | Guideline Concentration (µg/m³) | Source | Averaging Period (hours) | Per Unit Emission Rate (g/sec) | Maximum Annual Conc.* (µg/m³) | Percent of Guideline |
|---|---|---|---|---|---|---|---|
| COPPER | 7440-50-8 | 2.00E-02 | Air Guide 2000 AGC | Annual | 4.90E-05 | 3.21E-04 | 1.607% |
| DIBENZ(A,H)ANTHRACENE | 53-70-3 | 2.00E-02 | Air Guide 2000 AGC | Annual | 8.82E-09 | 5.79E-08 | 0.000% |
| DIBROMOMETHANE | 74-95-3 | NA | NA | NA | 5.36E-05 | NA | NA |
| DICHLORODIFLUOROMETHANE | 75-71-8 | 1.20E+04 | Air Guide 2000 AGC | Annual | 1.60E-04 | 1.05E-03 | 0.000% |
| DIETHYLPHTHALATE | 84-66-2 | 1.20E+01 | Air Guide 2000 AGC | Annual | 2.76E-05 | 1.81E-04 | 0.002% |
| DIMETHYLPHTHALATE | 131-11-3 | 1.20E+01 | Air Guide 2000 AGC | Annual | 3.52E-05 | 2.31E-04 | 0.002% |
| DI-N-BUTYLPHTHALATE | 84-74-2 | 1.20E+01 | Air Guide 2000 AGC | Annual | 3.52E-05 | 2.31E-04 | 0.002% |
| DI-N-OCTYLPHTHALATE | 117-84-0 | NA | NA | NA | 3.52E-05 | 2.31E-04 | NA |
| ETHYLBENZENE | 100-41-4 | 1.00E+03 | Air Guide 2000 AGC | Annual | 5.36E-05 | 3.52E-04 | 0.000% |
| FLUORANTHENE | 206-44-0 | NA | NA | NA | 4.23E-07 | 2.77E-06 | NA |
| FLUORENE | 86-73-7 | NA | NA | NA | 6.34E-07 | 4.16E-06 | NA |
| HEXACHLOROBENZENE | 118-74-1 | 2.20E-03 | Air Guide 2000 AGC | Annual | 4.44E-05 | 2.91E-04 | 13.227% |
| HEXACHLOROBUTADIENE | 87-68-3 | 4.50E-02 | Air Guide 2000 AGC | Annual | 7.04E-06 | 4.62E-05 | 0.103% |
| HEXACHLOROCYCLOPENTADIENE | 77-47-4 | 2.60E-01 | Air Guide 2000 AGC | Annual | 1.41E-04 | 9.24E-04 | 0.355% |
| HEXACHLOROETHANE | 67-72-1 | 2.50E-01 | Air Guide 2000 AGC | Annual | 7.04E-06 | 4.62E-05 | 0.018% |
| HYDROGEN BROMIDE ** | 10035-10-6 | 2.40E+02 | Air Guide 1995 AGC | Annual | 2.59E-02 | 1.70E-01 | 0.071% |
| HYDROGEN CHLORIDE ** | 7647-01-0 | 2.00E+01 | Air Guide 2000 AGC | Annual | 1.16E+00 | 7.61E+00 | 38.048% |
| HYDROGEN FLUORIDE ** | 7664-39-3 | 4.20E-01 | Air Guide 2000 AGC | Annual | 5.18E-03 | 3.40E-02 | 8.091% |
| INDENO(1,2,3-CD)PYRENE | 193-39-5 | NA | NA | NA | 2.46E-09 | 1.61E-08 | NA |
| LEAD | 7439-92-1 | 7.50E-01 | Air Guide 2000 AGC | Annual | 4.13E-06 | 2.71E-05 | 0.004% |
| M/P-XYLENE | 1330-20-7 | 7.00E+02 | Air Guide 2000 AGC | Annual | 5.21E-05 | 3.42E-04 | 0.000% |
| MERCURY (NON-CHLORIDE) | 7439-97-6 | 3.00E-01 | Air Guide 2000 AGC | Annual | 9.30E-05 | 6.10E-04 | 0.203% |
| MERCURY CHLORIDE | 07487-94-7 | 4.10E-01 | Air Guide 2000 AGC | Annual | 4.25E-05 | 2.79E-04 | 0.068% |
| METHYLENE CHLORIDE | 75-09-2 | 2.10E+00 | Air Guide 2000 AGC | Annual | 1.96E-04 | 1.28E-03 | 0.061% |
| METHYLMERCURY | 22967-92-6 | 2.40E-02 | Air Guide 2000 AGC | Annual | NA | NA | NA |
| NAPHTHALENE | 91-20-3 | 3.00E+00 | Air Guide 2000 AGC | Annual | 2.12E-05 | 1.39E-04 | 0.005% |
| NICKEL | 7440-02-0 | 4.00E-03 | Air Guide 2000 AGC | Annual | 8.50E-05 | 5.58E-04 | 13.940% |
| NITROBENZENE | 98-95-3 | 3.00E+01 | Air Guide 2000 AGC | Annual | 7.04E-06 | 4.62E-05 | 0.000% |
| O-XYLENE | 95-47-6 | 7.00E+02 | Air Guide 2000 AGC | Annual | 5.36E-05 | 3.52E-04 | 0.000% |
| PARTICULATE MATTER ** | - | 5.00E+01 | Air Guide 2000 AGC | Annual | 1.80E-01 | 1.18E+00 | 2.362% |
| PENTACHLOROPHENOL | 87-86-5 | 2.00E-01 | Air Guide 2000 AGC | Annual | 1.41E-04 | 9.24E-04 | 0.462% |
| PERYLENE (a) | 198-55-0 | NA | NA | NA | 2.20E-08 | 1.44E-07 | NA |
| PHENANTHRENE | 85-01-8 | 2.00E-02 | Air Guide 2000 AGC | Annual | 1.23E-06 | 8.09E-06 | 0.040% |
| PHENOL | 108-95-2 | 4.50E+01 | Air Guide 2000 AGC | Annual | 5.25E-05 | 3.44E-04 | 0.001% |
| PYRENE | 129-00-0 | 2.0E-02 | Air Guide 2000 AGC | Annual | 2.96E-07 | 1.94E-06 | 0.010% |
| SELENIUM | 7782-49-2 | 2.00E+01 | Air Guide 2000 AGC | Annual | 3.04E-06 | 1.99E-05 | 0.000% |
| SILVER | 7440-22-4 | 2.00E+01 | Air Guide 2000 AGC | Annual | 1.29E-06 | 8.46E-06 | 0.000% |
| STYRENE | 100-42-5 | 1.00E+03 | Air Guide 2000 AGC | Annual | 4.26E-05 | 2.79E-04 | 0.000% |
| TETRACHLOROETHYLENE | 127-18-4 | 1.00E+00 | Air Guide 2000 AGC | Annual | 6.13E-05 | 4.02E-04 | 0.040% |
| THALLIUM | 7440-28-0 | 2.40E-01 | Air Guide 2000 AGC | Annual | 3.04E-06 | 1.99E-05 | 0.008% |
| TOLUENE | 108-88-3 | 4.00E+02 | Air Guide 2000 AGC | Annual | 8.53E-05 | 5.59E-04 | 0.000% |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | 1.00E-01 | Air Guide 2000 AGC | Annual | 5.36E-05 | 3.52E-04 | 0.352% |
| TRANS-1,3-DICHLOROPROPENE (a) | 10061-02-6 | NA | NA | NA | 5.36E-05 | 3.52E-04 | NA |
| TRICHLOROETHYLENE | 79-01-6 | 4.50E-01 | Air Guide 2000 AGC | Annual | 4.80E-05 | 3.15E-04 | 0.070% |
| TRICHLOROFLUOROMETHANE | 75-69-4 | 2.00E+04 | Air Guide 2000 AGC | Annual | 1.60E-04 | 1.05E-03 | 0.000% |
| VINYL CHLORIDE | 75-01-4 | 2.00E-02 | Air Guide 2000 AGC | Annual | 1.60E-04 | 1.05E-03 | 5.248% |
| ZINC | 7440-66-6 | 5.0E+01 | Air Guide 2000 AGC | Annual | 1.44E-04 | 9.45E-04 | 0.002% |

* For two kilns operating simultaneously.
NA = not available/applicable
Note results are based on a maximum annual dispersion factor of 3.28 µg/m³ per g/sec for each kiln. Compound specific air concentrations computed based on per unit emission factor x dispersion factor x 2 units.
** Emission result from 1999 testing used, because parameter not measured in 2000 program.

## Table 7-11 Comparative Summary of Base Case and EPA "Alternative Case" Risk Assessment Results

| Case | N Child | N Adult | S Child | S. Adult | Beef Farm | Dairy Farm | Recreational Fisher * | | Subsistence Fisher |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Resident | Farmer | |
| **Norlite 02B/C NY ** ("Base Case")** | | | | | | | | | |
| Hazard Index | 0.23 | 0.29 | 0.18 | 0.24 | 0.24 | 0.24 | 0.24 | 0.24 | 0.21 |
| Risk | $3.61e^{-7}$ | $2.08e^{-6}$ | $5.8e^{-8}$ | $3.02e^{-7}$ | $1.15e^{-6}$ | $1.06e^{-6}$ | $1.57e^{-7}$ | $2.13e^{-7}$ | $2.15e^{-6}$ |
| Dioxin in Mother's Milk (pg/kg-day) | 0.172 | - | 0.149 | - | 0.429 | 0.397 | - | - | 0.228 |
| Lead, Total (ug/dl) | 0.000088 | - | 0.000012 | - | - | - | - | - | - |
| **Norlite 03B/C EPA *** ("EPA Alternative Case")** | | | | | | | | | |
| Hazard Index | 0.61 | 0.91 | 0.56 | 0.86 | 0.87 | 0.87 | 0.86 | 0.86 | 0.83 |
| Risk | $1.24e^{-6}$ | $3.45e^{-6}$ | $3.30e^{-7}$ | $1.30e^{-6}$ | $3.45e^{-6}$ | $2.98e^{-6}$ | $0.815e^{-6}$ | $1.10e^{-6}$ | $3.98e^{-6}$ |
| Dioxin in Mother's Milk (pg/kg-day) | 1.01 | - | 0.89 | - | 1.40 | 1.32 | - | - | 1.49 |
| Lead, Total in blood (ug/dl) | 0.000093 | - | 0.000022 | - | - | - | - | - | - |

- * **Maximum contribution to total Hazard Index or Risk from recreationally caught fish for adult residents and farmers**
- ** **Untilled soil mixing depth = 5 cm; NYSDOH-approved exposure freq.; NYSDOH veg., beef and milk ingest. rates; Subsistence Fisher = 60 g/day; Recreational Angler = 18 g/day and child = 2.5 g/day,**
- *** **Untilled soil mixing depth = 1 cm; EPA-guideline exposure freq.; EPA veg., beef and milk ingest. rates; Subsistence fisher= 81.9 g/day , child 11.4 g/day; Recreational Angler = 20.5 g/day and child = 2.85 g/day;**

# TABLE 7-12. Summary of Uncertainty Analysis Results

| Issues and Factors Parameters | Conservatism Level in this Assessment | | |
|---|---|---|---|
| | + | ~ or = | - |
| Hazard Identification | | | |
| Estimation of Emissions | | | |
| Metals | | √ | |
| PICs | | √ | |
| VOCs | √ | | |
| SvOCs | √ | | |
| PAHs | √ | | |
| TCDD-TEQs | | √ | |
| Selection of COPCs (Risk Ranking Method) | √ | | |
| Air Dispersion Modeling | | | |
| Atmospheric Dilution Parameters | √ | | |
| Aerodynamic Wake Effects | | √ | |
| Terrain Effects | √ | | |
| Deposition Rates (overall) | | √ | |
| Particle Size Representativeness | √ | | |
| Dry Deposition Rates | | √ | |
| Large Particles | √ | | |
| Smallest Particles | | √ | |
| Vapors (organic) | √ | | |
| Vapors (mercury) | | √ | ? |
| Wet Deposition Rates (overall) | √ | | |
| Large Particles | √ | | |

| | | | |
|---|---|---|---|
| Small Particles | | √ | |
| Vapors (organic) | √ | | |
| Vapors (mercury) | √ | | |
| Toxicity Assessment | | | |
| Dose Response Values | √ | | |
| Animal to Human Extrapolation (varies by compound) | √ | | |
| High to Low Dose Extrapolation | √ | | |
| Exposure Modeling | | | |
| Soil Concentration | EPA | NY | |
| Surface Water | EPA | NY | |
| Degradation in Water and Soil | √ | | |
| Estimating Plant Concentrations | √ | | |
| Root Uptake | | √ | |
| Vapor Deposition on Leaves | √ | | |
| Vapor Interception Fraction | | | √ |
| Plant Yield (site-specific) | | √ | |
| Photodegradation | √ | | |
| Dose from Exposure | | | |
| Location of Exposed Receptor | √ | | |
| Dietary Uptake Rates for: | | | |
| Crops | EPA | NY | |
| Meats and Fish | EPA | NY | |
| Dairy Products | EPA | NY | |
| Soil Ingestion | √ | | |
| Bioaccumulation Factors (BCFs and BSAFs) for: | | | |
| Meat | √ | | |

| | | | |
|---|---|---|---|
| Fish | √ | | |
| Milk | | √ | |
| Duration and Frequency of Exposure | EPA | NY | |
| Risk Characterization | | | |
| Exposure to Multiple Chemicals | √ | ? | |
| Sensitive Subpopulations | √ | | |
| Summing all Results | √ | | |

Key to Symbols:
+ = Conservative
~ = Approximately the same, or uncertain
- = May be unconservative
√ = Technical judgement of status
? = Impossible to be certain, but overestimates for individual COPCs are expected to compensate for others.

# 8.0 SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT

## 8.1 Introduction

A preliminary Screening Level Ecological Risk Assessment (SLERA) was conducted for the Norlite Corporate Lightweight Aggregate Manufacturing Facility ("Norlite Facility") in Cohoes, NY. The SLERA provides a first-approximation evaluation of the potential of emissions from the Norlite Facility to pose adverse ecological risk to habitats and biota in the vicinity of the facility. This SLERA focused exclusively on evaluation of risk to ecological receptors exposed to site-related constituents in nearby waterbody, terrestrial upland and wetland habitats.

### 8.1.1 Methodology and Guidance

Currently, no approved state protocol or specific guidance is available for conducting a SLERA for lightweight aggregate or cement kiln combustion facilities. The approach used for this SLERA is that outlined in the Protocol for a Multipathway Risk Assessment submitted in May 1996 (ENSR Doc. No. 9514-039) and approved by New York State Department of Conservation (NYSDEC). The methods in the protocol and draft SLERA were revised in response to U.S. EPA comments of January 24, 2002. The revised protocol and SLERA identify a preliminary screening approach that focused upon:

- Identification of ecological receptors (habitats and biota) in the area and determination of threatened/endangered species or species of special concern;
- Assessment of modeled surface water concentrations against available New York State water quality standards (NYSWQS), National Ambient Water Quality Criteria (AWQC), and other surface water ecotoxicological benchmarks;
- Assessment of modeled sediment concentrations against available NYS Sediment Guidance Values (NYSDEC, 1999) and other sediment ecotoxicological benchmarks;
- Assessment of modeled surface and hydric soil concentrations against ecotoxicological benchmarks for the protection of invertebrate and plant communities; and
- Assessment of modeled tissue concentrations to evaluate potential food chain risks to wildlife receptors.

The scope of work outlined in the Protocol was expanded slightly to include additional sources of aquatic toxicity benchmarks [e.g., national ambient water quality criteria (NAWQC); and other published scientific literature values] to supplement the NYS WQS. Several of the chemicals of potential ecological concern (CPECs) did not have a NYS ecological risk-based value. Selection of

CPECs was based upon a combination inspection of emission rates, comparison of human health risk-based screening results, consideration of bioaccumulative properties, and best professional judgment. This qualitative selection of CPECs was sufficient to evaluate the level of potential ecological risk to a first approximation under conservative assumptions. More extensive screening and selection of CPECs would be warranted if a further Tier 2 risk evaluation is undertaken. The general form of the SLERA contains the basic framework for ecological risk assessment (i.e., problem formulation, analysis, risk characterization) recommended by current generalized U.S. EPA ecological risk guidance (U.S. EPA, 1997d; 1998b; 1999c).

### 8.1.2 Organization of the SLERA

The SLERA is organized in the following manner: Introduction (Section 8.1); Problem Formulation (Section 8.2); Risk Analysis (Section 8.3); Risk Characterization (Section 8.4); Sources of Uncertainty (Section 8.5), and Conclusions and Summary (Section 8.6). Additional supporting data calculations and correspondence are contained in the Appendix E.

## 8.2 Problem Formulation

Problem formulation is the initial phase of the ecological risk assessment (ERA) process and provides the basis for the approach and methodology to be used. The problem formulation phase includes identification of ecological receptors and resources, identification of exposure pathways for those receptors, selection of assessment and measurement endpoints, as well as development of a conceptual site model (CSM) for the ERA.

This SLERA evaluates potential adverse effects to ecological receptors associated with exposure to organic and inorganic contaminants emitted from the Norlite Facility. This SLERA was conducted using guidance from several documents, including but not entirely restricted to:

- Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final Draft (U.S. EPA, 1997b);
- Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Peer Review Draft (U.S. EPA, 1999c);
- Proposed Guidelines for Ecological Risk Assessment (U.S. EPA, 1998b); and
- Intermittent "ECO Update" Bulletins published by U.S. EPA.

Currently, no approved state or federal protocol or guidance is available for conducting a SLERA for incineration facilities. The guidance documents above do provide an appropriate overall framework for evaluating environmental risk.

The problem formulation section consists of site description (Section 8.2.1); identification of ecological receptors (Section 8.2.2); identification of exposure pathways (Section 8.2.3); selection of CPECs (Section 8.2.4); and development of the conceptual site model (Section 8.2.5).

### 8.2.1 Site Description

The combustor is located within the Norlite Facility located on Green Island in the City of Cohoes, NY, bordering the Hudson River. The site is described in Section 2.0 of this document and the location is shown in Figure 2-2. Information on local terrestrial and wetland habitats is given below. Further details on nearby waterbodies and their watersheds are presented in Sections 6.1 and 6.4.5.

### 8.2.2 Identification of Ecological Receptors and Habitats in the Vicinity of the Norlite Facility

Characterization of ecological resources and receptors (habitats and biota) at or in the vicinity of the Norlite facility was conducted to help select potential complete exposure pathways of concern, to identify the potential presence of threatened/endangered (T/E) species, and provide a context for the conceptual site model. A qualified ecologist conducted a field reconnaissance survey in February 2002 to evaluate local habitats for consideration of their inclusion in the SLERA. Based on the results of this field reconnaissance and further review, a local wetland and terrestrial upland habitat were selected for risk evaluation. Details of the field reconnaissance survey are presented in Appendix H.

Ecological habitats within a 5-mile radius were identified from available USGS maps (Troy North and Troy South quadrangles) and include aquatic, wetland, and terrestrial habitats. The following major aquatic habitat types within the 5-mile radius were identified: major rivers (e.g., Hudson River, Mohawk River), streams and canals (e.g., Erie Canal, Poeston Kill, Wynants Kill), water supply reservoirs (e.g., Troy Reservoir), and small lakes and ponds (e.g., Wright/Bradley Lake, Lansingburgh Reservoir, Bordens Pond). Three representative waterbodies were selected to evaluate potential ecological risks posed by the facility: Hudson River, Erie Canal at Canal State Park, and Wright/Bradley Lake. These waterbodies are discussed in the following subsections.

On February 20, 2002 a field reconnaissance survey was conducted for three additional ecological risk receptor sites in response to comments from the US EPA (dated January 24, 2002) regarding the Norlite Facility (see Appendix H). Weather conditions during the field surveys were clear skies/ sunny with temperatures in the low-mid 40 degree range. Three terrestrial community sites were identified for consideration for potential inclusion in the SLERA.

The three candidate sites included the following:

- Site 1 - located on the north end of Green Island, approximately 0.6 miles northeast of the Norlite facility. The site is composed of approximately forty acres of forest stand bounded on the west by

Cohoes Ave, on the south by Veterans Memorial Drive, on the east by abandoned railroad tracks and on the north by a tributary of the Hudson River;

- Site 2 - located along the northeast side of Hillcrest Avenue in Sycaway, immediately east of the City of Troy, NY, approximately three miles southeast of the Norlite facility. The site is adjacent the Niagara Mohawk Sycaway electrical substation and is bounded by a power line right-of-way on the south and west and residential neighborhoods on the north and east. The area surveyed was approximately twenty acres and extends to the southeast. A small perennial stream flows along the western boundary of the site; and

- Site 3 - located along the eastern boundary of St. Peter's Cemetery on NYS Route 40 north of the City of Troy, NY, approximately 2.5 miles northeast of the Norlite facility. The site is partially located on high ground with steep slopes overlooking the cemetery proper and covers approximately ten to fifteen acres. Private residences bound the area on the south and east.

Further comparison of the candidate habitats included consideration of the size of the habitats, the proximity and location of the habitat relative to the Norlite facility, local patterns of emission deposition, and access to waterbodies. Based on this evaluation, Site 1 (Green Island) was selected for further investigation since (1) it had the largest area, (2) experienced the highest modeled emission deposition among the three sites, and (3) was adjacent to a aquatic habitat likely to be frequented by mink (EPA suggested receptor). Accordingly, ecological receptors residing in the terrestrial upland habitat and riparian wetland habitat located at Site 1 were selected for further ecological risk evaluation. The terrestrial and wetland habitats are presented in Figure 2-6 and described in the following subsections.

#### 8.2.2.1 Hudson River

The Hudson River, a Natural Heritage River, is the major waterbody in the vicinity of the Norlite facility. The Hudson River receives drainage from a large watershed as it flows 315 miles from its source in the Adirondack Mountains to its mouth at New York Harbor. While the Hudson River has a very large watershed (12,650 sq. mi), only the immediate drainage basin within 20 kilometers around the Norlite facility was used for calculation of the predicted water column concentration. The Hudson River is functionally divided into the Upper Hudson River (above Cohoes) and Lower Hudson River (below Troy Dam). This SLERA only considered the Hudson River that is in the immediate vicinity of the site near the confluence of the Mohawk ad Upper Hudson River. This stretch of the Hudson River is freshwater, while that below the Troy Dam is subject to estuarine tidal influence. The average river flow of the Hudson River at Green Island is approximately 13,822 cubic feet per second (cfs), based on a 50-year hydrologic record from 1947-1997 (EarthInfo, 1997).

Water quality in the Hudson River generally supports its designated use as being protective of fish propagation or wildlife consumption of fish. However, data from the early 1980s indicated elevated levels of polychlorinated biphenyls (PCBs) in the sediments below Fort Edward and has led to commercial and recreational fishing bans in the areas downstream. Historic industrial and manufacturing activity in the Albany-Schenectady-Troy area and upstream tributaries (Mohawk, Hoosic Rivers) have also led to concerns regarding sediment and water quality. Thus, it is likely that background sources of heavy metals, PAHs, PCBs, and other contaminants might be present in local waterbodies. However, this SLERA only considers the incremental ecological risk posed by the atmospheric emissions of the Norlite facility through potential ecological exposure to surface water aquatic receptors (i.e., fish, planktonic invertebrates), sediment receptors (i.e., benthic macroinvertebrates), and semi-aquatic wildlife (i.e., avian piscivore).

Fish species typically found in the Hudson River represent a great variety of gamefish, panfish, and forage species (Smith, 1985). These species include fish typically found in lakes, rivers, and streams, reflecting the variety of habitats available in the Hudson River. The fish assemblage in the Hudson River near the confluence of the Mohawk and Hudson Rivers (i.e., the segment of the river closest to the areas of high modeled air deposition from the kilns) was selected as an ecological receptor for the Norlite SLERA. In addition, the benthic (bottom) community was selected as an ecological receptor, as were piscivorous bird and mammal species feeding on fish in the Hudson River.

#### 8.2.2.2 Erie Canal

The Erie Canal represents a navigational and recreational waterbody that is located north of the Norlite facility. It forms an important fish passage area for species unable to pass the barriers of Cohoes Falls and associated hydroelectric impoundment. The fish community in the Canal includes recreational game fish (e.g., smallmouth bass) and forage fish (blue-backed herring). Due to its smaller hydrologic flows, the Canal represents an environment potentially receiving a greater relative exposure to CPEC arising from air deposition. The aquatic and benthic communities and piscivorous wildlife receptors were selected in the Erie Canal.

#### 8.2.2.3 Wright/Bradley Lake

The third aquatic habitat selected was Wright/Bradley Lake. This small lake system (about 14.5 acres) is located in an urban park within a residential setting in Troy, NY. It is located about 1.8 miles east of the Norlite Facility in an area subject to above average air deposition from the Facility. Wright/Bradley Lake was selected as a representative aquatic habitat of concern for the developed portion of the larger Hudson watershed due to its close proximity, urban park setting, and small size. The aquatic and benthic communities and piscivorous wildlife receptors in Wright/Bradley Lake were also selected for the Norlite facility SLERA.

#### 8.2.2.4 Green Island

Due to the well-defined channel and steep slope, little significant wetland habitats are located on the Hudson River on the stretch near the Norlite Facility. However, some wetland habitats were identified in the vicinity of the Norlite Facility through inspection of USGS topographic maps (Troy North and Troy South quadrangles) and a site reconnaissance survey. These include wetland communities associated with Green Island, those associated with the abandoned canal system running through the Norlite property, and a wetland area located south of Maplewood Cemetery near the site. The riparian wetland at Green Island was selected for further investigation. The riparian wetland habitat consists of banks and shoreline bordering a tributary of the Hudson River. In addition to the bank area, a small area of forested wetland containing American elm (*Ulmus americana*) and silky dogwood (*Cornus amomum*) was observed near the center of the site. The wildlife receptors in the Green Island wetland habitat were selected as receptors for the Norlite facility SLERA.

Due to the urbanized nature of the shoreline of the Hudson River area around the Norlite facility, there is limited contiguous terrestrial habitat except for parks and islands within the river. A terrestrial habitat on the north side of Green Island was selected for further assessment. The terrestrial habitat is characterized as variable density mixed age deciduous forest dominated by mixed age oak species (*Quercus spp*). The site also contained scattered mature white pine (*Pinus strobus*), speckled alder (*Alnus rugosa*), cherry (*Prunus serotina*), quaking aspen (*Populus tremuloides*), paper birch (*Betula papyrifera*), and gray birch (*Betula populifolia*). Scattered areas of raspberry (*Rubus* spp) understory were observed and heavy leaf litter was present throughout the site. Understory and canopy density decreased from the southern end of the site to the northern end. Several unpaved roadbeds cross the area and a series of concrete posts composing an abandoned traffic barrier was observed along one such area.

Widespread evidence of woodpecker activity was observed throughout the site and whitetail deer (*Odocoileus virginianus*) tracks were evident in various locations. The following wildlife species were observed on-site during the survey: Gray squirrel (*Sciurus carolinensis*), American crow (*Corvus brachyrhynchos)*, Tufted titmouse *(Baeolophus bicolor*), and Black-capped chickadee (*Poecile atricapillus)*. Tracks of raccoon (*Procyon lotor*) and other small mammals were noted on the site. The wildlife receptors in the Green Island terrestrial habitat were selected as receptors for the Norlite facility SLERA.

#### 8.2.2.5 Threatened/Endangered Species and Species of Special Concern

The potential presence of threatened or endangered species or species of special concern was evaluated for the Norlite Facility. Letters requesting a review of the site were sent to the New York State Department of Environmental Conservation (NYSDEC) Natural Heritage Program and U.S. Fish and Wildlife Service (USFWS). Correspondence with USFW indicates no Federally listed or proposed endangered or threatened species are known to be present in the study area. Correspondence with the NYSDEC Natural Heritage Program indicated Henslow's sparrow (*Ammodramus henslowii*) has been sited in Albany County, most recently in 1980. Copies of correspondence are contained in Appendix F.

### 8.2.3 Selection of Chemicals of Potential Ecological Concern (CPECs) and Media of Concern

This section presents a general overview of the selection process used to identify CPECs. CPECs represent the analytes that were considered in the SLERA. The CPECs selected were evaluated for potential risk for ecological receptors.

Consistent with the Protocol submitted in 1996, selection of CPECs was qualitatively based on information from plant emissions values, consideration of bioaccumulative compounds, as well as preliminary risk-based screening of chemicals for human health risk concerns. The latter list was inspected and total PAHs were added for ecological evaluation. The list of CPECs evaluated in the Norlite SLERA is presented in Table 8-1. The CPEC list includes 15 inorganic constituents, 8 semivolatiles, seven PAHs, total PAH, 12 volatiles, and dioxins. While this does not represent a comprehensive ecological risk-based screening, this qualitative selection process was considered appropriate for the purposes of preliminary evaluation of ecological risk. An ecological risk-based screening is warranted if further Tier 2 ecological risk assessment is needed.

### 8.2.4 Identification of Exposure Pathways

Potential ecological exposure pathways were identified through off-site evaluation of site geography, modeling of the kiln emissions, and determination of locations of potentially affected ecological resources. Potential exposure pathways for ecological receptors near the Norlite facility include:

- Exposure of water column aquatic receptors (fish, planktonic invertebrates) to CPECs in surface water due to deposition and runoff of kiln emissions to local waterbodies;
- Exposure of sediment-associated aquatic receptors (bottom-dwelling fish, benthic invertebrates) to CPECs due to deposition and runoff of kiln emissions to sediments in local waterbodies;
- Exposure of wetland invertebrates and plants to CPECs due to deposition and runoff of kiln emissions to hydric soils and overlying surface water in local wetlands;
- Exposure of semi-aquatic terrestrial wildlife receptors (great blue heron, osprey, mink) to CPECs through food items (fish) in the food chain;
- Exposure of wetland receptors (short-tailed shrew, muskrat, mink, raccoon, great blue heron) to CPECs through food items in the food chain; and
- Exposure of terrestrial upland receptors (deer mouse, American robin, raccoon, red-tailed hawk) to CPECs through food items in the food chain.

### 8.2.5 Conceptual Site Model and Endpoints

The endproduct of the problem formulation step is the development of a conceptual site model (CSM). The CSM for the Norlite Facility kilns was developed to summarize current knowledge of the site, known patterns of CPEC dynamics, and ecological resources potentially at risk. The CSM is a working hypothesis regarding how the CPECs might pose hazards to aquatic water column receptors at the Norlite site.

The primary sources of the CPECs are the emissions from the two Norlite rotary kilns. For the purposes of this SLERA, it was assumed that these emissions could enter surface waterbodies (i.e., Hudson River, Erie Canal, Wright/Bradley Lake) in four ways: direct deposition of particulate matter, surface water runoff from the immediate watershed, soil erosion/groundwater, and gaseous vapor phase fluxes. The SLERA uses the same fate and transport model used in the human health risk assessment to estimate the exposure point concentrations (EPCs) in these three waterbodies. For the wetland and terrestrial habitats, CPECs enter via deposition of particle matter and vapor fluxes.

As part of the CSM, ecologically based assessment and measurement endpoints relevant to the protection of natural resources at the Norlite site were developed. Assessment endpoints describe the characteristics of an ecosystem that have an intrinsic environmental value that is to be protected. Typically, assessment endpoints and receptors are selected for their potential exposure, ecological significance, economic importance, and/or societal relevance. Seven assessment endpoints were selected for this SLERA: (1) protection and maintenance of indigenous fish populations in local waterbodies; (2) protection and maintenance of sediment receptors in local waterbodies; (3) protection and maintenance of local piscivorous wildlife receptors; (4) protection and maintenance of wetland invertebrate and plant receptors; (5) protection and maintenance of terrestrial invertebrate and plant receptors; (6) protection and maintenance of local wetland wildlife receptors; and (7) protection and maintenance of local terrestrial upland wildlife receptors.

Because assessment endpoints often cannot be measured directly, sets of surrogate endpoints (measurement endpoints) are selected for ecological risk assessments that relate to the assessment endpoints and have measurable attributes. These measurement endpoints provide a metric for evaluating potential effects of CPEC on the ecosystem components at risk. The measurement endpoints selected to represent the assessment endpoint identified above were: (1) comparison of the surface water EPCs for each CPEC in the Hudson River, Erie Canal, and Wright/Bradley Lake to NYS water quality criteria for the protection of aquatic life; (2) comparison of the sediment EPCs for each CPEC in the Hudson River, Erie Canal, and Wright/Bradley Lake to NYS sediment quality criteria for the protection of aquatic life; (3) food chain modeling of piscivorous wildlife for ingestion of fish that may have bioaccumulated CPECs from surface water; (4) comparison of the surface water EPCs for each CPEC in the Green Island wetland to NYS surface quality criteria for the protection of aquatic life, and comparison of hydric soil CPEC to NYS sediment criteria and screening benchmarks for the protection of terrestrial invertebrate and plant communities; (5) comparison of the surface soil EPCs for each CPEC in the Green Island upland to screening benchmarks for the protection of terrestrial invertebrate and plant communities; (6) food chain modeling of wildlife for ingestion of wetland prey items that may have bioaccumulated CPECs from wetland surface water and hydric soil; and (7) food chain modeling of terrestrial wildlife for ingestion of prey items that may have bioaccumulated CPECs from surface soil. Where these values were not available from NYS, additional federal criteria and/or published ecotoxicological benchmarks from nationally recognized databases were used.

## 8.3 Risk Analysis

Risk Analysis quantifies the magnitude, frequency, type, and duration of exposures of ecological receptors to site contaminants. Information is collected to define chemical sources and chemical partitioning among water, sediment, and organisms; perform analysis and apply environmental fate and transport modeling; estimate the bioavailability of contaminants in the species' exposure media; and attempt to relate chemical concentration in the relevant environmental media to adverse ecological effects. Risk analysis in this SLERA includes Exposure Assessment and Ecological Effects Evaluation.

### 8.3.1 Exposure Assessment

Exposure assessment is the process of estimating or measuring the amount of a CPEC in environmental media (surface soil, surface water, sediment, hydric soil, and food items) to which an ecological receptor may be exposed via the evaluated exposure routes. For the Norlite SLERA, exposure assessment was based on the predicted surface water, sediment, and prey tissue concentrations in the Wright/Bradley Lake, Erie Canal and Hudson River, and predicted surface water, hydric soil, surface soil, and prey item tissue concentrations for Green Island.

For calculation of surface water, sediment, surface soil, terrestrial plants, and hydric soil concentrations of CPECs, emission data from the Norlite kilns were incorporated into a fate and transport model. This fate and transport model followed the recommendations and assumptions contained in Screening Level Ecological Risk Protocol for Hazardous Waste Combustion Facilities (U.S. EPA, 1999c) and Guidance for Performing Screening Level Risk Analyses at Combustion Facilities Burning Hazardous Waste (U.S. EPA, 1994c). This guidance was used in conjunction with the Industrial Source Term Complex Short-Term Model (ISCST3) (U.S. EPA, 1995a), an air dispersion and deposition model, to predict air concentrations and wet and dry deposition. Wetland hydric soils were differentiated from terrestrial soils by assuming a methyl mercury fraction of 15% rather than 2%, per U.S. EPA (1999c). (For further details on the workings of the fate and transport model refer to Sections 3.0 and 6.0 of this document).

From the ISCST3 model, EPCs for all abiotic media and terrestrial plants were established for evaluating the incremental risk posed to ecological receptors in the areas of concern from the Norlite Facility. These EPCs represent the media concentrations arising from deposition, based on five years of annual average air concentrations using annual deposition rates. The rates were considered representative of the potential emission deposition rates in the vicinity of the Norlite Facility near the areas of concern.

For the Norlite SLERA, exposure assessment was based on the predicted surface water and sediment concentrations in the Hudson River, Erie Canal, and Wright/Bradley Lake, surface soil and terrestrial vegetation in the representative forested terrestrial areas of Green Island, and wetland hydric soil and surface water from the palustrine wetland on Green Island. Surface water CPECs from the dissolved fraction were used to evaluate potential risks to aquatic receptors for inorganic constituents, and were used to estimate all (inorganic and organic) tissue concentrations. Surface water CPEC EPCs from the total recoverable fraction were used to evaluate potential risks to aquatic receptors for organic CPECs, and were used as the EPCs (metals and organic CPECs) for ingestion of water by wildlife. The media-specific EPCs for these areas are presented in Table 8-2.

The concentrations of CPECs in the food items (fish, small mammals, terrestrial and wetland invertebrates, and wetland plants) consumed by the avian and mammalian higher trophic level receptors were calculated using media- and receptor-specific bioconcentration factors (BCFs) and food chain multipliers following the general guidance of U.S. EPA (1999c). The calculation spreadsheet for wetland plant, aquatic invertebrate, fish, wetland and terrestrial invertebrate, herbivorous mammal, and omnivorous mammal tissue burdens are presented in Tables 8-3 through 8-8 and described below.

#### 8.3.1.1 Aquatic/Wetland Plant Tissue

Aquatic/wetland plant tissue was calculated at the Green Island wetland study area (Table 8-3). Estimates of plant tissue CPEC concentrations were made following the guidance of U.S. EPA (1999c). The general equation for calculating the concentration of CPECs in aquatic/wetland plant tissue is:

$$C_{AV} = C_{hs} \times BCF_{S\text{-}AV} \times 0.12$$

Where:

$C_{AV}$ = CPEC concentration in aquatic vegetation; expressed as $mg_{CPEC}/kg_{plant\ wet\ weight\ (ww)}$

$C_{hs}$ = CPEC concentration in hydric soil; estimated from Fate and Transport modeling; expressed as $mg_{CPEC}/kg_{soil\ dry\ weight\ (dw)}$

$BCF_{S\text{-}AV}$ = Bioconcentration factor for soil-to-aquatic vegetation; expressed as $[mg_{CPEC}/kg_{plant\ ww}]/[mg_{CPEC}/kg_{soil/soil\ dw}]$

0.12 = Dry weight to wet weight conversion factor (0.12 used per U.S. EPA, 1999c)

$BCF_{S\text{-}AV}$ values were obtained from U.S. EPA (1999c) and include measured and derived values.

#### 8.3.1.2 Wetland Invertebrate Tissue

Wetland invertebrate tissue was calculated at the Green Island wetland study area (Table 8-4). Estimates of wetland invertebrate tissue CPEC concentrations were made following the guidance of U.S. EPA (1999c). The general equation for calculating the concentration of CPECs in wetland invertebrates is:

$$C_{INV} = C_{HS} \times BCF_{S\text{-}INV}$$

Where:

$C_{INV}$ = CPEC concentration in terrestrial invertebrates; expressed as $mg_{CPEC}/kg_{tissue\ ww}$

$C_{HS}$ = CPEC concentration in hydric soil estimated from Fate and Transport modeling; expressed as $mg_{CPEC}/kg_{soil\ dw}$

$BCF_{S\text{-}INV}$= Bioconcentration factor for soil-to-invertebrate; expressed as $[mg_{CPEC}/kg_{tissue\ ww}]/[mg_{CPEC}/kg_{soil\ dw}]$

$BCF_{S\text{-}INV}$ values were obtained from U.S. EPA (1999c) and include measured and derived values.

#### 8.3.1.3 Fish Tissue

Fish tissue CPEC concentrations from two trophic levels were calculated at the Hudson River, Erie Canal, and Wright/Bradley Lake study areas (Table 8-5). Fish consumed by omnivorous receptors were assumed to be trophic level 3 (TL3) (omnivorous and insectivorous fish, such as yellow perch and catfish) and fish consumed by top-level carnivorous receptors were assumed to include both TL3 and TL4 (carnivorous, such as Northern pike and lake trout) fish. Estimates of fish tissue CPEC concentrations were made following the guidance of U.S. EPA (1999c). The general equation for calculating the concentration of CPECs in omnivorous fish tissue is:

$$C_{OF} = C_{dw} \times BCF_f \times FCM_{TL3}$$

Where:

$C_{OF}$ = CPEC concentration in omnivorous fish; expressed as $mg_{CPEC}/kg_{tissue\ ww}$

$C_{dw}$ = CPEC concentration in dissolved surface water; estimated from Fate and Transport modeling; expressed as $mg_{CPEC}/L_{water}$

$BCF_f$ = Bioconcentration factor for water-to-fish; expressed as $[mg_{CPEC}/kg_{tissue\ ww}]/[mg_{CPEC}/L_{water}]$

$FCM_{TL3}$ = Food chain multiplier for trophic level 3 predator; unitless

The general equation for calculating the concentration of CPECs in carnivorous fish tissue is:

$$C_{CF} = C_{dw} \times BCF_f \times FCM_{TL4}$$

Where:

$C_{CF}$ = CPEC concentration in carnivorous fish; expressed as $mg_{CPEC}/kg_{tissue\ ww}$

$C_{dw}$ = CPEC concentration in dissolved surface water; estimated from Fate and Transport modeling; expressed as $mg_{CPEC}/L_{water}$

$BCF_f$ = Bioconcentration factor for water-to-fish; expressed as $[mg_{CPEC}/kg_{tissue\ ww}]/[mg_{CPEC}/L_{water}]$

$FCM_{TL4}$ = Food chain multiplier for trophic level 4 predator; unitless

$BCF_f$ values were obtained from U.S. EPA (1999c) and include measured and derived values. FCM values were also obtained from U.S. EPA (1999c) and were based on U.S. EPA (1995c) *Great Lakes Water Quality Initiative Technical Support Document to Determine Bioaccumulation Factors.*

#### 8.3.1.4 Terrestrial Invertebrate Tissue

Terrestrial invertebrate tissue was calculated at the Green Island forested upland study area (Table 8-6). Estimates of invertebrate tissue CPEC concentrations were made following the guidance of U.S. EPA (1999c). The general equation for calculating the concentration of CPECs in terrestrial invertebrates is:

$$C_{INV} = C_s \times BCF_{S\text{-}INV}$$

Where:

$C_{INV}$ = CPEC concentration in terrestrial invertebrates; expressed as $mg_{CPEC}/kg_{tissue\ ww}$

$C_s$ = CPEC concentration in soil; estimated from Fate and Transport modeling; expressed as $mg_{CPEC}/kg_{soil\ dw}$

$BCF_{S\text{-}INV}$ = Bioconcentration factor for soil-to-invertebrate; expressed as $[mg_{CPEC}/kg_{tissue\ ww}]/[mg_{CPEC}/kg_{soil\ dw}]$

$BCF_{S\text{-}INV}$ values were obtained from U.S. EPA (1999c) and include measured and derived values.

### 8.3.1.5 Herbivorous Mammal Tissue

Herbivorous mammal tissue was calculated at the Green Island forested upland study area (Table 8-7). Estimates of herbivorous mammal tissue CPEC concentrations were made following the guidance of U.S. EPA (1999c). For the purposes of the Norlite SLERA, the deer mouse was assumed to be the herbivorous mammal functioning as prey to higher trophic level organisms. The general equation for calculating the concentration of CPECs in herbivorous mammal tissue is:

$$C_{HM} = \{C_{TP} \times BCF_{TP\text{-}HM} \times P_{TP} \times F_{TP}\} + \{C_S \times BCF_{S\text{-}HM} \times P_S\} + \{C_{wctot} \times BCF_{W\text{-}HM} \times P_W\}$$

Where:

| | | |
|---|---|---|
| $C_{HM}$ | = | CPEC concentration in herbivorous mammal; expressed as $mg_{CPEC}/kg_{tissue\ ww}$ |
| $C_{TP}$ | = | CPEC concentration in terrestrial plants; estimated from Fate and Transport Modeling; expressed as $mg_{CPEC}/kg_{plant\ ww}$ |
| $BCF_{TP\text{-}HM}$ | = | Bioconcentration factor for terrestrial plant-to-herbivorous mammal; expressed as $[mg_{CPEC}/kg_{tissue\ ww}]/[mg_{CPEC}/kg_{plant\ ww}]$ |
| $P_{TP}$ | = | Proportion of terrestrial plant in diet that is contaminated (assumed to be 1); unitless |
| $F_{TP}$ | = | Fraction of diet comprised of terrestrial plants; unitless |
| $C_S$ | = | CPEC concentration in soil; expressed as $mg_{CPEC}/kg_{soil\ dw}$ |
| $BCF_{S\text{-}HM}$ | = | Bioconcentration factor for soil-to-herbivorous mammal; expressed as $[mg_{CPEC}/kg_{tissue\ ww}]/[mg_{CPEC}/kg_{soil\ dw}]$ |
| $P_S$ | = | Proportion of soil in diet that is contaminated (assumed to be 1); unitless |
| $C_{wctot}$ | = | Total recoverable CPEC concentration in water; estimated from Fate and Transport modeling; expressed as $mg_{CPEC}/L_{water}$ |
| $BCF_{W\text{-}HM}$ | = | Bioconcentration factor for water-to-herbivorous mammal; expressed as $[mg_{CPEC}/kg_{tissue\ ww}]/[mg_{CPEC}/L_{water}]$ |
| PW | = | Proportion of water in diet that is contaminated (assumed to be 1); unitless |

$BCF_{TP\text{-}HM}$, $BCF_{S\text{-}HM}$, and $BCF_{W\text{-}HM}$ values were obtained from U.S. EPA (1999c) and include measured and derived values. FCM values were also obtained from U.S. EPA (1999c) and were based on U.S. EPA (1995c) *Great Lakes Water Quality Initiative Technical Support Document to Determine Bioaccumulation Factors.*

### 8.3.1.6 Omnivorous Mammal Tissue

Omnivorous mammal tissue was calculated at the Green Island forested upland study area (Table 8-8). Estimates of omnivorous mammal tissue CPEC concentrations were made following the guidance of U.S. EPA (1999c). For the purposes of the Norlite SLERA, the short-tailed shrew was assumed to be the omnivorous mammal functioning as prey to higher trophic level organisms. The general equation for calculating the concentration of CPECs in omnivorous mammal tissue is:

$$C_{OM} = \{C_{INV} \times (FCM_{TL3}/FCM_{TL2}) \times P_{INV} \times F_{INV}\} + \{C_{TP} \times BCF_{TP\text{-}OM} \times P_{TP} \times F_{TP}\} + \{C_{HM} \times (FCM_{TL3}/FCM_{TL2}) \times P_{HM} \times F_{HM}\} + \{C_{HB} \times (FCM_{TL3}/FCM_{TL2}) \times P_{HB} \times F_{HB}\} + \{C_S \times BCF_{S\text{-}OM} \times P_S\} + \{C_{wctot} \times BCF_{W\text{-}OM} \times P_W\}$$

Where:

| | | |
|---|---|---|
| $C_{OM}$ | = | CPEC concentration in omnivorous mammal; expressed as $mg_{CPEC}/kg_{tissue\ ww}$ |
| $C_{INV}$ | = | CPEC concentration in terrestrial invertebrates; expressed as $mg_{CPEC}/kg_{tissue\ ww}$ |
| $FCM_{TL3}$ | = | Food chain multiplier for trophic level 3 predator (omnivorous mammal such as short-tailed shrew); unitless |
| $FCM_{TL2}$ | = | Food chain multiplier for trophic level 2 predator (herbivorous mammal, such as deer mouse); unitless |
| $P_{INV}$ | = | Proportion of terrestrial invertebrate in diet that is contaminated (assumed to be 1); unitless |
| $F_{INV}$ | = | Fraction of diet comprised of terrestrial invertebrates; unitless |
| $C_{TP}$ | = | CPEC concentration in terrestrial plants; expressed as $mg_{CPEC}/kg_{tissue\ ww}$ |
| $BCF_{TP\text{-}OM}$ | = | Bioconcentration factor for terrestrial plant-to-omnivorous mammal; expressed as $[mg_{CPEC}/kg_{tissue\ ww}]/[mg_{CPEC}/kg_{plant\ ww}]$ |
| $P_{TP}$ | = | Proportion of terrestrial plant in diet that is contaminated (assumed to be 1); unitless |
| $F_{TP}$ | = | Fraction of diet comprised of terrestrial plants; unitless |
| $C_{HM}$ | = | CPEC concentration in herbivorous mammals; expressed as $mg_{CPEC}/kg_{tissue\ ww}$ |
| $P_{HM}$ | = | Proportion of herbivorous mammal in diet that is contaminated (assumed to be 1); unitless |
| $F_{HM}$ | = | Fraction of diet comprised of herbivorous mammals; unitless |
| $C_{HB}$ | = | CPEC concentration in herbivorous birds; expressed as $mg_{CPEC}/kg_{tissue\ ww}$ |
| $FCM_{TL3}$ | = | Food chain multiplier for trophic level 3 predator; unitless |
| $FCM_{TL2}$ | = | Food chain multiplier for trophic level 2 predator; unitless |
| $P_{HB}$ | = | Proportion of herbivorous birds in diet that is contaminated (assumed to be 1); unitless |
| $F_{HB}$ | = | Fraction of diet comprised of herbivorous birds (assumed to be zero); unitless |
| $C_S$ | = | CPEC concentration in soil; expressed as $mg_{CPEC}/kg_{soil\ dw}$ |
| $BCF_{S\text{-}OM}$ | = | Bioconcentration factor for soil-to-omnivorous mammal; expressed as |

[$mg_{CPEC}/kg_{tissue\ ww}$]/[$mg_{CPEC}/kg_{soil\ dw}$]

$P_S$ = Proportion of soil in diet that is contaminated (assumed to be 1); unitless

$C_{wctot}$ = Total recoverable CPEC concentration in water; expressed as $mg_{CPEC}/L_{water}$

$BCF_{W-OM}$ = Bioconcentration factor for water-to-omnivorous mammal; expressed as [$mg_{CPEC}/kg_{tissue\ ww}$]/[$mg_{CPEC}/L_{water}$]

PW = Proportion of water in diet that is contaminated (assumed to be 1); unitless

$BCF_{TP-OM}$, $BCF_{S-OM}$, and $BCF_{W-OM}$ values were obtained from U.S. EPA (1999c) and include measured and derived values. FCM values were also obtained from U.S. EPA (1999c) and were based on U.S. EPA (1995c) *Great Lakes Water Quality Initiative Technical Support Document to Determine Bioaccumulation Factors.*

### 8.3.2 Ecological Effects Evaluation

The potential adverse effects associated with wildlife receptor exposure to CPECs were considered through the use of literature derived ecotoxicological benchmarks. The CPECs represent a diverse group of metals, semi-volatile, and volatile organic compounds. Due to the screening nature of this assessment, no attempt was made to fully characterize the specific ecological effects caused by these CPEC. Potential ecological effects of the CPECs in both terrestrial and aquatic environments are detailed in the chemical-specific AWQC and other documents used and referred to in this analysis.

### 8.3.3 Evaluation of Direct Exposure Pathways

Evaluation of direct exposure pathways was conducted by comparison of EPCs to media-specific benchmark screening values that represent threshold concentrations associated with potential ecological risk. PAHs were evaluated receptors as total PAH (tPAH); high molecular weight PAHs (HMW PAHs) were also evaluated as individual compounds. This section describes the sources and decision-making criteria used in the selection of benchmark screening values used in the ecological risk assessment. Screening benchmark values for surface water, sediment, and hydric and surface soil are presented in Tables 8-9 through 8-11, respectively.

Screening benchmark toxicity values were available for surface water (Table 8-9) for CPECs from the New York water quality standards (NYSDEC, 1999), National Ambient Water Quality Criteria (AWQC) (U.S. EPA, 1999b), U.S. EPA freshwater TRVs (U.S. EPA, 1999c), and the ORNL screening value database (Suter and Tsao, 1996). The surface water benchmark values are protective of aquatic life including, but not limited to, aquatic invertebrate and fish species. The New York Water Quality Standards were used as a primary source for the selection of surface water screening values. These values are considered protective of aquatic life, including aquatic invertebrates and fish (NYSDEC, 1998). If state standards were not available for the CPECs, national AWQC values (U.S. EPA, 1999b) were used. In the absence of state and federal standards, U.S. EPA freshwater TRVs (U.S. EPA, 1999c) and GLWQI-derived secondary chronic values (Suter and Tsao, 1996) were used. Chronic level surface water screening values were available for all metals, 7 of 8 SVOCs, all PAHs, 6 of 12 VOCs, and 2,3,7,8-TCDD (Table 8-9).

Screening benchmark toxicity values were available for sediment (Table 8-10) for CPECs from the New York sediment quality standards (NYSDEC, 1999), freshwater sediment TRVs (U.S. EPA, 1999c), Low Effects Level (LEL) values developed by the Ontario Ministry of the Environment (OMOE) (Persaud et al., 1996), and the ORNL database (Jones et al., 1997). Screening values from the Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities (U.S. EPA, 1999c) and New York freshwater sediment benchmarks were used as a primary source for the selection of screening values. If screening values from the Combustion guidance or NYSDEC were not available for the CPEC, values were obtained form the Oak Ridge National Laboratory database (Jones et al, 1997). Values obtained from ORNL included values derived using Equilibrium Partitioning, Tier II Secondary Chronic Values and lowest effects level values. Where appropriate and to be consistent with U.S. EPA (1999c), a sediment total organic carbon (TOC) value of 4% was assumed. Sediment screening values were available for 12 of 15 metals, 7 of 8 SVOCs, all PAHs, 6 of 12 VOCs, and 2,3,7,8-TCDD (Table 8-10).

Screening benchmark toxicity values were available for soil (Table 8-11) for CPECs from U.S. EPA (1999c) and the ORNL database (plant and invertebrate screening values) (Efroymson et al., 1997a, b). Terrestrial invertebrate and plant TRVs from U.S. EPA (1999c) were used as the primary screening values. When these values were not available, toxicological benchmarks for screening CPECs in terrestrial plants (Efroymson, 1997a) and soil invertebrates (Efroymson, 1997b) were used as secondary sources for the selection of surface soil screening values. These values are considered protective of plants and soil invertebrates. Terrestrial plant screening values were available for 13 of 15 metals, two of 8 SVOCs, and all PAHs. Invertebrate screening values were available for nine of 15 metals, two of 8 SVOCs, all PAHs, and 2,3,7,8-TCDD (Table 8-11).

### 8.3.4 Evaluation of Bioaccumulation Pathways

A food web model was used to evaluate potential ecological risk via bioaccumulation pathways to representative mammalian and avian receptors that may feed in the Hudson River, Erie Canal, Wright/Bradley Lake, or Green Island forested upland terrestrial and wetland areas and potentially be exposed to CPECs found in the soil, surface water, hydric soil, or sediment. Since many CPEC may biomagnify through the food web, representative vertebrate wildlife species were selected for evaluation in each area. PAHs concentrations as individual HMW PAH and tPAH were evaluated for potential effects to wildlife receptors.

Herbivores are primary consumers. They consume primary producers (vegetation) and therefore ingest CPEC from one trophic level. For the purposes of this analysis, it was assumed that omnivores consume both primary producers and primary consumers. They ingest CPEC from two trophic levels.

Carnivores are top of the food chain and are potentially exposed to the highest level of bioaccumulation CPECs. For purposes of this food chain, the diets of the carnivores were assumed to include herbivores (TL2) and omnivores (TL3).

#### 8.3.4.1 Description of Model

Food web models are typically used to evaluate potential risk due to exposure including bioaccumulation. Exposure assumptions (e.g. body weights, food and water ingestion rates, relative consumption of food items, exposure duration, etc) for the representative species are provided in Table 8-12. These values were obtained primarily from the U.S. EPA Wildlife Exposure Factors Handbook (U.S. EPA, 1993d). Where applicable, the lowest published body weight and highest food and water ingestion rates for each receptor were selected.

The terrestrial wildlife receptors were assumed to be potentially exposed to CPECs in the surface soil by incidental ingestion and through the food chain via tissue ingestion. The aquatic and wetland wildlife receptors were assumed to be potentially exposed to CPECs in the surface water, hydric soil, and sediment and through the food chain via tissue ingestion. To estimate these exposures, a Total Daily Dose was estimated for the individual receptors. The total daily dose calculation considered the following factors: estimated concentration of CPECs in food items that the organism would consume, estimated amounts of ecological media that it would ingest, the relative amount of different food items in its diet, body weight, and exposure duration.

**Description of Representative Species**

The following vertebrate wildlife species were evaluated in the Norlite SLERA. For each area, representative mammalian and avian species were selected. The information presented below was obtained from the U.S. EPA Wildlife Exposure Factors Handbook (U.S. EPA, 1993d) and Degraaf and Yamasaki (2000).

<u>Terrestrial Herbivores</u>

- **Deer Mouse (*Peromyscus maniculatus*)**

This small primarily herbivorous mammal was selected as a representative species for evaluation of potential risks associated with surface soil exposure in the Green Island forested upland area. The deer mouse has the widest distribution of any *Peromyscus* species and a metabolic rate that is 1.3 times higher than other species in the genus. The high metabolic rate, and therefore high food ingestion rate relative to body size, make the deer mouse a good representative species that may receive high doses of CPECs. The deer mouse commonly nests in tree hollows, and is known to use tree roots, rotting stumps, and under rocks and logs. The deer mouse may ingest large amounts of surface soil as it will burrow into soil to assist in thermoregulation. The deer mouse was selected as a measurement endpoint species, and as a prey source for omnivorous and carnivorous predators.

Wetland Herbivores

- **Muskrat (*Ondatra zibethicus*)**

This representative herbivorous mammal is common in most of the United States. Its wetland habitat requirements and feeding habits exposes it to surface water and hydric soil in various ways. The muskrat's habitat includes marshes and shallow portions of lakes, ponds, swamps, sluggish streams, and drainage ditches. The muskrat digs dens in banks and the gathering of building materials introduces the potential for incidental ingestion of hydric soil. Additional exposure to CPECs includes ingestion of aquatic plants such as cattails, reeds, pondweeds, bulrushes, and water lilies that may have bioaccumulated CPECs from hydric soils or surface water. The muskrat was selected for evaluation in the Green Island wetlands.

Terrestrial Omnivores

- **American Robin (*Turdus migratorius*)**

The robin was selected as a representative omnivorous avian wildlife species for the evaluation of potential risks associated with exposures to surface soil. The medium-sized bird occurs throughout most of the U.S. and was selected to represent avian species that would receive a relatively high dose of CPECs because of their relatively small body size. Exposure occurs due to preference for insects and fruits, habit of ground gleaning for worms, and incidental ingestion of associated soils. The American robin was selected for evaluation of CPEC intake in the Green Island forested upland.

Wetland/Terrestrial Omnivores

- **Short-tailed Shrew (*Blarina brevicauda*)**

This small omnivorous species was selected as a representative species for evaluation of potential risks associated with terrestrial soil and wetland hydric soil exposure and bioaccumulation of constituents into invertebrate prey items. The shrew was selected to represent mammalian species that would be maximally exposed (receive high doses as a result of their small body size and high metabolism). The diet of the shrew consists primarily earthworms and other invertebrates, but also includes some vegetative matter. Because of the nature of their foraging habits and underground living behavior, the shrew has the potential to intake a relatively large amount of soil. Shrews are known to concentrate bioaccumulative chemicals and thereby serve as biomagnifiers to higher trophic organisms that prey on them (e.g. red fox, mink, red-tailed hawk). The shrew was selected for evaluation of CPEC intake in the Green Island terrestrial and wetland areas.

- **Raccoon (*Procyon lotor*)**

The raccoon was selected as the representative omnivorous mammalian species for evaluation of potential risks associated with terrestrial soil and wetland hydric soil exposure and bioaccumulation of constituents into a large array of prey items. The raccoon is the most abundant and widespread medium-sized omnivore in North America. Raccoons are found in nearly every aquatic habitat, particularly in swamps, mangroves, floodplain forests and marshes. They are also common in suburban residential areas. The raccoon is an omnivorous and opportunistic feeder and is primarily active from sunset to sunrise. They feed primarily on fruits, nuts, acorns and corn but also eat grains, insects, frogs, rodents, crayfish, eggs, and vegetable matter. The raccoon was selected for evaluation of CPEC intake in the Green Island terrestrial and wetland areas.

Terrestrial Carnivores

- **Red-tailed Hawk (*Buteo jamaicensis*)**

Red-tailed hawks are moderately large soaring hawks that inhabit open or semi-open areas with many habitat types, preferably with a mosaic pattern of old fields, wetlands, woodlands, and pastures. They are common throughout most of the United States. The hawk was chosen as a representative species for evaluating the exposure of CPECs in surface soil and prey items to carnivorous birds. It is one of the most common daytime avian predators, feeding on ground-dwelling vertebrates, particularly rodents and other small mammals. Red-tailed hawks were selected for evaluation of CPEC exposure in the Green Island terrestrial areas.

Aquatic/Wetland Carnivores

- **Osprey (*Pandion haliaetus*)**

The osprey has long, narrow wings, a sharp hooked bill and powerful talons. They are found near freshwater and saltwater and their diet is almost completely restricted to fish. To feed, they hover over the water and dive feet-first, seizing the fish with their talons. The primary resources for osprey include large open shallow water and plentiful supply of fish. Preferred nesting sites include tops of isolated, dead trees and man-made structures. Their prey preference changes seasonally with the abundance of the local fish. They are most successful at catching slow-moving fish that eat benthic organisms in shallow waters and fish that remain near the water's surface. The osprey was selected for evaluation of CPEC exposure in the Hudson River, Erie Canal, and Wright/Bradley Lake.

- **Great Blue Heron (*Ardea herodias*)**

The great blue are found primarily in palustrine wetlands and shallow inlets. The great blue heron feeds primarily on aquatic animals, preferring fish, but also consuming amphibians, reptiles, crustaceans, insects, birds and mammals (USEPA, 1993d). The heron prefers a shallow water habitat, where fish and other prey may come in close to shore. Heron forage by standing still and waiting for fish to swim within striking distance, or by slowly wading to catch more sedentary prey. These foraging techniques tend to increase the amount of sediment incidentally ingested by the heron. Heron are migratory birds in the northern portions of their range, which extend over most of North America. The great blue heron was selected for evaluation of CPEC exposure in the Hudson River, Erie Canal, Wright/Bradley Lake, and Green Island wetland areas.

- **Mink (*Mustela vison*)**

The mink is the most abundant and widespread carnivorous mammal in North America. It is sensitive to PCBs and similar chemicals, and it serves as a bioindicator of mercury pollution in aquatic habitats. It was selected to evaluate the exposure of CPECs in surface water and sediment due to its association with aquatic habitats and its opportunistic feeding habits which include fish, amphibians, crustaceans, shorebirds, insects, small mammals (e.g. shrews), and other prey items that may bioaccumulate CPECs from sediments. The mink uses hollow logs, natural cavities under tree roots, beaver lodges, and muskrat bank burrows for nesting sites. The mink has been studied extensively at other sites located along the Hudson River, and was selected for evaluation of CPEC exposure in fish tissue from the Hudson River, Erie Canal, and Wright/Bradley Lake.

#### 8.3.4.2 Selection of Wildlife Toxicity Reference Values (TRVs)

Toxicity Reference Values (TRVs) were determined for site CPECs for the representative wildlife species to allow calculation of a potential ecological risk. TRVs relate the dose of a chemical from oral exposure with an adverse effect. Eco-toxicological literature values were obtained from Sample et al. (1996), the protocol for hazardous waste combustion facility SLERAs (U.S. EPA, 1999c), and supplemental sources. The literature values were body-weight normalized using body weight scaling factors recommended for use by the ORNL (Sample et al., 1996). The derivation of TRVs for the wildlife species is presented in Table 8-13. Mammalian TRVs were available for all metals, 7 of 8 SVOCs, all PAHs, six of 12 VOCs, and 2,3,7,8-TCDD. Avian TRVs were available for 13 of 15 metals, 4 of 8 SVOCs, all PAHs, two VOCs, and 2,3,7,8-TCDD.

#### 8.3.4.3 Toxicity Equivalency Factors (TEFs)

Toxicity Equivalency Factors were developed by the World Health Organization (WHO) for the congeners of PCDDs and PCDFs based on their structural similarity and toxicity. A TEF value was assigned to each congener relative to its toxicity in relation to 2,3,7,8-TCDD (U.S. EPA, 1999c; Van den Berg et al., 1998). Toxicity Equivalency Factors (TEFs) were used to calculate toxic equivalent concentrations (2,3,7,8-TCDD TEs) in surface soil, terrestrial vegetation, surface water, hydric soil, and sediment. Multiplying the concentration of each individual congener by its corresponding TEF and summing the congeners obtained the 2,3,7,8-TCDD TE. TEFs for birds, mammals, and fish were calculated for all media, including prey items. The TEFs used in the Norlite SLERA are presented in Table 8-14.

## 8.4 Risk Characterization

This section describes how potential ecological risks from CPEC exposures were characterized for ecological receptors within the study area. Risk characterization provides a quantitative evaluation of the potential for adverse ecological impacts due to compounds of potential concern in an area of concern.

The potential for ecological risks to occur in the study area for the representative receptors was assessed using the hazard quotient (HQ) approach (U.S. EPA, 1988). A HQ was calculated by dividing the exposure point concentration (EPC) of a chemical by a chemical-specific toxicity benchmark concentration. The equation used to derive the HQ is show below:

*Hazard Quotient (unitless) =*
*Exposure Point Concentration /Toxicity Benchmark Concentration*

When the HQ was less than 1 (i.e., the exposure point concentration was less than the benchmark toxicity value), the CPEC exposure was assumed to fall below the range considered to be associated with adverse effects for growth, reproduction, or survival of individual receptors, and no population level risks were assumed to be present. For HQ values greater than 1, further evaluation of potential risk and uncertainties associated with the risk analysis may be warranted.

### 8.4.1 Calculation of Potential Ecological Risk to Community Receptors

The CPEC concentrations modeled in the areas of concern were compared to screening benchmark toxicity values to estimate ecological risk. The HQ approach was used to estimate potential risk. To evaluate potential impacts to community receptors, the EPC was the modeled concentration of each CPEC in surface water, hydric soil, sediment, or surface soil. The toxicity benchmark concentration may be a specific surface water or sediment guidance value, or a species-specific value derived from the literature. These toxicity benchmarks are intended to provide estimate of levels of CPECs that will not cause undue risk to the community (e.g., surface water community, terrestrial plant community) evaluated.

#### 8.4.1.1 Risk Characterization of Hudson River

Surface Water

The potential ecological risks associated with the surface water concentrations of CPECs in the Hudson River were evaluated. To evaluate potential risk to aquatic receptors, the surface water EPCs of the various CPECs were compared to the respective screening benchmark values. The results of these comparisons are shown in Table 8-15.

Comparison of the surface water CPECs to screening values indicates that none of the CPECs exceeded their respective benchmark values for the Hudson River (HQ < 1) (Table 8-15). The HQs ranged from 1.30E-10 (vinyl chloride) to 2.99E-05 (2,3,7,8-TCDD TE). All of the individual HQs were well below a value of 1.

Sediment

The potential ecological risks associated with the sediment concentrations of CPECs in the Hudson River were evaluated. To evaluate potential risk to benthic receptors, the sediment EPCs of the CPECs were compared to respective sediment screening benchmark values. The results of these comparisons are shown in Table 8-16.

Comparison of the sediment EPCs to screening values indicates that none of the CPECs exceeded their respective benchmark values (HQ < 1) (Table 8-16). The HQs ranged from 1.05E-10 (1,1,2,2-tetrachloroethane) to 1.77E-04 (inorganic mercury). All of the individual HQs were well below a value of 1.

#### 8.4.1.2 Risk Characterization of the Erie Canal

Surface Water

The potential ecological risks associated with the surface water concentrations of CPECs in the Erie Canal were evaluated. To evaluate potential risk to aquatic receptors, the surface water EPCs of the various CPECs were compared to the respective screening benchmark values. The results of these comparisons are shown in Table 8-17.

Comparison of the surface water CPECs to screening values indicates that none of the CPECs exceeded their respective benchmark values for the Erie Canal (HQ < 1). The HQs ranged from 5.48E-10 (vinyl chloride) to 6.70E-04 (2,3,7,8-TCDD TE). All of the individual HQs were well below a value of 1.

Sediment

The potential ecological risks associated with the sediment concentrations of CPECs in the Erie Canal were evaluated. To evaluate potential risk to benthic receptors, the sediment EPCs of the CPECs were compared to respective sediment screening benchmark values. The results of these comparisons are shown in Table 8-18.

Comparison of the sediment EPCs to screening values indicates that none of the CPECs exceeded their respective benchmark values (HQ < 1) (Table 8-18). The HQs ranged from 5.48E-10 (vinyl chloride) to 2.93E-03 (inorganic mercury). All of the individual HQs were well below a value of 1.

#### 8.4.1.3 Risk Characterization of Wright/Bradley Lake

Surface Water

The potential ecological risks associated with the surface water concentrations of CPECs in Wright/Bradley Lake were evaluated. To evaluate potential risk to aquatic receptors, the surface water EPCs of the various CPECs were compared to the respective screening benchmark values. The results of these comparisons are shown in Table 8-19.

Comparison of the surface water CPECs to screening values indicates that none of the CPECs exceeded their respective benchmark values for the Erie Canal (HQ < 1). The HQs ranged from 1.18E-09 (vinyl chloride) to 1.15E-03 (methyl mercury). All of the individual HQs were well below a value of 1.

Sediment

The potential ecological risks associated with the sediment concentrations of CPECs in Wright/Bradley Lake were evaluated. To evaluate potential risk to benthic receptors, the sediment EPCs of the CPECs were compared to respective sediment screening benchmark values. The results of these comparisons are shown in Table 8-20.

Comparison of the sediment EPCs to screening values indicates that none of the CPECs exceeded their respective benchmark values (HQ < 1) (Table 8-20). The HQs ranged from 1.18E-09 (vinyl chloride) to 5.28E-03 (inorganic mercury). All of the individual HQs were well below a value of 1.

#### 8.4.1.4 Risk Characterization of Green Island

Wetland Surface Water

The potential ecological risks associated with the surface water concentrations of CPECs in the Green Island wetland were evaluated. To evaluate potential risk to wetland receptors, the surface water EPCs of the various CPECs were compared to the respective screening benchmark values. The results of these comparisons are shown in Table 8-21.

Comparison of the surface water CPECs to screening values indicates that none of the CPECs exceeded their respective benchmark values for the wetland (HQ < 1). The HQs ranged from 5.59E-09 (chromium) to 1.89E-02 (methyl mercury). All of the individual HQs were well below a value of 1.

Wetland Hydric soil

The potential ecological risks associated with the hydric soil concentrations of CPECs in the Green Island wetland were evaluated. To evaluate potential risk to wetland invertebrate receptors, the hydric soil EPCs of the CPECs were compared to respective sediment screening benchmark values for benthic invertebrates, and were compared to respective screening benchmarks for terrestrial plants and invertebrates. The results of these comparisons are shown in Table 8-22.

Comparison of the wetland hydric soil EPCs to sediment screening values indicates that none of the CPECs exceeded their respective benchmark values (HQ < 1) (Table 8-22). The HQs ranged from 2.19E-12 (hexachlorobenzene) to 1.08E-02 (inorganic mercury). All of the individual HQs were well below a value of 1.

Comparison of the hydric soil CPECs to terrestrial plant screening values indicates that none of the CPECs exceeded their respective benchmark values for the Green Island wetland area (HQ < 1). The HQs ranged from 2.55E-11 (pentachlorophenol) to 4.62E-03 (inorganic mercury). All of the individual HQs were well below a value of 1.

Comparison of the hydric soil CPECs to terrestrial invertebrate screening values indicates that none of the CPECs exceeded their respective benchmark values for the Green Island wetland area (HQ < 1). The HQs ranged from 4.42E-12 (pentachlorophenol) to 6.46E-04 (inorganic mercury). All of the individual HQs were well below a value of 1.

Surface Soil

The potential ecological risks associated with the surface soil concentrations of CPECs in the Green Island terrestrial upland were evaluated. To evaluate potential risk to terrestrial receptors, the surface soil EPCs of the various CPECs were compared to the respective screening benchmark values for plants and invertebrates. The results of these comparisons are shown in Table 8-23.

Comparison of the surface soil CPECs to terrestrial plant screening values indicates that none of the CPECs exceeded their respective benchmark values for the Green Island terrestrial upland area (HQ < 1). The HQs ranged from 7.70E-08 (dibenz(a,h)anthracene) to 1.37E-03 (inorganic mercury). All of the individual HQs were well below a value of 1.

Comparison of the surface soil CPECs to terrestrial invertebrate screening values indicates that none of the CPECs exceeded their respective benchmark values for the Green Island terrestrial upland area (HQ < 1). The HQs ranged from 4.92E-09 (Indeno (1,2,3-cd) pyrene) to 1.91E-04 (inorganic mercury). All of the individual HQs were well below a value of 1.

### 8.4.2 Calculation of Potential Ecological Risk to Individual Wildlife Receptors

The CPEC concentrations modeled in the areas of concern were used to model tissue burden concentrations for a variety of prey items, including terrestrial and wetland plants and invertebrates, two trophic levels of fish, and two trophic levels of small mammal. The HQ approach was used to estimate potential risk. To evaluate potential impacts to wildlife receptors, the EPC was the modeled estimated daily dose of each CPEC. The toxicity benchmarks used to evaluate potential risks are based on dose concentrations causing no adverse sub-lethal effect to the species exposed. These toxicity benchmarks are intended to provide estimate of levels of CPECs that will not cause undue risk to the population of species (e.g., mink, herons) evaluated. A summary of diets by receptor is presented in Table 8-24.

#### 8.4.2.1 Risk Characterization of Hudson River Vertebrate Wildlife

The potential for adverse effects to vertebrate receptors was also estimated using screening level food web models. The exposure point concentrations were derived from CPEC fate and transport modeling and bioconcentration factors. The EPCs used in the food web models for the SLERA are presented in Table 8-2. Species-specific HQs were calculated by dividing the estimated daily dose (the TDD) of individual CPECs (normalized to body weight) by toxicity reference values determined from the literature. The results of the Hudson River food web models are presented in Table 8-25. Details of these calculations are given in Appendix E-2.

<u>Osprey</u>

The osprey was selected as a representative species for evaluating potential risks posed to trophic level 4 avian piscivores from sediment and surface water exposure in the Hudson River. For the purpose of this risk assessment, exposure was assumed to include the following complete exposure pathways:

- Ingestion of fish containing CPECs bioaccumulated from surface water in the Hudson River;
- Incidental ingestion of sediment from the Hudson River; and
- Ingestion of surface water from the Hudson River.

The results of the osprey food web model are presented in Table 8-25. The potential daily doses of all CPECs were less than the respective toxicity reference values for the osprey (HQ < 1). Resulting HQs were less than one and ranged from 6.17E-12 (1,1-dichloroethylene) to 3.05E-04 (methyl mercury).

<u>Great Blue Heron</u>

The great blue heron was selected as a representative species for evaluating potential risks posed to trophic level 4 avian species from sediment and surface water exposure in the Hudson River. For the purpose of this risk assessment, exposure was assumed to include the following complete exposure pathways:

- Ingestion of fish containing CPECs bioaccumulated from surface water in the Hudson River;

- Incidental ingestion of sediment from the Hudson River; and
- Ingestion of surface water from the Hudson River.

The results of the great blue heron food web model are presented in Table 8-25. The potential daily doses of all CPECs were less than the respective toxicity reference values for the heron (HQ < 1). Resulting HQs were less than one and ranged from 5.40E-12 (1,1-dichloroethylene) to 1.92E-04 (methyl mercury).

Mink

The mink was selected as a representative species for evaluating potential risks posed to trophic level 4 mammalian piscivores from sediment and surface water exposure in the Hudson River. For the purpose of this risk assessment, exposure was assumed to include the following complete exposure pathways:

- Ingestion of fish containing CPECs bioaccumulated from surface water in the Hudson River;
- Incidental ingestion of sediment from the Hudson River; and
- Ingestion of surface water from the Hudson River.

The results of the mink food web model are presented in Table 8-25. The potential daily doses of all CPECs were less than the respective toxicity reference values for the mink (HQ < 1). Resulting HQs were less than one and ranged from 6.48E-12 (1,1-dichloroethylene) to 7.63E-04 (2,3,7,8-TCDD).

#### 8.4.2.2 Risk Characterization of Erie Canal Vertebrate Wildlife

The potential for adverse effects to vertebrate receptors was also estimated using screening level food web models. The exposure point concentrations were derived from CPEC fate and transport modeling and bioconcentration factors. The EPCs used in the food web models for the SLERA are presented in Table 8-2. Species-specific HQs were calculated by dividing the estimated daily dose (the TDD) of individual CPECs (normalized to body weight) by toxicity reference values determined from the literature. The results of the Erie Canal food web models are presented in Table 8-26. Details of these calculations are given in Appendix E-3.

Osprey

The osprey was selected as a representative species for evaluating potential risks posed to trophic level 4 avian piscivores from sediment and surface water exposure in the Erie Canal. For the purpose of this risk assessment, exposure was assumed to include the following complete exposure pathways:

- Ingestion of fish containing CPECs bioaccumulated from surface water in the Erie Canal;
- Incidental ingestion of sediment from the Erie Canal; and
- Ingestion of surface water from the Erie Canal.

The results of the osprey food web model are presented in Table 8-26. The potential daily doses of all CPECs were less than the respective toxicity reference values for the osprey (HQ < 1). Resulting HQs were less than one and ranged from 2.24E-12 (1,1-dichloroethylene) to 4.87E-05 (benzo(b)fluoranthene).

Great Blue Heron

The great blue heron was selected as a representative species for evaluating potential risks posed to trophic level 4 avian species from sediment and surface water exposure in the Erie Canal. For the purpose of this risk assessment, exposure was assumed to include the following complete exposure pathways:

- Ingestion of fish containing CPECs bioaccumulated from surface water in the Erie Canal;
- Incidental ingestion of sediment from the Erie Canal; and
- Ingestion of surface water from the Erie Canal.

The results of the great blue heron food web model are presented in Table 8-26. The potential daily doses of all CPECs were less than the respective toxicity reference values for the heron (HQ < 1). Resulting HQs were less than one and ranged from 2.41E-12 (1,1-dichloroethylene) to 4.37E-04 (benzo(b)fluoranthene).

Mink

The mink was selected as a representative species for evaluating potential risks posed to trophic level 4 mammalian piscivores from sediment and surface water exposure in the Erie Canal. For the purpose of this risk assessment, exposure was assumed to include the following complete exposure pathways:

- Ingestion of fish containing CPECs bioaccumulated from surface water in the Erie Canal;
- Incidental ingestion of sediment from the Erie Canal; and
- Ingestion of surface water from the Erie Canal.

The results of the mink food web model are presented in Table 8-26. The potential daily doses of all CPECs were less than the respective toxicity reference values for the mink (HQ < 1). Resulting HQs were less than one and ranged from 3.54E-12 (1,1-dichloroethylene) to 1.53E-04 (2,3,7,8-TCDD).

#### 8.4.2.3 Risk Characterization of Wright/Bradley Lake Vertebrate Wildlife

The potential for adverse effects to vertebrate receptors was also estimated using screening level food web models. The exposure point concentrations were derived from CPEC fate and transport modeling and bioconcentration factors. The EPCs used in the food web models for the SLERA are presented in Table 8-2. Species-specific HQs were calculated by dividing the estimated daily dose (the TDD) of individual CPECs (normalized to body weight) by toxicity reference values determined from the literature. The results of Wright/Bradley Lake food web models are presented in Table 8-27. Details of these calculations are given in Appendix E-4.

Osprey

The osprey was selected as a representative species for evaluating potential risks posed to trophic level 4 avian piscivores from sediment and surface water exposure in Wright/Bradley Lake. For the purpose of this risk assessment, exposure was assumed to include the following complete exposure pathways:

- Ingestion of fish containing CPECs bioaccumulated from surface water in Wright/Bradley Lake;
- Incidental ingestion of sediment from Wright/Bradley Lake; and
- Ingestion of surface water from Wright/Bradley Lake.

The results of the osprey food web model are presented in Table 8-27. The potential daily doses of all CPECs were less than the respective toxicity reference values for the osprey (HQ < 1). Resulting HQs were less than one and ranged from 5.86E-11 (1,1-dichloroethylene) to 3.83E-02 (methyl mercury).

Great Blue Heron

The great blue heron was selected as a representative species for evaluating potential risks posed to trophic level 4 avian species from sediment and surface water exposure in Wright/Bradley Lake. For the purpose of this risk assessment, exposure was assumed to include the following complete exposure pathways:

- Ingestion of fish containing CPECs bioaccumulated from surface water in Wright/Bradley Lake;
- Incidental ingestion of sediment from Wright/Bradley Lake; and
- Ingestion of surface water from Wright/Bradley Lake.

The results of the great blue heron food web model are presented in Table 8-27. The potential daily doses of all CPECs were less than the respective toxicity reference values for the heron (HQ < 1).

Resulting HQs were less than one and ranged from 5.13E-11 (1,1-dichloroethylene) to 2.41E-02 (methyl mercury).

Mink

The mink was selected as a representative species for evaluating potential risks posed to trophic level 4 mammalian piscivores from sediment and surface water exposure in Wright/Bradley Lake. For the purpose of this risk assessment, exposure was assumed to include the following complete exposure pathways:

- Ingestion of fish containing CPECs bioaccumulated from surface water in Wright/Bradley Lake;
- Incidental ingestion of sediment from Wright/Bradley Lake; and
- Ingestion of surface water from Wright/Bradley Lake.

The results of the mink food web model are presented in Table 8-27. The potential daily doses of all CPECs were less than the respective toxicity reference values for the mink (HQ < 1). Resulting HQs were less than one and ranged from 6.15E-11 (1,1-dichloroethylene) to 2.05E-02 (2,3,7,8-TCDD).

#### 8.4.2.4 Risk Characterization of Green Island Vertebrate Wildlife

The potential for adverse effects to vertebrate receptors was also estimated using screening level food web models. The exposure point concentrations were derived from CPEC fate and transport modeling and bioconcentration factors. The EPCs used in the food web models for the SLERA are presented in Table 8-2. Species-specific HQs were calculated by dividing the estimated daily dose (the TDD) of individual CPECs (normalized to body weight) by toxicity reference values determined from the literature. The results of Green Island food web models are presented in Table 8-28. Details of these calculations are given in Appendix E-5.

Deer Mouse

The deer mouse was selected as a representative species for evaluating potential risks posed to trophic level 2 mammalian species from surface soil and surface water exposure in the Green Island terrestrial upland. For the purpose of this risk assessment, mouse exposure was assumed to include the following complete exposure pathways:

- Ingestion of terrestrial vegetation containing CPECs bioaccumulated from surface soil in the Green Island upland;
- Incidental ingestion of surface soil from the Green Island upland; and
- Ingestion of surface water from the Green Island wetland.

The results of the deer mouse food web model are presented in Table 8-28. The potential daily doses of all CPECs were less than the respective toxicity reference values for the mouse (HQ < 1). Resulting HQs were less than one and ranged from 1.76E-11 (chromium) to 4.59E-05 (2,3,7,8-TCDD).

American Robin

The American robin was selected as a representative species for evaluating potential risks posed to trophic level 3 avian species from surface soil exposure in the Green Island forested upland. For the purpose of this risk assessment, exposure was assumed to include the following complete exposure pathways:

- Ingestion of terrestrial vegetation containing CPECs bioaccumulated from surface soil and aerial deposition in the Green Island forested upland;
- Ingestion of terrestrial invertebrate containing CPECs bioaccumulated from surface soil in the Green Island forested upland;
- Ingestion of surface water from Green Island; and
- Incidental ingestion of surface soil from the Green Island forested upland.

The results of the American robin food web model are presented in Table 8-28. The potential daily doses of all CPECs were less than the respective toxicity reference values for the robin (HQ < 1). Resulting HQs were less than one and ranged from 1.99E-10 (1,1-dichloroethylene) to 5.50E-01 (bis(2-ethylhexyl)phthalate).

Red-tailed Hawk

The red-tailed hawk was selected as a representative species for evaluating potential risks posed to trophic level 4 avian species from surface soil exposure in the Green Island terrestrial upland. For the purpose of this risk assessment, exposure was assumed to include the following complete exposure pathways:

- Ingestion of herbivorous (TL2) and omnivorous (TL3) small mammals containing CPECs from surface soil and food chain uptake;
- Ingestion of surface water from the Green Island wetland; and
- Incidental ingestion of surface soil from the Green Island terrestrial upland.

The results of the red-tailed hawk food web model are presented in Table 8-28. The potential daily doses of all CPECs were less than the respective toxicity reference values for the hawk (HQ < 1). Resulting HQs were less than one and ranged from 1.39E-10 (1,1-dichloroethylene) to 4.16E-04 (benzo(b)fluoranthene).

Muskrat

The muskrat was selected as a representative species for evaluating potential risks posed to trophic level 2 mammalian species from hydric soil and surface water exposure in the Green Island wetland. For the purpose of this risk assessment, muskrat exposure was assumed to include the following complete exposure pathways:

- Ingestion of wetland and aquatic vegetation containing CPECs bioaccumulated from hydric soil in the Green Island wetland;
- Incidental ingestion of hydric soil from the Green Island wetland; and
- Ingestion of surface water from the Green Island wetland.

The results of the muskrat food web model are presented in Table 8-28. The potential daily doses of all CPECs were less than the respective toxicity reference values for the muskrat (HQ < 1). Resulting HQs were less than one and ranged from 3.07E-11 (chromium) to 3.35E-05 (2,3,7,8-TCDD).

Short-tailed Shrew

The short-tailed shrew was selected as a representative species for evaluating potential risks posed to trophic level 3 mammalian species from surface soil exposure in Green Island exposure area. For the purpose of this risk assessment, exposure was assumed to include the following complete exposure pathways:

- Ingestion of terrestrial vegetation containing CPECs bioaccumulated from surface soil and aerial deposition in the Green Island upland;
- Ingestion of terrestrial invertebrates containing CPECs bioaccumulated from surface soil in the Green Island upland area;
- Ingestion of wetland invertebrates containing CPECs bioaccumulated from hydric soil the Green Island wetland;
- Incidental ingestion of surface soil from the Green Island upland area;
- Incidental ingestion of hydric soil from the Green Island wetland area; and
- Ingestion of surface water from the Green Island wetland.

The results of the short-tailed shrew food web model are presented in Table 8-28. The potential daily doses of all CPECs were less than the respective toxicity reference values for the shrew (HQ < 1). Resulting HQs were less than one and ranged from 1.78E-10 (carbon tetrachloride) to 1.19E-02 (2,3,7,8-TCDD).

Raccoon

The raccoon was selected as a representative species for evaluating potential risks posed to trophic level 3 mammalian species from hydric soil and surface water exposure in the Green Island exposure area. For the purpose of this risk assessment, exposure was assumed to include the following complete exposure pathways:

- Ingestion of terrestrial vegetation containing CPECs bioaccumulated from surface soil and aerial deposition in the Green Island upland;
- Ingestion of terrestrial invertebrates containing CPECs bioaccumulated from surface soil in the Green Island upland area;
- Ingestion of herbivorous (TL2) and omnivorous (TL3) small mammals containing CPECs from surface soil and food chain uptake in the Green Island upland;
- Ingestion of wetland invertebrates containing CPECs bioaccumulated from hydric soil the Green Island wetland;
- Incidental ingestion of soils from the Green Island terrestrial upland;
- Incidental ingestion of hydric soil from the Green Island wetland; and
- Ingestion of surface water from the Green Island wetland.

The results of the raccoon food web model are presented in Table 8-28. The potential daily doses of all CPECs were less than the respective toxicity reference values for the raccoon (HQ < 1). Resulting HQs were less than one and ranged from 2.09E-10 (carbon tetrachloride) to 1.55E-02 (2,3,7,8-TCDD).

Great Blue Heron

The great blue heron was selected as a representative species for evaluating potential risks posed to trophic level 4 avian species from hydric soil and surface water exposure in the Green Island wetland. For the purpose of this risk assessment, exposure was assumed to include the following complete exposure pathways:

- Ingestion of aquatic invertebrates containing CPECs bioaccumulated from hydric soil in the Green Island wetland;
- Incidental ingestion of hydric soil from the Green Island wetland; and
- Ingestion of surface water from the Green Island wetland.

The results of the great blue heron food web model are presented in Table 8-28. The potential daily doses of all CPECs were less than the respective toxicity reference values for the heron (HQ < 1). Resulting HQs were less than one and ranged from 3.35E-10 (1,1-dichloroethylene) to 5.95E-02 (methyl mercury).

## 8.5 Summary and Conclusions

This section summarizes and evaluates the results of the Norlite Facility risk characterization and provides an interpretation of the magnitude of potential ecological risk and its significance. Risk assessment provides a context for information that may be used in risk management and decision-making evaluation of the results in contained in Section 8.5.1. The factors leading to uncertainty in the results are discussed in Section 8.5.2. The summary for Norlite facility SLERA is contained in Section 8.5.3.

### 8.5.1 Evaluation of Assessment Endpoints

The results from the measurement endpoints discussed in Section 8.2.5 were used to evaluate the potential risk associated with the assessment endpoints sel3cted for the SLERA. Seven assessment endpoints were selected for this SLERA: (1) protection and maintenance of indigenous fish populations in local waterbodies; (2) protection and maintenance of sediment receptors in local waterbodies; (3) protection and maintenance of local piscivorous wildlife receptors; (4) protection and maintenance of wetland invertebrate and plant receptors; (5) protection and maintenance of terrestrial invertebrate and plant receptors; (6) protection and maintenance of local wetland wildlife receptors; and (7) protection and maintenance of local terrestrial upland wildlife receptors.

None of the HQs calculated for exposure of ecological receptors to environmental media exceeded a value of one. The highest HQ observed was that for the American robin on Green Island (HQ=0.55) due to BEHP. For most of the receptors, the highest individual CPEC risk was associated with either methyl mercury or 2,3,7,8-TCDD. These results indicated that, even under the conservative assumptions of the SLERA, that no potential ecological harm is predicted.

Based on the results of the screening measurement endpoint, the SLERA indicates that emissions from the Norlite Facility pose negligible potential for ecological harm to surface water aquatic community receptors, sediment associated benthic community organisms, terrestrial upland plant and invertebrate communities, and wetland invertebrate and plant communities. The calculated EPCs in surface water, sediment, surface soil, and hydric soil were all well below the chemical-specific screening benchmarks. In addition, based on the results of the food web measurement endpoint, the SLERA also indicates that emissions from the Norlite Facility do not pose potential ecological risk to the wildlife receptors evaluated in the four areas/habitats of concern (Hudson River, Erie Canal, Wright/Bradley Lake, and Green Island).

### 8.5.2 Uncertainty Evaluation

The factors leading to uncertainty in the results are described and the information provides a context for risk decision-making. A number of assumptions and factors were made in the risk assessment that contributes to the uncertainty of the results of the Norlite Facility SLERA. These include uncertainty associated with CPEC screening/selection, exposure assessment, ecological effects, and risk characterization.

#### 8.5.2.1 Toxicity Reference Values

The aquatic risk assessment used toxicity values based on chronic effects to analyze the potential for ecological risk. Chronic toxicity values from NYS or U.S. EPA were used as screening benchmarks because it was assumed that surface water and benthic species would experience continuous, chronic exposure. Exposure in the aquatic environment is unlikely to be continuous for many fish species in some habitats, as they are generally transitory and are likely to move in and out of the affected regions. Thus, the assumption of chronic exposure may be realistic for the sediment-associated fish species, but may be relatively conservative for most surface water species.

#### 8.5.2.2 Potential Ecological Risk to Individual Wildlife Receptors Using an Exclusive Diet

The CPEC concentrations modeled in the areas of concern were used to model tissue burden concentrations for a variety of prey items, including terrestrial and wetland plants, terrestrial and wetland invertebrates, and two trophic levels of small mammal. The wildlife receptors, with the exception of the herbivores, consume a variety of prey items. The amount of CPEC in each modeled prey item differs depending on the chemical-specific characteristics of each CPEC, and its behavior in environmental compartments (bioaccumulation potential, volatilization, etc.). In order to provide a conservative estimate of the maximum dose, the potential daily dose to the raccoon, an opportunistic feeder found in most habitats, was modeled assuming 100% ingestion of each prey item, plus any potential ingestion from abiotic media (surface water, surface soil, sediment, hydric soil). Green Island contains the largest variety of habitat among the exposure areas in the Norlite SLERA, including both terrestrial and wetland/semi-aquatic prey items and exposure. The raccoon and shrew were selected for evaluation in the uncertainty section. The diet of the raccoon is varied, and may include prey items from plants, invertebrates, and small mammals. The shrew may consume plants and invertebrates from terrestrial and wetland habitats, and has a high metabolism and food ingestion rate for its size. Since Green Island contains the largest variety of potential exposure pathways, it was selected for modeling of exclusive diets for the raccoon and the shrew. The results of these models are presented in Tables 8-29 and 8-30. Details of these calculations are given in Appendix E-6.

Raccoon

The raccoon was selected as a representative species for evaluating potential risks posed to trophic level 3 mammalian species from surface soil, hydric soil, and surface water exposure in the Green Island exposure area. For the purpose of the exclusive diet risk calculations, exposure was assumed to include ingestion of surface soil, hydric soil, and surface water from Green Island, and the following complete exposure pathways:

- Ingestion of wetland/aquatic vegetation containing CPECs bioaccumulated from hydric soil in the Green Island wetland;
- Ingestion of wetland/aquatic invertebrates containing CPECs bioaccumulated from hydric soil in the Green Island wetland;
- Ingestion of terrestrial vegetation containing CPECs bioaccumulated from soils in the Green Island upland;
- Ingestion of terrestrial invertebrates containing CPECs bioaccumulated from soils in the Green Island upland;
- Ingestion of herbivorous small mammals containing CPECs bioaccumulated from soils and prey in the Green Island upland; and
- Ingestion of omnivorous mammals containing CPECs bioaccumulated from soils and prey in the Green Island upland.

The results of the exclusive diet Hudson River raccoon food web model are presented in Table 8-29. In general, a diet consisting of aquatic invertebrates produced the highest potential daily dose for inorganic CPECs, and omnivorous mammals for organic CPECs.

*Exclusive Diet of Wetland Invertebrates*: The potential daily doses of all CPECs were less than the respective toxicity reference values for the raccoon (HQ < 1). Resulting HQs were less than one and ranged from 2.69E-10 (carbon tetrachloride) to 3.24E-02 (methyl mercury).

*Exclusive Diet of Wetland Plants*: The potential daily doses of all CPECs were less than the respective toxicity reference values for the raccoon (HQ < 1). Resulting HQs were less than one and ranged from 2.68E-10 (carbon tetrachloride) to 1.44E-03 (2,3,7,8-TCDD).

*Exclusive Diet of Terrestrial Invertebrates*: The potential daily doses of all CPECs were less than the respective toxicity reference values for the raccoon (HQ < 1). Resulting HQs ranged from 1.54E-10 (1,1-dichloroethylene) to 3.99E-02 (bis(2-ethylhexyl)phthalate).

*Exclusive Diet of Terrestrial Plants*: The potential daily doses of all CPECs were less than the respective toxicity reference values for the raccoon (HQ < 1). Resulting HQs were less than one and ranged from 1.23E-09 (chromium) to 1.51E-03 (2,3,7,8-TCDD).

*Exclusive Diet of Herbivorous Small Mammals*: The potential daily doses of all CPECs were less than the respective toxicity reference values for the raccoon (HQ < 1). Resulting HQs were less than one and ranged from 1.53E-10 (1,1-dichloroethylene) to 1.43E-03 (2,3,7,8-TCDD).

*Exclusive Diet of Omnivorous Small Mammals*: The potential daily doses of all CPECs were less than the respective toxicity reference values for the raccoon (HQ < 1). Resulting HQs ranged from 2.58E-10 (1,1-dichloroethylene) to 1.59E-01 (2,3,7,8-TCDD).

Short-tailed Shrew

The short-tailed shrew was selected as a representative species for evaluating potential risks posed to small trophic level 3 mammalian species from surface soil, hydric soil, and surface water exposure in the Green Island exposure area. For the purpose of the exclusive diet risk calculations, exposure was assumed to include ingestion of surface soil, hydric soil, and surface water from Green Island, and the following complete exposure pathways:

- Ingestion of wetland/aquatic vegetation containing CPECs bioaccumulated from hydric soil in the Green Island wetland;
- Ingestion of wetland/aquatic invertebrates containing CPECs bioaccumulated from hydric soil in the Green Island wetland;
- Ingestion of terrestrial vegetation containing CPECs bioaccumulated from soils in the Green Island upland; and
- Ingestion of terrestrial invertebrates containing CPECs bioaccumulated from soils in the Green Island upland.

The results of the exclusive diet Hudson River short-tailed shrew food web model are presented in Table 8-30. In general, a diet consisting of aquatic invertebrates produced the highest potential daily dose for organic CPECs, and TL3 fish for inorganic CPECs.

*Exclusive Diet of Wetland Invertebrates*: The potential daily doses of all CPECs were less than the respective toxicity reference values for the shrew (HQ < 1). Resulting HQs one ranged from 4.14-E10 (carbon tetrachloride) to 5.11E-02 (methyl mercury).

*Exclusive Diet of Wetland Plants*: The potential daily doses of all CPECs were less than the respective toxicity reference values for the shrew (HQ < 1). Resulting HQs were less than one and ranged from 4.13E-10 (carbon tetrachloride) to 5.14E-04 (2,3,7,8-TCDD).

*Exclusive Diet of Terrestrial Invertebrates*: The potential daily doses of all CPECs were less than the respective toxicity reference values for the shrew (HQ < 1). Resulting HQs ranged from 2.31E-10 (1,1-dichloroethylene) to 6.33E-02 (bis(2-ethylhexyl)phthalate).

*Exclusive Diet of Terrestrial Plants*: The potential daily doses of all CPECs were less than the respective toxicity reference values for the shrew (HQ < 1). Resulting HQs were less than one and ranged from 4.53E-10 (chromium) to 6.18E-04 (2,3,7,8-TCDD).

Although none of the HQ were greater than 1 for any receptor, evaluation of exclusive diets indicates that 2,3,7,8-TCDD poses the highest potential risk to mammals regardless of diet. However, the invertebrate tissue concentration of bis(2-ethylhexyl)phthalate is driven by a high bioconcentration factor. This produces the highest dose of all CPEC for animals ingesting terrestrial invertebrates. The BCF is a calculated, not empirical value. This is the type of uncertainty that can be resolved, if needed, with Tier 2 ERA. Since no HQ > 1 in the SLERA, Tier 2 ERA is not warranted for the Norlite Facility.

#### 8.5.2.3 Media Concentration Modeling

Considerable uncertainty in the SLERA is due to the use of the ISCST3 model and ancillary sub-models to predict surface water, sediment, terrestrial plant, and hydric soil concentrations. The ISCST3 model is a steady-state model that assumes that environmental conditions are constant, when these factors are highly dynamic and incorporate daily, seasonal, and inter-annual variation. Incorporation of 5 years of site-specific data helps increase the realism of this modeling, however.

To predict media CPEC concentrations, several U.S. EPA fate and transport models are utilized, along with the air concentrations and deposition rates predicted by the ISCST3 model. These modeling steps introduce considerable, but unquantified, uncertainty due to the large number of parameters and variables used in these models. Many of these input variables are estimated, or must be assumed, for the vicinity around the Norlite Facility and for the watershed basins for the Hudson River, Erie Canal, and Wright/Bradley Lake. Although the true effect of these uncertainties on the SLERA is unknown, all of these models have been designed to employ (in the absence of site-specific, or time-specific data) average default values that will generally produce conservatively high estimates of long-term exposures.

#### 8.5.2.4 Estimation of Magnitude of Potential Risk

Another source of uncertainty in the application of the HQ method is the source of toxicity data used for benchmark concentrations. Typically, the lowest data points among the available toxicity data were conservatively selected as the benchmark concentrations (e.g., from ORNL databases). The lowest data point observed in the laboratory may not be representative of the actual toxicity that might occur in the environment. Using the lowest reported chronic toxicity data point as a benchmark concentration, as was done in this assessment, is a very conservative approach, especially when there is a wide range in reported toxicity values for the relevant species.

#### 8.5.2.5 Lack of Adequate Toxicological Data

Another large source of uncertainty is the many CPECs for which there was no screening benchmark. Further investigation and evaluation may be required to establish whether these CPECs pose a potential risk. Based on the magnitude of the EPCs for CPECs with known screening levels, it is unlikely that these unevaluated CPECs pose an ecological concern.

#### 8.5.2.6 Extrapolation of Toxicity Data

Extrapolation of the potential for community, population, or ecosystem effects from the examination of one or more representative species is a major source of uncertainty in the SLERA process. The underlying assumption is that potential effects on one representative species are consistent with the effects on similar species and representative of the potential for effects on the particular ecosystem being investigated. Thus, for the aquatic risk assessment, the lowest toxicity values for sensitive freshwater species found in the literature (i.e., AWQC document) were chosen to represent the potential for adverse chemical effects on the aquatic ecosystem. Differential species sensitivity to the CPEC may result in these benchmarks being underestimates or, more likely, overestimates of potential acute and chronic toxicity for many aquatic and terrestrial organisms. The selection of these species as representative indicators of the Wright/Bradley Lake, Erie Canal, Green Island wetland, and Hudson River systems is one source of uncertainty in the risk assessment.

Finally, it is difficult to predict how an adverse effect on an individual organism might affect the ecosystem as a whole. If adverse effects are predicted for an individual, it does not necessarily mean that the community, population or ecosystem will be similarly affected. Even if one subset of the ecosystem is impacted in a localized area, it may not be a perceptible impact to the overall ecosystem. In addition, there is the potential effect of background concentrations of CPECs that arise from other sources and may affect local populations.

### 8.5.3 Summary for SLERA

A SLERA was conducted for the Norlite Facility to evaluate its potential to pose adverse ecological risk to community and individual receptors in three waterbodies – Hudson River, Wright/Bradley Lake, and Erie Canal – and Green Island a terrestrial upland/wetland habitat area. The results of the SLERA indicate no potential ecological concern for the community receptors in the three waterbodies or Green Island. Neither were ecological concerns due to Norlite Facility emissions indicated for any of the piscivorous wildlife receptors in the Hudson River, Wright/Bradley Lake, and Erie Canal, or wildlife receptors in the Green Island wetland or terrestrial upland. The uncertainty associated with the ecological risk assessment was described and factors potentially influencing the results were discussed. Consideration of exclusive diets for various diet items for omnivorous receptors (short-tailed shrew, raccoon) did not lead to greater risks for these receptors. Based on the unambiguous pattern of results across a wide variety of species, trophic levels, and habitats, it may be concluded that emissions from the Norlite Facility do not pose an adverse risk to ecological receptors. Therefore, no further ecological evaluation (i.e., Tier 2 ERA) is warranted.

**TABLE 8-1**
**SUMMARY OF COMPOUNDS OF POTENTIAL ECOLOGICAL CONCERN (CPECs) EVALUATED IN THE SLERA**
**NORLITE FACILITY**
**COHOES, NY**

| INORGANICS | ORGANICS | | | |
|---|---|---|---|---|
| | Semivolatiles | Polycyclic Aromatic Hydrocarbons | Volatiles | Dioxins |
| ANTIMONY | 2,4-DINITROTOLUENE | BENZO(A)PYRENE | 1,1,2,2-TETRACHLOROETHANE | 2,3,7,8-TCDD TE |
| ARSENIC | 2,6-DINITROTOLUENE | BENZO(A)ANTHRACENE | 1,1-DICHLOROETHYLENE | 2,3,7,8-TCDD (MAMMAL) |
| BARIUM | 2-NITROANILINE | BENZO(B)FLUORANTHENE | 1,3-BUTADIENE | 2,3,7,8-TCDD (BIRD) |
| BERYLLIUM | BIS(2-ETHYLHEXYL)PHTHALATE | BENZO(K)FLUORANTHENE | BENZENE | 2,3,7,8-TCDD (FISH) |
| CADMIUM | HEXACHLOROBENZENE | CHRYSENE | BROMOMETHANE | |
| CHROMIUM | HEXACHLOROBUTADIENE | DIBENZ(A,H)ANTHRACENE | CARBON TETRACHLORIDE | |
| CHROMIUM VI | HEXACHLOROCYCLOPENTADIENE | INDENO(1,2,3-CD)PYRENE | CHLOROFORM | |
| LEAD | PENTACHLOROPHENOL | TOTAL PAH | CHLOROMETHANE | |
| INORGANIC MERCURY | | | DICHLOROFLUOROMETHANE | |
| METHYL MERCURY | | | TRANS-1,3-DICHLOROPROPENE | |
| NICKEL | | | TRICHLOROFLUOROMETHANE | |
| SELENIUM | | | VINYL CHLORIDE | |
| SILVER | | | | |
| THALLIUM | | | | |
| ZINC | | | | |

TABL( ...

## MODELED CONCENTRATIONS OF CPEC IN SURFACE SOIL, TERRES...AL PLANTS, SEDIMENT, HYDRIC SOIL, AND SURFACE WATER
## SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT
## NORLITE FACILITY
## COHOES, NY

| CPEC (parts per million) | GREEN ISLAND | | | | | HUDSON RIVER | | |
|---|---|---|---|---|---|---|---|---|
| | SURFACE SOIL | TERRESTRIAL PLANT | HYDRIC SOIL | SURFACE WATER TOTAL | SURFACE WATER DISSOLVED | BED SEDIMENT | SURFACE WATER TOTAL | SURFACE WATER DISSOLVED |
| INORGANICS | | | | | | | | |
| ANTIMONY | 7.92E-06 | 2.64E-07 | 3.08E-05 | 8.57E-07 | 8.57E-07 | 2.20E-08 | 7.58E-10 | 7.57E-10 |
| ARSENIC | 2.40E-06 | 1.18E-07 | 9.15E-06 | 1.71E-07 | 1.71E-07 | 6.77E-09 | 1.51E-10 | 1.50E-10 |
| BARIUM | 3.88E-06 | 2.01E-07 | 1.49E-05 | 3.02E-07 | 3.02E-07 | 1.09E-08 | 2.66E-10 | 2.66E-10 |
| BERYLLIUM | 4.57E-06 | 1.78E-08 | 1.47E-05 | 3.78E-08 | 3.75E-08 | 2.58E-08 | 3.29E-11 | 3.26E-11 |
| CADMIUM | 4.40E-06 | 5.00E-07 | 1.62E-05 | 1.95E-07 | 1.95E-07 | 1.27E-08 | 1.70E-10 | 1.70E-10 |
| CHROMIUM | 3.23E-05 | 1.27E-07 | 1.02E-04 | 4.46E-09 | 2.35E-10 | 1.27E-05 | 1.34E-10 | 7.04E-12 |
| CHROMIUM VI | 4.29E-07 | 2.14E-08 | 1.69E-06 | 6.97E-08 | 6.97E-08 | 1.18E-09 | 6.19E-11 | 6.18E-11 |
| LEAD | 2.22E-05 | 1.77E-07 | 7.12E-05 | 1.70E-07 | 1.68E-07 | 1.35E-07 | 1.51E-10 | 1.50E-10 |
| INORGANIC MERCURY | 4.77E-04 | 1.80E-05 | 1.61E-03 | 1.70E-07 | 8.49E-08 | 2.66E-05 | 1.06E-09 | 5.32E-10 |
| METHYL MERCURY | 8.48E-06 | 4.52E-06 | 2.48E-04 | 4.54E-07 | 2.27E-07 | 3.31E-07 | 2.20E-10 | 1.10E-10 |
| NICKEL | 7.11E-05 | 1.51E-06 | 2.64E-04 | 3.59E-06 | 3.59E-06 | 2.04E-07 | 3.14E-09 | 3.14E-09 |
| SELENIUM | 7.87E-08 | 1.48E-08 | 3.16E-07 | 4.67E-08 | 4.67E-08 | 2.09E-10 | 4.18E-11 | 4.18E-11 |
| SILVER | 1.70E-06 | 4.08E-07 | 6.79E-06 | 6.16E-07 | 6.16E-07 | 4.57E-09 | 5.50E-10 | 5.50E-10 |
| THALLIUM | 6.26E-06 | 8.09E-08 | 2.31E-05 | 2.91E-07 | 2.91E-07 | 1.81E-08 | 2.54E-10 | 2.54E-10 |
| ZINC | 1.64E-04 | 1.25E-05 | 6.11E-04 | 8.64E-06 | 8.64E-06 | 4.69E-07 | 7.57E-09 | 7.56E-09 |
| ORGANICS | | | | | | | | |
| Semivolatiles | | | | | | | | |
| HEXACHLOROCYCLOPENTADIENE | 3.70E-08 | 2.21E-09 | 1.03E-06 | 8.36E-08 | 8.31E-08 | 1.70E-07 | 4.50E-10 | 4.47E-10 |
| HEXACHLOROBUTADIENE | 9.25E-10 | 6.89E-11 | 6.58E-06 | 4.14E-09 | 4.11E-09 | 6.19E-09 | 2.25E-11 | 2.23E-11 |
| 2,4-DINITROTOLUENE | 2.04E-06 | 5.84E-06 | 7.03E-06 | 3.03E-06 | 3.03E-06 | 1.75E-08 | 8.60E-09 | 8.60E-09 |
| 2,6-DINITROTOLUENE | 3.67E-06 | 1.18E-05 | 3.42E-12 | 6.29E-06 | 6.29E-06 | 3.01E-08 | 1.79E-08 | 1.79E-08 |
| HEXACHLOROBENZENE | 3.44E-06 | 9.33E-08 | 4.89E-10 | 2.63E-08 | 2.48E-08 | 5.10E-07 | 1.69E-10 | 1.59E-10 |
| 2-NITROANILINE | 5.41E-07 | 1.83E-06 | 3.91E-06 | 8.71E-07 | 8.71E-07 | 4.72E-09 | 3.01E-09 | 3.01E-09 |
| PENTACHLOROPHENOL | 2.41E-06 | 3.34E-07 | 4.42E-11 | 2.95E-07 | 2.95E-07 | 3.56E-08 | 1.76E-09 | 1.76E-09 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 6.15E-04 | 2.31E-05 | 1.77E-09 | 5.31E-07 | 4.90E-07 | 1.71E-05 | 4.17E-09 | 3.85E-09 |
| BENZO(A)PYRENE | 5.42E-07 | 4.74E-09 | 9.32E-07 | 1.38E-10 | 8.02E-11 | 4.87E-08 | 2.17E-12 | 1.26E-12 |
| BENZO(A)ANTHRACENE | 3.20E-07 | 4.74E-09 | 5.38E-07 | 1.50E-10 | 1.26E-10 | 1.37E-08 | 1.58E-12 | 1.32E-12 |
| BENZO(B)FLUORANTHENE | 5.56E-06 | 3.70E-08 | 8.94E-06 | 1.21E-09 | 7.45E-10 | 4.70E-07 | 2.29E-11 | 1.41E-11 |
| BENZO(K)FLUORANTHENE | 3.25E-07 | 4.30E-09 | 6.14E-07 | 1.05E-10 | 6.44E-11 | 2.72E-08 | 1.33E-12 | 8.18E-13 |
| CHRYSENE | 4.56E-06 | 4.71E-08 | 7.21E-06 | 2.10E-09 | 1.71E-09 | 2.05E-07 | 2.10E-11 | 1.72E-11 |
| DIBENZ(A,H)ANTHRACENE | 9.24E-08 | 1.46E-08 | 2.56E-07 | 3.34E-11 | 1.43E-11 | 1.16E-08 | 3.78E-13 | 1.61E-13 |
| INDENO(1,2,3-CD)PYRENE | 1.23E-07 | 7.28E-08 | 3.50E-07 | 3.51E-11 | 8.61E-12 | 1.99E-08 | 4.96E-13 | 1.21E-13 |
| TOTAL PAH | 4.20E-07 | 3.68E-09 | 1.13E-03 | 1.07E-10 | 6.21E-11 | 3.77E-08 | 1.68E-12 | 9.75E-13 |
| Volatiles | | | | | | | | |
| BENZENE | 2.55E-10 | -- | 3.38E-11 | 1.11E-07 | 1.11E-07 | 1.83E-09 | 7.39E-10 | 7.39E-10 |
| BROMOMETHANE | 1.76E-11 | -- | 1.37E-10 | 6.83E-08 | 6.83E-08 | 1.83E-10 | 5.07E-10 | 5.07E-10 |
| 1,3-BUTADIENE | 1.27E-11 | -- | 7.23E-07 | 5.82E-08 | 5.82E-08 | 1.02E-09 | 5.05E-10 | 5.05E-10 |
| CARBON TETRACHLORIDE | 7.16E-11 | -- | 1.34E-12 | 2.37E-08 | 2.37E-08 | 9.35E-10 | 1.54E-10 | 1.54E-10 |
| CHLOROFORM | 4.57E-10 | -- | 2.42E-11 | 7.34E-08 | 7.34E-08 | 1.08E-09 | 5.11E-10 | 5.11E-10 |
| CHLOROMETHANE | 1.79E-12 | -- | 4.61E-06 | 6.23E-08 | 6.23E-08 | 1.21E-10 | 5.05E-10 | 5.05E-10 |
| 1,1-DICHLOROETHYLENE | 2.31E-11 | -- | 6.58E-09 | 2.45E-08 | 2.45E-08 | 4.42E-10 | 1.70E-10 | 1.70E-10 |
| DICHLOROFLUOROMETHANE | 7.03E-13 | -- | 1.80E-10 | 8.26E-08 | 8.25E-08 | 1.39E-09 | 5.08E-10 | 5.08E-10 |
| TRANS-1,3-DICHLOROPROPENE | 9.39E-11 | -- | 7.40E-11 | 2.60E-08 | 2.60E-08 | 1.85E-10 | 1.71E-10 | 1.71E-10 |
| 1,1,2,2-TETRACHLOROETHANE | 3.44E-09 | -- | 8.75E-10 | 2.93E-08 | 2.93E-08 | 5.87E-10 | 1.86E-10 | 1.86E-10 |
| TRICHLOROFLUOROMETHANE | 3.87E-11 | -- | 1.11E-12 | 7.71E-08 | 7.71E-08 | 2.71E-09 | 5.07E-10 | 5.07E-10 |
| VINYL CHLORIDE | 5.80E-13 | -- | 7.08E-08 | 6.89E-08 | 6.89E-08 | 2.25E-10 | 5.06E-10 | 5.06E-10 |
| Dioxins | | | | | | | | |
| 2,3,7,8-TCDD TE | | | | | | | | |
| 2,3,7,8-TCDD (MAMMAL) | 1.87E-08 | 1.61E-10 | 3.92E-08 | 3.92E-12 | 1.30E-12 | 2.71E-09 | 7.58E-14 | 2.51E-14 |
| 2,3,7,8-TCDD (FISH) | 2.88E-08 | 2.50E-10 | 5.42E-08 | 5.14E-12 | 1.70E-12 | 4.06E-09 | 1.14E-13 | 3.76E-14 |
| 2,3,7,8-TCDD (BIRD) | 9.57E-08 | 8.31E-10 | 1.80E-07 | 1.71E-11 | 5.67E-12 | 1.35E-08 | 3.78E-13 | 1.25E-13 |

TABL[illegible]

# MODELED CONCENTRATIONS OF CPEC IN SURFACE SOIL, TERRESTRIAL PLANTS, SEDIMENT, HYDRIC SOIL, AND SURFACE WATER
## SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT
## NORLITE FACILITY
## COHOES, NY

| CPEC (parts per million) | WRIGHT-BRADLEY LAKE | | | ERIE CANAL | | |
|---|---|---|---|---|---|---|
| | BED SEDIMENT | SURFACE WATER | | BED SEDIMENT | SURFACE WATER | |
| | | TOTAL | DISSOLVED | | TOTAL | DISSOLVED |
| INORGANICS | | | | | | |
| ANTIMONY | 1.71E-06 | 5.91E-08 | 5.91E-08 | 3.05E-07 | 1.05E-08 | 1.05E-08 |
| ARSENIC | 5.39E-07 | 1.20E-08 | 1.20E-08 | 9.54E-08 | 2.12E-09 | 2.12E-09 |
| BARIUM | 8.63E-07 | 2.11E-08 | 2.10E-08 | 1.53E-07 | 3.73E-09 | 3.73E-09 |
| BERYLLIUM | 2.79E-06 | 3.56E-09 | 3.53E-09 | 4.82E-07 | 6.15E-10 | 6.11E-10 |
| CADMIUM | 1.05E-06 | 1.40E-08 | 1.40E-08 | 1.84E-07 | 2.46E-09 | 2.46E-09 |
| CHROMIUM | 1.12E-04 | 1.18E-09 | 6.21E-11 | 1.10E-04 | 1.16E-09 | 6.11E-11 |
| CHROMIUM VI | 9.04E-08 | 4.76E-09 | 4.76E-09 | 1.61E-08 | 8.49E-10 | 8.49E-10 |
| LEAD | 1.47E-05 | 1.65E-08 | 1.63E-08 | 2.56E-06 | 2.88E-09 | 2.85E-09 |
| INORGANIC MERCURY | 7.93E-04 | 3.17E-08 | 1.59E-08 | 4.39E-04 | 1.76E-08 | 8.79E-09 |
| METHYL MERCURY | 4.15E-05 | 2.77E-08 | 1.38E-08 | 8.27E-06 | 5.52E-09 | 2.76E-09 |
| NICKEL | 1.66E-05 | 2.56E-07 | 2.55E-07 | 2.92E-06 | 4.50E-08 | 4.50E-08 |
| SELENIUM | 1.58E-08 | 3.15E-09 | 3.15E-09 | 2.82E-09 | 5.65E-10 | 5.65E-10 |
| SILVER | 3.46E-07 | 4.17E-08 | 4.17E-08 | 6.19E-08 | 7.46E-09 | 7.46E-09 |
| THALLIUM | 1.48E-06 | 2.08E-08 | 2.08E-08 | 2.60E-07 | 3.67E-09 | 3.66E-09 |
| ZINC | 3.80E-05 | 6.14E-07 | 6.14E-07 | 6.71E-06 | 1.08E-07 | 1.08E-07 |
| ORGANICS | | | | | | |
| Semivolatiles | | | | | | |
| HEXACHLOROCYCLOPENTADIENE | 1.89E-06 | 5.01E-09 | 4.98E-09 | 7.69E-07 | 2.04E-09 | 2.02E-09 |
| HEXACHLOROBUTADIENE | 6.85E-08 | 2.48E-10 | 2.47E-10 | 2.78E-08 | 1.01E-10 | 1.00E-10 |
| 2,4-DINITROTOLUENE | 1.78E-06 | 8.71E-07 | 8.71E-07 | 3.97E-07 | 1.95E-07 | 1.95E-07 |
| 2,6-DINITROTOLUENE | 3.07E-06 | 1.82E-06 | 1.82E-06 | 6.85E-07 | 4.08E-07 | 4.08E-07 |
| HEXACHLOROBENZENE | 1.01E-05 | 3.35E-09 | 3.16E-09 | 4.53E-06 | 1.50E-09 | 1.41E-09 |
| 2-NITROANILINE | 4.96E-07 | 3.16E-07 | 3.16E-07 | 1.11E-07 | 7.08E-08 | 7.08E-08 |
| PENTACHLOROPHENOL | 2.43E-06 | 1.20E-07 | 1.20E-07 | 7.07E-07 | 3.50E-08 | 3.50E-08 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 1.65E-03 | 4.03E-07 | 3.72E-07 | 5.53E-04 | 1.35E-07 | 1.25E-07 |
| BENZO(A)PYRENE | 2.12E-06 | 9.44E-11 | 5.47E-11 | 1.30E-06 | 5.79E-11 | 3.35E-11 |
| BENZO(A)ANTHRACENE | 1.09E-06 | 1.26E-10 | 1.05E-10 | 4.58E-07 | 5.24E-11 | 4.39E-11 |
| BENZO(B)FLUORANTHENE | 2.25E-05 | 1.10E-09 | 6.75E-10 | 1.36E-05 | 6.61E-10 | 4.06E-10 |
| BENZO(K)FLUORANTHENE | 1.21E-06 | 5.89E-11 | 3.62E-11 | 7.04E-07 | 3.43E-11 | 2.12E-11 |
| CHRYSENE | 1.58E-05 | 1.62E-09 | 1.32E-09 | 6.71E-06 | 6.89E-10 | 5.64E-10 |
| DIBENZ(A,H)ANTHRACENE | 2.86E-07 | 9.35E-12 | 3.99E-12 | 1.93E-07 | 6.32E-12 | 2.70E-12 |
| INDENO(1,2,3-CD)PYRENE | 3.83E-07 | 9.53E-12 | 2.33E-12 | 2.93E-07 | 7.28E-12 | 1.78E-12 |
| TOTAL PAH | 1.64E-06 | 7.32E-11 | 4.24E-11 | 1.01E-06 | 4.49E-11 | 2.60E-11 |
| Volatiles | | | | | | |
| BENZENE | 1.84E-08 | 7.42E-09 | 7.41E-09 | 8.09E-09 | 3.26E-09 | 3.26E-09 |
| BROMOMETHANE | 1.67E-09 | 4.63E-09 | 4.63E-09 | 7.74E-10 | 2.15E-09 | 2.15E-09 |
| 1,3-BUTADIENE | 8.23E-09 | 4.07E-09 | 4.07E-09 | 4.13E-09 | 2.05E-09 | 2.05E-09 |
| CARBON TETRACHLORIDE | 9.31E-09 | 1.53E-09 | 1.53E-09 | 4.06E-09 | 6.67E-10 | 6.67E-10 |
| CHLOROFORM | 1.08E-08 | 5.08E-09 | 5.08E-09 | 4.83E-09 | 2.28E-09 | 2.28E-09 |
| CHLOROMETHANE | 1.03E-09 | 4.29E-09 | 4.29E-09 | 5.00E-10 | 2.08E-09 | 2.08E-09 |
| 1,1-DICHLOROETHYLENE | 4.20E-09 | 1.61E-09 | 1.61E-09 | 1.89E-09 | 7.27E-10 | 7.27E-10 |
| DICHLOROFLUOROMETHANE | 1.42E-08 | 5.19E-09 | 5.19E-09 | 6.05E-09 | 2.21E-09 | 2.21E-09 |
| TRANS-1,3-DICHLOROPROPENE | 1.94E-09 | 1.79E-09 | 1.79E-09 | 8.42E-10 | 7.80E-10 | 7.80E-10 |
| 1,1,2,2-TETRACHLOROETHANE | 9.36E-09 | 2.96E-09 | 2.96E-09 | 3.82E-09 | 1.21E-09 | 1.21E-09 |
| TRICHLOROFLUOROMETHANE | 2.65E-08 | 4.97E-09 | 4.97E-09 | 1.16E-08 | 2.18E-09 | 2.18E-09 |
| VINYL CHLORIDE | 2.04E-09 | 4.59E-09 | 4.59E-09 | 9.43E-10 | 2.12E-09 | 2.12E-09 |
| Dioxins | | | | | | |
| 2,3,7,8-TCDD TE | | | | | | |
| 2,3,7,8-TCDD (MAMMAL) | 7.28E-08 | 2.04E-12 | 6.74E-13 | 5.61E-08 | 1.57E-12 | 5.20E-13 |
| 2,3,7,8-TCDD (FISH) | 1.24E-07 | 3.47E-12 | 1.15E-12 | 9.10E-08 | 2.54E-12 | 8.43E-13 |
| 2,3,7,8-TCDD (BIRD) | 4.13E-07 | 1.16E-11 | 3.83E-12 | 3.03E-07 | 8.47E-12 | 2.80E-12 |

TABLE 8-3
CALCULATION OF WETLAND PLANT TISSUE CONCENTRATIONS
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT
NORLITE FACILITY
COHOES, NY

| CPEC | log Kow | Soil/Sediment to Wetland Plant Uptake Factor (1) (mg $COPC_{plant}/kg_{dw}$)/ (mg $COPC_{sed}/kg_{dw}$) | | Green Island Hydric Soil ($mg/kg_{dw}$) | Green Island Aquatic Plant ($mg/kg_{ww}$) |
|---|---|---|---|---|---|
| INORGANICS | | | | | |
| ANTIMONY | NA | 0.2 | (a) | 3.08E-05 | 7.39E-07 |
| ARSENIC | NA | 0.036 | (a) | 9.15E-06 | 3.95E-08 |
| BARIUM | NA | 0.15 | (a) | 1.49E-05 | 2.67E-07 |
| BERYLLIUM | NA | 0.01 | (a) | 1.47E-05 | 1.76E-08 |
| CADMIUM | NA | 0.364 | (a) | 1.62E-05 | 7.06E-07 |
| CHROMIUM | NA | 0.0075 | (a) | 1.02E-04 | 9.16E-08 |
| CHROMIUM VI | NA | 0.0075 | (a) | 1.69E-06 | 1.52E-09 |
| LEAD | NA | 0.045 | (a) | 7.12E-05 | 3.84E-07 |
| INORGANIC MERCURY | NA | 0.0375 | (a) | 1.61E-03 | 7.26E-06 |
| METHYL MERCURY | NA | 0.137 | (a) | 2.48E-04 | 4.08E-06 |
| NICKEL | NA | 0.032 | (a) | 2.64E-04 | 1.01E-06 |
| SELENIUM | NA | 0.016 | (a) | 3.16E-07 | 6.07E-10 |
| SILVER | NA | 0.4 | (a) | 6.79E-06 | 3.26E-07 |
| THALLIUM | NA | 0.004 | (a) | 2.31E-05 | 1.11E-08 |
| ZINC | NA | 1.2E-12 | (a) | 6.11E-04 | 8.80E-17 |
| ORGANICS | | | | | |
| Semivolatiles | | | | | |
| HEXACHLOROCYCLOPENTADIENE | 4.91 | 0.0565 | (a) | 1.03E-06 | 7.02E-09 |
| HEXACHLOROBUTADIENE | 4.73 | 0.071 | (b) | 6.58E-06 | 5.61E-08 |
| 2,4-DINITROTOLUENE | 2.00 | 2.718 | (b) | 7.03E-06 | 2.29E-06 |
| 2,6-DINITROTOLUENE | 1.89 | 3.147 | (b) | 3.42E-12 | 1.29E-12 |
| HEXACHLOROBENZENE | 5.50 | 0.026 | (b) | 4.89E-10 | 1.53E-12 |
| 2-NITROANILINE | 1.85 | 3.301 | (b) | 3.91E-06 | 1.55E-06 |
| PENTACHLOROPHENOL | 5.08 | 0.0449 | (a) | 4.42E-11 | 2.38E-13 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 5.20 | 0.038 | (a) | 1.77E-09 | 8.07E-12 |
| BENZO(A)PYRENE | 6.13 | 0.011 | (a) | 9.32E-07 | 1.23E-09 |
| BENZO(A)ANTHRACENE | 5.68 | 2.02E-02 | (a) | 5.38E-07 | 1.31E-09 |
| BENZO(B)FLUORANTHENE | 6.20 | 1.01E-02 | (a) | 8.94E-06 | 1.08E-08 |
| BENZO(K)FLUORANTHENE | 6.19 | 1.01E-02 | (a) | 6.14E-07 | 7.45E-10 |
| CHRYSENE | 5.74 | 1.87E-02 | (a) | 7.21E-06 | 1.62E-08 |
| DIBENZ(A,H)ANTHRACENE | 6.55 | 6.40E-03 | (a) | 2.56E-07 | 1.96E-10 |
| INDENO(1,2,3-CD)PYRENE | 6.92 | 3.90E-03 | (a) | 3.50E-07 | 1.64E-10 |
| TOTAL PAH | 6.13 | 0.0202 | (a) | 1.13E-03 | 2.73E-06 |
| Volatiles | | | | | |
| BENZENE | 2.14 | 24.967 | (b) | 3.38E-11 | 1.01E-10 |
| BROMOMETHANE | 1.11 | 36.383 | (b) | 1.37E-10 | 5.98E-10 |
| 1,3-BUTADIENE | 1.99 | 26.017 | (b) | 7.23E-07 | 2.26E-06 |
| CARBON TETRACHLORIDE | 2.72 | 1.04 | (a) | 1.34E-12 | 1.68E-13 |
| CHLOROFORM | 1.95 | 2.9 | (a) | 2.42E-11 | 8.44E-12 |
| CHLOROMETHANE | 0.90 | 41.078 | (b) | 4.61E-06 | 2.27E-05 |
| 1,1-DICHLOROETHYLENE | 2.12 | 25.076 | (b) | 6.58E-09 | 1.98E-08 |
| DICHLOROFLUOROMETHANE | 1.55 | 30.06 | (b) | 1.80E-10 | 6.48E-10 |
| TRANS-1,3-DICHLOROPROPENE | 1.41 | 31.751 | (b) | 7.40E-11 | 2.82E-10 |
| 1,1,2,2-TETRACHLOROETHANE | 4.64 | 0.08 | (b) | 8.75E-10 | 8.40E-12 |
| TRICHLOROFLUOROMETHANE | 2.53 | 22.641 | (b) | 1.11E-12 | 3.01E-12 |
| VINYL CHLORIDE | 1.15 | 8.43 | (a) | 7.08E-08 | 7.17E-08 |
| Dioxins | | | | | |
| 2,3,7,8-TCDD (MAMMAL) | 6.64 | 0.0056 | (a) | 3.92E-08 | 2.64E-11 |
| 2,3,7,8-TCDD (FISH) | 6.64 | 0.0056 | (a) | 5.42E-08 | 3.64E-11 |
| 2,3,7,8-TCDD (BIRD) | 6.64 | 0.0056 | (a) | 1.80E-07 | 1.21E-10 |

General Notes:
NA - not applicable
(1) Tissue concentration calculated by: $COPC_{plant}$ ($mg/kg_{ww}$) = $COPC_{sed}$ ($mg/kg_{dw}$) x BCF ((mg $_{COPC\ plant}/kg_{dw}$)/(mg$_{COPC\ sed}/kg_{dw}$)) X 0.12
Per U.S. EPA (1999c), plant moisture content assumed to be 88%.
(a) All values are recommended values from USEPA, 1999c.
(b) All values are calculated using equations from Travis and Arms (1983) per USEPA, 1999c.

**TABLE 8-4**
**CALCULATION OF WETLAND INVERTEBRATE TISSUE CONCENTRATIONS**
**SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT**
**NORLITE FACILITY**
**COHOES, NY**

| CPEC | log Kow | Soil to Invertebrate Uptake Factor (1) (mg $COPC_{invert}/kg_{ww}$)/ (mg $COPC_{soil}/kg_{dw}$) | | Green Island Hydric Soil ($mg/kg_{dw}$) | Green Island Wetland Invertebrate ($mg/kg_{ww}$) |
|---|---|---|---|---|---|
| **INORGANICS** | | | | | |
| ANTIMONY | NA | 2.20E-01 | (a) | 3.08E-05 | 2.77E-05 |
| ARSENIC | NA | 1.10E-01 | (a) | 9.15E-06 | 8.24E-06 |
| BARIUM | NA | 2.20E-01 | (a) | 1.49E-05 | 1.34E-05 |
| BERYLLIUM | NA | 2.20E-01 | (a) | 1.47E-05 | 1.32E-05 |
| CADMIUM | NA | 9.60E-01 | (a) | 1.62E-05 | 5.50E-05 |
| CHROMIUM | NA | 1.00E-02 | (a) | 1.02E-04 | 3.97E-05 |
| CHROMIUM VI | NA | 1.00E-02 | (a) | 1.69E-06 | 6.59E-07 |
| LEAD | NA | 3.00E-02 | (a) | 7.12E-05 | 4.48E-05 |
| INORGANIC MERCURY | NA | 4.00E-02 | (a) | 1.61E-03 | 1.10E-04 |
| METHYL MERCURY | NA | 8.50E+00 | (a) | 2.48E-04 | 1.19E-04 |
| NICKEL | NA | 2.00E-02 | (a) | 2.64E-04 | 2.38E-04 |
| SELENIUM | NA | 2.20E-01 | (a) | 3.16E-07 | 2.85E-07 |
| SILVER | NA | 2.20E-01 | (a) | 6.79E-06 | 6.11E-06 |
| THALLIUM | NA | 2.20E-01 | (a) | 2.31E-05 | 2.08E-05 |
| ZINC | NA | 5.60E-01 | (a) | 6.11E-04 | 3.48E-04 |
| **ORGANICS** | | | | | |
| Semivolatiles | | | | | |
| HEXACHLOROCYCLOPENTADIENE | 4.91 | 7.45E+02 | (a) | 1.03E-06 | 7.72E-04 |
| HEXACHLOROBUTADIENE | 4.73 | 5.35E+02 | (a) | 6.58E-06 | 2.90E-06 |
| 2,4-DINITROTOLUENE | 2.00 | 3.08E+00 | (b) | 7.03E-06 | 4.08E-04 |
| 2,6-DINITROTOLUENE | 1.89 | 2.50E+00 | (b) | 3.42E-12 | 8.55E-12 |
| HEXACHLOROBENZENE | 5.50 | 2.29E+03 | (b) | 4.89E-10 | 1.12E-06 |
| 2-NITROANILINE | 1.85 | 2.34E+00 | (b) | 3.91E-06 | 9.14E-06 |
| PENTACHLOROPHENOL | 5.08 | 1.03E+03 | (a) | 4.42E-11 | 4.57E-08 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 5.20 | 1.31E+03 | (b) | 1.77E-09 | 2.32E-06 |
| BENZO(A)PYRENE | 6.13 | 7.00E-02 | (a) | 9.32E-07 | 1.48E-06 |
| BENZO(A)ANTHRACENE | 5.68 | 3.00E-02 | (a) | 5.38E-07 | 7.81E-07 |
| BENZO(B)FLUORANTHENE | 6.20 | 7.00E-02 | (a) | 8.94E-06 | 1.44E-05 |
| BENZO(K)FLUORANTHENE | 6.19 | 8.00E-02 | (a) | 6.14E-07 | 9.89E-07 |
| CHRYSENE | 5.74 | 4.00E-02 | (a) | 7.21E-06 | 9.95E-06 |
| DIBENZ(A,H)ANTHRACENE | 6.55 | 7.00E-02 | (a) | 2.56E-07 | 4.12E-07 |
| INDENO(1,2,3-CD)PYRENE | 6.92 | 8.00E-02 | (a) | 3.50E-07 | 5.63E-07 |
| TOTAL PAH | 6.13 | 7.50E-02 | | 1.13E-03 | 1.80E-03 |
| Volatiles | | | | | |
| BENZENE | 2.14 | 4.02E+00 | (b) | 3.38E-11 | 1.36E-10 |
| BROMOMETHANE | 1.11 | 5.84E-01 | (b) | 1.37E-10 | 8.00E-11 |
| 1,3-BUTADIENE | 1.99 | 3.05E+00 | (b) | 7.23E-07 | 2.20E-06 |
| CARBON TETRACHLORIDE | 2.72 | 1.20E+01 | (a) | 1.34E-12 | 1.61E-11 |
| CHLOROFORM | 1.95 | 2.82E+00 | (a) | 2.42E-11 | 6.84E-11 |
| CHLOROMETHANE | 0.90 | 3.92E-01 | (b) | 4.61E-06 | 1.81E-06 |
| 1,1-DICHLOROETHYLENE | 2.12 | 3.90E+00 | (b) | 6.58E-09 | 2.57E-08 |
| DICHLOROFLUOROMETHANE | 1.55 | 1.33E+00 | (b) | 1.80E-10 | 2.39E-10 |
| TRANS-1,3-DICHLOROPROPENE | 1.41 | 1.02E+00 | (b) | 7.40E-11 | 7.55E-11 |
| 1,1,2,2-TETRACHLOROETHANE | 4.64 | 4.54E+02 | (b) | 8.75E-10 | 3.97E-07 |
| TRICHLOROFLUOROMETHANE | 2.53 | 8.45E+00 | (b) | 1.11E-12 | 9.37E-12 |
| VINYL CHLORIDE | 1.15 | 6.20E-01 | (a) | 7.08E-08 | 4.39E-08 |
| Dioxins | | | | | |
| 2,3,7,8-TCDD (MAMMAL) | 6.64 | 1.59E+00 | (b) | 3.92E-08 | 7.68E-04 |
| 2,3,7,8-TCDD (FISH) | 6.64 | 1.59E+00 | (b) | 5.42E-08 | 1.06E-03 |
| 2,3,7,8-TCDD (BIRD) | 6.64 | 1.59E+00 | (b) | 1.80E-07 | 3.53E-03 |

General Notes:
NA - not applicable
(1) Tissue concentration calculated by: COPCinvert ($mg/kg_{ww}$) = $COPC_{hs}$ ($mg/kg_{dw}$) x BCF (($mg_{COPC\ invert}/kg_{ww}$)/($mg_{COPC\ hs}/kg_{dw}$))
(a) All values are recommended values from USEPA, 1999c.
(b) All values are calculated using equations from Southworth et al. (1978) per USEPA, 1999c.

**TABLE 8-5**
**CALCULATION OF FISH TISSUE CONCENTRATIONS**
**SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT**
**NORLITE FACILITY**
**COHOES, NY**

| CPEC | log Kow | BCF (L/kg) | Food Chain Multiplier TL3 | Food Chain Multiplier TL4 | HUDSON RIVER Surface Water (mg/L) | HUDSON RIVER TL3 Fish Tissue (mg/kg$_{WW}$) | HUDSON RIVER TL4 Fish Tissue (mg/kg$_{WW}$) | WRIGHT-BRADLEY LAKE Surface Water (mg/L) | WRIGHT-BRADLEY LAKE TL3 Fish Tissue (mg/kg$_{WW}$) | WRIGHT-BRADLEY LAKE TL4 Fish Tissue (mg/kg$_{WW}$) | ERIE CANAL Surface Water (mg/L) | ERIE CANAL TL3 Fish Tissue (mg/kg$_{WW}$) | ERIE CANAL TL4 Fish Tissue (mg/kg$_{WW}$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| INORGANICS | | | | | | | | | | | | | |
| ANTIMONY | NA | 40 | 1 | 1 | 7.57E-10 | 3.03E-08 | 3.03E-08 | 5.91E-08 | 2.36E-06 | 2.36E-06 | 1.05E-08 | 1.27E-14 | 1.27E-14 |
| ARSENIC | NA | 114 | 1 | 1 | 1.50E-10 | 1.72E-08 | 1.72E-08 | 1.20E-08 | 1.37E-06 | 1.37E-06 | 2.12E-09 | 4.14E-15 | 4.14E-15 |
| BARIUM | NA | 633 | 1 | 1 | 2.66E-10 | 1.68E-07 | 1.68E-07 | 2.10E-08 | 1.33E-05 | 1.33E-05 | 3.73E-09 | 3.97E-13 | 3.97E-13 |
| BERYLLIUM | NA | 62 | 1 | 1 | 3.26E-11 | 2.02E-09 | 2.02E-09 | 3.53E-09 | 2.19E-07 | 2.19E-07 | 6.11E-10 | 7.65E-17 | 7.65E-17 |
| CADMIUM | NA | 907 | 1 | 1 | 1.70E-10 | 1.54E-07 | 1.54E-07 | 1.40E-08 | 1.27E-05 | 1.27E-05 | 2.46E-09 | 3.44E-13 | 3.44E-13 |
| CHROMIUM | NA | 19 | 1 | 1 | 7.04E-12 | 1.34E-10 | 1.34E-10 | 6.21E-11 | 1.18E-09 | 1.18E-09 | 6.11E-11 | 1.55E-19 | 1.55E-19 |
| CHROMIUM VI | NA | 19 | 1 | 1 | 6.18E-11 | 1.18E-09 | 1.18E-09 | 4.76E-09 | 9.04E-08 | 9.04E-08 | 8.49E-10 | 1.90E-17 | 1.90E-17 |
| LEAD | NA | 0.09 | 1 | 1 | 1.50E-10 | 1.35E-11 | 1.35E-11 | 1.63E-08 | 1.47E-09 | 1.47E-09 | 2.85E-09 | 3.46E-21 | 3.46E-21 |
| INORGANIC MERCURY | NA | 3530 | 2.52 | 12.6 | 5.32E-10 | 4.73E-06 | 2.37E-05 | 1.59E-08 | 1.41E-04 | 7.05E-04 | 8.79E-09 | 1.47E-10 | 7.34E-10 |
| METHYL MERCURY | NA | 11168 | 2.52 | 12.6 | 1.10E-10 | 3.10E-06 | 1.55E-05 | 1.38E-08 | 3.89E-04 | 1.95E-03 | 2.76E-09 | 9.65E-11 | 4.77E-10 |
| NICKEL | NA | 78 | 1 | 1 | 3.14E-09 | 2.45E-07 | 2.45E-07 | 2.55E-07 | 1.99E-05 | 1.99E-05 | 4.50E-08 | 8.59E-13 | 8.59E-13 |
| SELENIUM | NA | 129 | 1 | 1 | 4.18E-11 | 5.39E-09 | 5.39E-09 | 3.15E-09 | 4.06E-07 | 4.06E-07 | 5.65E-10 | 3.93E-16 | 3.93E-16 |
| SILVER | NA | 87.71 | 1 | 1 | 5.50E-10 | 4.82E-08 | 4.82E-08 | 4.17E-08 | 3.65E-06 | 3.65E-06 | 7.46E-09 | 3.16E-14 | 3.16E-14 |
| THALLIUM | NA | 10000 | 1 | 1 | 2.54E-10 | 2.54E-06 | 2.54E-06 | 2.08E-08 | 2.08E-04 | 2.08E-04 | 3.66E-09 | 9.32E-11 | 9.32E-11 |
| ZINC | NA | 2059 | 1 | 1 | 7.56E-09 | 1.56E-05 | 1.56E-05 | 6.14E-07 | 1.26E-03 | 1.26E-03 | 1.08E-07 | 3.47E-09 | 3.47E-09 |
| ORGANICS | | | | | | | | | | | | | |
| Semivolatiles | | | | | | | | | | | | | |
| HEXACHLOROCYCLOPENTADIENE | 4.91 | 165 | 2.8 | 2.2 | 4.47E-10 | 2.07E-07 | 1.62E-07 | 4.98E-09 | 2.30E-06 | 1.81E-06 | 2.02E-09 | 6.89E-14 | 5.42E-14 |
| HEXACHLOROBUTADIENE | 4.73 | 253 | 2.2 | 1.6 | 2.23E-11 | 1.24E-08 | 9.04E-09 | 2.47E-10 | 1.38E-07 | 1.00E-07 | 1.00E-10 | 3.16E-16 | 2.30E-16 |
| 2,4-DINITROTOLUENE | 2.00 | 21.04 | 1 | 1 | 8.60E-09 | 1.81E-07 | 1.81E-07 | 8.71E-07 | 1.83E-05 | 1.83E-05 | 1.95E-07 | 7.41E-13 | 7.41E-13 |
| 2,6-DINITROTOLUENE | 1.89 | 21.04 | 1 | 1 | 1.79E-08 | 3.77E-07 | 3.77E-07 | 1.82E-06 | 3.84E-05 | 3.84E-05 | 4.08E-07 | 3.24E-12 | 3.24E-12 |
| HEXACHLOROBENZENE | 5.50 | 253 | 6.3 | 7.1 | 1.59E-10 | 2.54E-07 | 2.86E-07 | 3.16E-09 | 5.03E-06 | 5.67E-06 | 1.41E-09 | 9.10E-14 | 1.03E-13 |
| 2-NITROANILINE | 1.85 | 2.47 | 1 | 1 | 3.01E-09 | 7.42E-09 | 7.42E-09 | 3.16E-07 | 7.81E-07 | 7.81E-07 | 7.08E-08 | 1.30E-15 | 1.30E-15 |
| PENTACHLOROPHENOL | 5.08 | 109 | 3.6 | 3.2 | 1.76E-09 | 6.91E-07 | 6.14E-07 | 1.20E-07 | 4.71E-05 | 4.19E-05 | 3.50E-08 | 2.64E-12 | 2.34E-12 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 5.20 | 70 | 4.2 | 3.9 | 3.85E-09 | 1.13E-06 | 1.05E-06 | 3.72E-07 | 1.09E-04 | 1.02E-04 | 1.25E-07 | 9.88E-12 | 9.17E-12 |
| BENZO(A)PYRENE | 6.13 | 500 | 11 | 18 | 1.26E-12 | 6.92E-09 | 1.13E-08 | 5.47E-11 | 3.01E-07 | 4.92E-07 | 3.35E-11 | 1.16E-16 | 1.90E-16 |
| BENZO(A)ANTHRACENE | 5.68 | 500 | 8 | 10 | 1.32E-12 | 5.27E-09 | 6.59E-09 | 1.05E-10 | 4.21E-07 | 5.26E-07 | 4.39E-11 | 1.16E-16 | 1.45E-16 |
| BENZO(B)FLUORANTHENE | 6.20 | 500 | 12 | 20 | 1.41E-11 | 8.44E-08 | 1.41E-07 | 6.75E-10 | 4.05E-06 | 6.75E-06 | 4.06E-10 | 1.72E-14 | 2.86E-14 |
| BENZO(K)FLUORANTHENE | 6.19 | 500 | 12 | 20 | 8.18E-13 | 4.91E-09 | 8.18E-09 | 3.62E-11 | 2.17E-07 | 3.62E-07 | 2.12E-11 | 5.19E-17 | 8.65E-17 |
| CHRYSENE | 5.74 | 500 | 8 | 10 | 1.72E-11 | 6.88E-08 | 8.60E-08 | 1.32E-09 | 5.30E-06 | 6.62E-06 | 5.64E-10 | 1.94E-14 | 2.42E-14 |
| DIBENZ(A,H)ANTHRACENE | 6.55 | 500 | 14 | 25 | 1.61E-13 | 1.13E-09 | 2.02E-09 | 3.99E-12 | 2.80E-08 | 4.99E-08 | 2.70E-12 | 1.52E-18 | 2.72E-18 |
| INDENO(1,2,3-CD)PYRENE | 6.92 | 500 | 14 | 27 | 1.21E-13 | 8.50E-10 | 1.64E-09 | 2.33E-12 | 1.63E-08 | 3.15E-08 | 1.78E-12 | 7.58E-19 | 1.46E-18 |
| TOTAL PAH | 6.13 | 500 | 11 | 18 | 9.75E-13 | 5.36E-09 | 8.76E-09 | 4.24E-11 | 2.33E-07 | 3.81E-07 | 2.60E-11 | 6.97E-17 | 1.14E-16 |
| Volatiles | | | | | | | | | | | | | |
| BENZENE | 2.14 | 2.73 | 1 | 1 | 7.39E-10 | 2.02E-09 | 2.02E-09 | 7.41E-09 | 2.02E-08 | 2.02E-08 | 3.26E-09 | 1.79E-17 | 1.79E-17 |
| BROMOMETHANE | 1.11 | 1.8 | 1 | 1 | 5.07E-10 | 9.13E-10 | 9.13E-10 | 4.63E-09 | 8.33E-09 | 8.33E-09 | 2.15E-09 | 3.53E-18 | 3.53E-18 |
| 1,3-BUTADIENE | 1.99 | 2.6 | 1 | 1 | 5.05E-10 | 1.31E-09 | 1.31E-09 | 4.07E-09 | 1.06E-08 | 1.06E-08 | 2.05E-09 | 6.98E-18 | 6.98E-18 |
| CARBON TETRACHLORIDE | 2.72 | 30 | 1 | 1 | 1.54E-10 | 4.62E-09 | 4.62E-09 | 1.53E-09 | 4.59E-08 | 4.59E-08 | 6.67E-10 | 9.24E-17 | 9.24E-17 |
| CHLOROFORM | 1.95 | 3.59 | 1 | 1 | 5.11E-10 | 1.83E-09 | 1.83E-09 | 5.08E-09 | 1.82E-08 | 1.82E-08 | 2.28E-09 | 1.50E-17 | 1.50E-17 |
| CHLOROMETHANE | 0.90 | 1.61 | 1 | 1 | 5.05E-10 | 8.14E-10 | 8.14E-10 | 4.29E-09 | 6.90E-09 | 6.90E-09 | 2.08E-09 | 2.73E-18 | 2.73E-18 |
| 1,1-DICHLOROETHYLENE | 2.12 | 2.72 | 1 | 1 | 1.70E-10 | 4.62E-10 | 4.62E-10 | 1.61E-09 | 4.39E-09 | 4.39E-09 | 7.27E-10 | 9.14E-19 | 9.14E-19 |
| DICHLOROFLUOROMETHANE | 1.55 | 2.2 | 1 | 1 | 5.08E-10 | 1.12E-09 | 1.12E-09 | 5.19E-09 | 1.14E-08 | 1.14E-08 | 2.21E-09 | 5.43E-18 | 5.43E-18 |
| TRANS-1,3-DICHLOROPROPENE | 1.41 | 2.07 | 1 | 1 | 1.71E-10 | 3.54E-10 | 3.54E-10 | 1.79E-09 | 3.71E-09 | 3.71E-09 | 7.80E-10 | 5.72E-19 | 5.72E-19 |
| 1,1,2,2-TETRACHLOROETHANE | 4.64 | 4.99 | 2 | 1.5 | 1.86E-10 | 1.85E-09 | 1.39E-09 | 2.96E-09 | 2.95E-08 | 2.22E-08 | 1.21E-09 | 1.12E-17 | 8.38E-18 |
| TRICHLOROFLUOROMETHANE | 2.53 | 3.09 | 1 | 1 | 5.07E-10 | 1.57E-09 | 1.57E-09 | 4.97E-09 | 1.53E-08 | 1.53E-08 | 2.18E-09 | 1.06E-17 | 1.06E-17 |
| VINYL CHLORIDE | 1.15 | 1.81 | 1 | 1 | 5.06E-10 | 9.16E-10 | 9.16E-10 | 4.59E-09 | 8.30E-09 | 8.30E-09 | 2.12E-09 | 3.52E-18 | 3.52E-18 |
| Dioxins | | | | | | | | | | | | | |
| 2,3,7,8-TCDD (MAMMAL) | 6.64 | 4235 | 14 | 26 | 2.51E-14 | 1.49E-09 | 2.76E-09 | 6.74E-13 | 4.00E-08 | 7.42E-08 | 5.20E-13 | 3.27E-18 | 6.08E-18 |
| 2,3,7,8-TCDD (FISH) | 6.64 | 4235 | 14 | 26 | 3.76E-14 | 2.23E-09 | 4.14E-09 | 1.15E-12 | 6.82E-08 | 1.27E-07 | 8.43E-13 | 7.96E-18 | 1.48E-17 |
| 2,3,7,8-TCDD (BIRD) | 6.64 | 4235 | 14 | 26 | 1.25E-13 | 7.42E-09 | 1.38E-08 | 3.83E-12 | 2.27E-07 | 4.21E-07 | 2.80E-12 | 8.81E-17 | 1.64E-16 |

TL3 = Trophic level 3 fish
TL4 = Trophic level 4 fish
All BCFs are recommended values from U.S.EPA, 1999c
Food chain multipliers from Great Lakes Water Quality Initiative, as cited in U.S. EPA, 1999c

**TABLE 8-6**
**CALCULATION OF TERRESTRIAL INVERTEBRATE TISSUE CONCENTRATIONS**
**SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT**
**NORLITE FACILITY**
**COHOES, NY**

| CPEC | log Kow | Soil to Terrestrial Invertebrate Uptake Factor (1) (mg $COPC_{invert}/kg_{ww}$)/ (mg $COPC_{soil}/kg_{dw}$) | | Green Island Surface Soil ($mg/kg_{dw}$) | Green Island Terrestrial Invertebrate ($mg/kg_{ww}$) |
|---|---|---|---|---|---|
| **INORGANICS** | | | | | |
| ANTIMONY | NA | 2.20E-01 | (a) | 7.92E-06 | 1.74E-06 |
| ARSENIC | NA | 1.10E-01 | (a) | 2.40E-06 | 2.64E-07 |
| BARIUM | NA | 2.20E-01 | (a) | 3.88E-06 | 8.54E-07 |
| BERYLLIUM | NA | 2.20E-01 | (a) | 4.57E-06 | 1.00E-06 |
| CADMIUM | NA | 9.60E-01 | (a) | 4.40E-06 | 4.23E-06 |
| CHROMIUM | NA | 1.00E-02 | (a) | 3.23E-05 | 3.23E-07 |
| CHROMIUM VI | NA | 1.00E-02 | (a) | 4.29E-07 | 4.29E-09 |
| LEAD | NA | 3.00E-02 | (a) | 2.22E-05 | 6.66E-07 |
| INORGANIC MERCURY | NA | 4.00E-02 | (a) | 4.77E-04 | 1.91E-05 |
| METHYL MERCURY | NA | 8.50E+00 | (a) | 8.48E-06 | 7.21E-05 |
| NICKEL | NA | 2.00E-02 | (a) | 7.11E-05 | 1.42E-06 |
| SELENIUM | NA | 2.20E-01 | (a) | 7.87E-08 | 1.73E-08 |
| SILVER | NA | 2.20E-01 | (a) | 1.70E-06 | 3.73E-07 |
| THALLIUM | NA | 2.20E-01 | (a) | 6.26E-06 | 1.38E-06 |
| ZINC | NA | 5.60E-01 | (a) | 1.64E-04 | 9.18E-05 |
| **ORGANICS** | | | | | |
| Semivolatiles | | | | | |
| HEXACHLOROCYCLOPENTADIENE | 4.91 | 7.45E+02 | (a) | 3.70E-08 | 2.76E-05 |
| HEXACHLOROBUTADIENE | 4.73 | 5.35E+02 | (a) | 9.25E-10 | 4.95E-07 |
| 2,4-DINITROTOLUENE | 2.00 | 3.08E+00 | (b) | 2.04E-06 | 6.29E-06 |
| 2,6-DINITROTOLUENE | 1.89 | 2.50E+00 | (b) | 3.67E-06 | 9.20E-06 |
| HEXACHLOROBENZENE | 5.50 | 2.29E+03 | (b) | 3.44E-06 | 7.88E-03 |
| 2-NITROANILINE | 1.85 | 2.34E+00 | (b) | 5.41E-07 | 1.27E-06 |
| PENTACHLOROPHENOL | 5.08 | 1.03E+03 | (a) | 2.41E-06 | 2.49E-03 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 5.20 | 1.31E+03 | (b) | 6.15E-04 | 8.03E-01 |
| BENZO(A)PYRENE | 6.13 | 7.00E-02 | (a) | 5.42E-07 | 3.79E-08 |
| BENZO(A)ANTHRACENE | 5.68 | 3.00E-02 | (a) | 3.20E-07 | 9.61E-09 |
| BENZO(B)FLUORANTHENE | 6.20 | 7.00E-02 | (a) | 5.56E-06 | 3.89E-07 |
| BENZO(K)FLUORANTHENE | 6.19 | 8.00E-02 | (a) | 3.25E-07 | 2.60E-08 |
| CHRYSENE | 5.74 | 4.00E-02 | (a) | 4.56E-06 | 1.82E-07 |
| DIBENZ(A,H)ANTHRACENE | 6.55 | 7.00E-02 | (a) | 9.24E-08 | 6.47E-09 |
| INDENO(1,2,3-CD)PYRENE | 6.92 | 8.00E-02 | (a) | 1.23E-07 | 9.84E-09 |
| TOTAL PAH | 6.13 | 7.50E-02 | | 4.20E-07 | 3.15E-08 |
| Volatiles | | | | | |
| BENZENE | 2.14 | 4.02E+00 | (b) | 2.55E-10 | 1.03E-09 |
| BROMOMETHANE | 1.11 | 5.84E-01 | (b) | 1.76E-11 | 1.03E-11 |
| 1,3-BUTADIENE | 1.99 | 3.05E+00 | (b) | 1.27E-11 | 3.86E-11 |
| CARBON TETRACHLORIDE | 2.72 | 1.20E+01 | (a) | 7.16E-11 | 8.59E-10 |
| CHLOROFORM | 1.95 | 2.82E+00 | (a) | 4.57E-10 | 1.29E-09 |
| CHLOROMETHANE | 0.90 | 3.92E-01 | (b) | 1.79E-12 | 7.01E-13 |
| 1,1-DICHLOROETHYLENE | 2.12 | 3.90E+00 | (b) | 2.31E-11 | 9.00E-11 |
| DICHLOROFLUOROMETHANE | 1.55 | 1.33E+00 | (b) | 7.03E-13 | 9.34E-13 |
| TRANS-1,3-DICHLOROPROPENE | 1.41 | 1.02E+00 | (b) | 9.39E-11 | 9.58E-11 |
| 1,1,2,2-TETRACHLOROETHANE | 4.64 | 4.54E+02 | (b) | 3.44E-09 | 1.56E-06 |
| TRICHLOROFLUOROMETHANE | 2.53 | 8.45E+00 | (b) | 3.87E-11 | 3.27E-10 |
| VINYL CHLORIDE | 1.15 | 6.20E-01 | (a) | 5.80E-13 | 3.59E-13 |
| Dioxins | | | | | |
| 2,3,7,8-TCDD (MAMMAL) | 6.64 | 1.59E+00 | (b) | 1.87E-08 | 2.98E-08 |
| 2,3,7,8-TCDD (FISH) | 6.64 | 1.59E+00 | (b) | 2.88E-08 | 4.57E-08 |
| 2,3,7,8-TCDD (BIRD) | 6.64 | 1.59E+00 | (b) | 9.57E-08 | 1.52E-07 |

General Notes:
(1) Tissue concentration calculated by: COPCinvert ($mg/kg_{ww}$) = $COPC_{ss}$ ($mg/kg_{dw}$) x BCF (($mg_{COPC\ invert}/kg_{ww}$)/($mg_{COPC\ soil}/kg_{dw}$))
(a) All values are recommended values from USEPA, 1999c.
(b) All values are based on Southworth et al. (1978) per USEPA, 1999c.

**TABLE 8-7**
**CALCULATION OF HERBIVOROUS MAMMAL TISSUE CONCENTRATIONS**
**SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT**
**NORLITE FACILITY**
**COHOES, NY**

| CPEC | Deer Mouse | | | Green Island | | | | |
|---|---|---|---|---|---|---|---|---|
| | Bioconcentration Factors | | Fraction of Diet as Plant | Surface Soil | Hydric Soil | Terrestrial Plant | Wetland Plant | Herbivore Tissue |
| | soil-herbivore $BCF_{S-H}$ | plant-herbivore $BCF_{P-H}$ | $F_P$ | (mg/kg) | (mg/kg) | (mg/kg) | (mg/kg) | $(mg/kg_{ww})$ |
| **INORGANICS** | | | | | | | | |
| ANTIMONY | 1.44E-06 | 5.99E-04 | 100% | 7.92E-06 | 3.08E-05 | 2.84E-07 | 7.39E-07 | 3.34E-10 |
| ARSENIC | 2.88E-06 | 1.20E-03 | 100% | 2.40E-06 | 9.15E-06 | 1.18E-07 | 3.95E-08 | 1.11E-10 |
| BARIUM | 2.16E-07 | 8.99E-05 | 100% | 3.88E-06 | 1.49E-05 | 2.01E-07 | 2.67E-07 | 2.31E-11 |
| BERYLLIUM | 1.44E-06 | 5.99E-04 | 100% | 4.57E-06 | 1.47E-05 | 1.78E-08 | 1.76E-08 | 2.45E-11 |
| CADMIUM | 1.73E-07 | 7.19E-05 | 100% | 4.40E-06 | 1.62E-05 | 5.00E-07 | 7.06E-07 | 4.51E-11 |
| CHROMIUM | 7.91E-06 | 3.30E-03 | 100% | 3.23E-05 | 1.02E-04 | 1.27E-07 | 9.16E-08 | 8.91E-10 |
| CHROMIUM VI | 7.91E-06 | 3.30E-03 | 100% | 4.29E-07 | 1.69E-06 | 2.14E-08 | 1.52E-09 | 4.63E-11 |
| LEAD | 4.32E-07 | 1.80E-04 | 100% | 2.22E-05 | 7.12E-05 | 1.77E-07 | 3.84E-07 | 7.07E-11 |
| INORGANIC MERCURY | 7.52E-06 | 3.13E-03 | 100% | 4.77E-04 | 1.61E-03 | 1.80E-05 | 7.26E-06 | 4.74E-08 |
| METHYL MERCURY | 1.12E-06 | 4.68E-04 | 100% | 8.48E-06 | 2.48E-04 | 4.52E-06 | 4.08E-06 | 2.16E-09 |
| NICKEL | 8.63E-06 | 3.60E-03 | 100% | 7.11E-05 | 2.64E-04 | 1.51E-06 | 1.01E-06 | 5.99E-09 |
| SELENIUM | 3.27E-06 | 1.36E-03 | 100% | 7.87E-08 | 3.16E-07 | 1.48E-08 | 6.07E-10 | 1.11E-11 |
| SILVER | 4.32E-06 | 1.80E-03 | 100% | 1.70E-06 | 6.79E-06 | 4.08E-07 | 3.26E-07 | 6.79E-10 |
| THALLIUM | 5.75E-05 | 2.40E-02 | 100% | 6.26E-06 | 2.31E-05 | 8.09E-08 | 1.11E-08 | 1.95E-09 |
| ZINC | 1.29E-07 | 5.39E-05 | 100% | 1.64E-04 | 6.11E-04 | 1.25E-05 | 8.80E-17 | 3.88E-10 |
| **ORGANICS** | | | | | | | | |
| Semivolatiles | | | | | | | | |
| HEXACHLOROCYCLOPENTADIENE | 2.92E-06 | 1.22E-03 | 100% | 3.70E-08 | 1.03E-06 | 2.21E-09 | 7.02E-09 | 7.19E-12 |
| HEXACHLOROBUTADIENE | 1.94E-06 | 8.09E-04 | 100% | 9.25E-10 | 6.58E-06 | 6.89E-11 | 5.61E-08 | 2.91E-11 |
| 2,4-DINITROTOLUENE | 3.58E-09 | 1.49E-06 | 100% | 2.04E-06 | 7.03E-06 | 5.84E-06 | 2.29E-06 | 6.07E-12 |
| 2,6-DINITROTOLUENE | 2.78E-09 | 1.16E-06 | 100% | 3.67E-06 | 3.42E-12 | 1.18E-05 | 1.29E-12 | 6.86E-12 |
| HEXACHLOROBENZENE | 1.15E-05 | 4.79E-03 | 100% | 3.44E-06 | 4.89E-10 | 9.33E-08 | 1.53E-12 | 2.43E-10 |
| 2-NITROANILINE | 3.58E-09 | 1.49E-06 | 100% | 5.41E-07 | 3.91E-06 | 1.83E-06 | 1.55E-06 | 2.53E-12 |
| PENTACHLOROPHENOL | 4.34E-06 | 1.81E-03 | 100% | 2.41E-06 | 4.42E-11 | 3.34E-07 | 2.38E-13 | 3.08E-10 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 5.80E-06 | 2.42E-03 | 100% | 6.15E-04 | 1.77E-09 | 2.31E-05 | 8.07E-12 | 2.98E-08 |
| BENZO(A)PYRENE | 4.86E-05 | 2.03E-02 | 100% | 5.42E-07 | 9.32E-07 | 4.74E-09 | 1.23E-09 | 9.64E-11 |
| BENZO(A)ANTHRACENE | 1.73E-05 | 7.19E-03 | 100% | 3.20E-07 | 5.38E-07 | 4.74E-09 | 1.31E-09 | 2.92E-11 |
| BENZO(B)FLUORANTHENE | 5.75E-05 | 2.40E-02 | 100% | 5.56E-06 | 8.94E-06 | 3.70E-08 | 1.08E-08 | 9.91E-10 |
| BENZO(K)FLUORANTHENE | 5.73E-05 | 2.39E-02 | 100% | 3.25E-07 | 6.14E-07 | 4.30E-09 | 7.45E-10 | 8.71E-11 |
| CHRYSENE | 1.99E-05 | 8.27E-03 | 100% | 4.56E-06 | 7.21E-06 | 4.71E-08 | 1.62E-08 | 3.79E-10 |
| DIBENZ(A,H)ANTHRACENE | 1.27E-04 | 5.31E-02 | 100% | 9.24E-08 | 2.56E-07 | 1.46E-08 | 1.96E-10 | 4.16E-10 |
| INDENO(1,2,3-CD)PYRENE | 2.98E-04 | 1.24E-01 | 100% | 1.23E-07 | 3.50E-07 | 7.28E-08 | 1.64E-10 | 4.59E-09 |
| TOTAL PAH | 4.86E-05 | 2.03E-02 | 100% | 4.20E-07 | 1.13E-03 | 3.68E-09 | 2.73E-06 | 5.52E-08 |
| Volatiles | | | | | | | | |
| BENZENE | 4.95E-09 | 2.06E-06 | 100% | 2.55E-10 | 3.38E-11 | – | 1.01E-10 | 2.10E-16 |
| BROMOMETHANE | 4.69E-10 | 1.96E-07 | 100% | 1.76E-11 | 1.37E-10 | – | 5.98E-10 | 1.17E-16 |
| 1,3-BUTADIENE | 3.53E-09 | 1.47E-06 | 100% | 1.27E-11 | 7.23E-07 | – | 2.26E-06 | 3.32E-12 |
| CARBON TETRACHLORIDE | 1.88E-08 | 7.85E-06 | 100% | 7.16E-11 | 1.34E-12 | – | 1.68E-13 | 2.00E-18 |
| CHLOROFORM | 3.21E-09 | 1.34E-06 | 100% | 4.57E-10 | 2.42E-11 | – | 8.44E-12 | 1.21E-17 |
| CHLOROMETHANE | 2.89E-10 | 1.20E-07 | 100% | 1.79E-12 | 4.61E-06 | – | 2.27E-05 | 2.74E-12 |
| 1,1-DICHLOROETHYLENE | 4.77E-09 | 1.99E-06 | 100% | 2.31E-11 | 6.58E-09 | – | 1.98E-08 | 3.94E-14 |
| DICHLOROFLUOROMETHANE | 1.28E-09 | 5.34E-07 | 100% | 7.03E-13 | 1.80E-10 | – | 6.48E-10 | 3.47E-16 |
| TRANS-1,3-DICHLOROPROPENE | 9.28E-10 | 3.87E-07 | 100% | 9.39E-11 | 7.40E-11 | – | 2.82E-10 | 1.09E-16 |
| 1,1,2,2-TETRACHLOROETHANE | 1.59E-06 | 6.62E-04 | 100% | 3.44E-09 | 8.75E-10 | – | 8.40E-12 | 8.98E-15 |
| TRICHLOROFLUOROMETHANE | 1.23E-08 | 5.12E-06 | 100% | 3.87E-11 | 1.11E-12 | – | 3.01E-12 | 1.57E-17 |
| VINYL CHLORIDE | 5.05E-10 | 2.11E-07 | 100% | 5.80E-13 | 7.08E-08 | – | 7.17E-08 | 1.51E-14 |
| Dioxins | | | | | | | | |
| 2,3,7,8-TCDD (MAMMAL) | 7.81E-05 | 3.25E-02 | 100% | 1.87E-08 | 3.92E-08 | 1.61E-10 | 2.64E-11 | 5.30E-12 |
| 2,3,7,8-TCDD (FISH) | 7.81E-05 | 3.25E-02 | 100% | 2.88E-08 | 5.42E-08 | 2.50E-10 | 3.64E-11 | 7.89E-12 |
| 2,3,7,8-TCDD (BIRD) | 7.81E-05 | 3.25E-02 | 100% | 9.57E-08 | 1.80E-07 | 8.31E-10 | 1.21E-10 | 2.63E-11 |

BCFs from U.S. EPA, 1999c.
Hervivorous mammal tissue modeled based on parameters for a deer mouse.

TABLE 8-8
CALCULATION OF OMNIVOROUS MAMMAL TISSUE CONCENTRATIONS
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT
NORLITE FACILITY
COHOES, NY

| CPEC | Short-tailed Shrew: Bioconcentration Factors: soil-omnivore $BCF_{s-om}$ | plant-omnivore $BCF_{P-om}$ | Fraction of Diet (1): Invertebrate $F_I$ | Plant $F_P$ | Food Chain Multipliers: Trophic Level: Shrew $TL_T$ | Prey $TL_{s-N}$ | GREEN ISLAND: Surface Soil (mg/kg) | Hydric Soil (mg/kg) | Terrestrial Plant (mg/kg) | Wetland Plant (mg/kg) | Invertebrate Tissue (mg/kg$_{ww}$) | Wetland Inv. Tissue (mg/kg$_{ww}$) | Omnivore Tissue (mg/kg$_{ww}$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| INORGANICS | | | | | | | | | | | | | |
| ANTIMONY | 1.36E-05 | 6.20E-04 | 50% | 50% | 1 | 1 | 7.92E-06 | 3.08E-05 | 2.84E-07 | 7.39E-07 | 1.74E-06 | 6.78E-06 | 2.13E-06 |
| ARSENIC | 2.73E-05 | 1.24E-03 | 50% | 50% | 1 | 1 | 2.40E-06 | 9.15E-06 | 1.18E-07 | 3.95E-08 | 2.64E-07 | 1.01E-06 | 3.18E-07 |
| BARIUM | 2.05E-06 | 9.30E-05 | 50% | 50% | 1 | 1 | 3.88E-06 | 1.49E-05 | 2.01E-07 | 2.67E-07 | 6.54E-07 | 3.27E-06 | 1.03E-06 |
| BERYLLIUM | 1.36E-05 | 6.20E-04 | 50% | 50% | 1 | 1 | 4.57E-06 | 1.47E-05 | 1.76E-08 | 1.76E-08 | 1.00E-06 | 3.23E-06 | 1.06E-06 |
| CADMIUM | 1.64E-06 | 7.44E-05 | 50% | 50% | 1 | 1 | 4.40E-06 | 1.62E-05 | 5.00E-07 | 7.06E-07 | 4.23E-06 | 1.55E-05 | 4.94E-06 |
| CHROMIUM | 7.50E-05 | 3.41E-03 | 50% | 50% | 1 | 1 | 3.23E-05 | 1.02E-04 | 1.27E-07 | 9.16E-08 | 3.23E-07 | 1.02E-06 | 3.41E-07 |
| CHROMIUM VI | 7.50E-05 | 3.41E-03 | 50% | 50% | 1 | 1 | 4.29E-07 | 1.69E-06 | 2.14E-08 | 1.52E-09 | 4.29E-09 | 1.69E-08 | 5.39E-09 |
| LEAD | 4.09E-06 | 1.86E-04 | 50% | 50% | 1 | 1 | 2.22E-05 | 7.12E-05 | 1.77E-07 | 3.84E-07 | 6.66E-07 | 2.13E-06 | 7.00E-07 |
| INORGANIC MERCURY | 7.10E-05 | 3.24E-03 | 50% | 50% | 2.52 | 1 | 4.77E-04 | 1.61E-03 | 1.80E-05 | 7.28E-06 | 1.91E-05 | 6.46E-05 | 5.28E-05 |
| METHYL MERCURY | 1.06E-05 | 4.84E-04 | 50% | 50% | 2.52 | 1 | 6.48E-06 | 2.48E-04 | 4.52E-06 | 4.08E-06 | 7.21E-05 | 2.11E-03 | 1.37E-03 |
| NICKEL | 8.18E-05 | 3.72E-03 | 50% | 50% | 1 | 1 | 7.11E-05 | 2.64E-04 | 1.51E-06 | 1.01E-06 | 1.42E-06 | 5.28E-06 | 1.69E-06 |
| SELENIUM | 3.10E-05 | 1.41E-03 | 50% | 50% | 1 | 1 | 7.87E-08 | 3.16E-07 | 1.48E-08 | 6.07E-10 | 1.73E-08 | 6.96E-08 | 2.17E-08 |
| SILVER | 4.09E-05 | 1.86E-03 | 50% | 50% | 1 | 1 | 1.70E-06 | 6.79E-06 | 4.08E-07 | 3.26E-07 | 3.73E-07 | 1.49E-06 | 4.67E-07 |
| THALLIUM | 5.46E-04 | 2.48E-02 | 50% | 50% | 1 | 1 | 6.26E-06 | 2.31E-05 | 8.09E-08 | 1.11E-08 | 1.38E-06 | 5.08E-06 | 1.62E-06 |
| ZINC | 1.23E-06 | 5.58E-05 | 50% | 50% | 1 | 1 | 1.64E-04 | 6.11E-04 | 1.25E-05 | 8.80E-17 | 9.18E-05 | 3.42E-04 | 1.08E-04 |
| ORGANICS | | | | | | | | | | | | | |
| Semivolatiles | | | | | | | | | | | | | |
| HEXACHLOROCYCLOPENTADIENE | 2.77E-05 | 1.26E-03 | 50% | 50% | 2.8 | 1 | 3.70E-08 | 1.03E-06 | 2.21E-09 | 7.02E-09 | 2.76E-05 | 7.71E-04 | 5.59E-04 |
| HEXACHLOROBUTADIENE | 1.84E-05 | 8.37E-04 | 50% | 50% | 2.2 | 1 | 9.25E-10 | 6.58E-06 | 6.89E-11 | 6.61E-08 | 4.95E-07 | 3.52E-03 | 1.94E-03 |
| 2,4-DINITROTOLUENE | 3.40E-08 | 1.54E-06 | 50% | 50% | 1 | 1 | 2.04E-06 | 7.03E-06 | 5.64E-08 | 2.29E-06 | 6.29E-06 | 2.17E-05 | 6.99E-06 |
| 2,6-DINITROTOLUENE | 2.63E-08 | 1.20E-06 | 50% | 50% | 1 | 1 | 3.67E-06 | 3.42E-12 | 1.16E-05 | 1.29E-12 | 9.20E-06 | 6.57E-12 | 2.30E-06 |
| HEXACHLOROBENZENE | 1.09E-04 | 4.95E-03 | 50% | 50% | 6.3 | 1 | 3.44E-06 | 4.89E-10 | 9.33E-08 | 1.53E-12 | 7.88E-03 | 1.12E-06 | 1.24E-02 |
| 2-NITROANILINE | 2.63E-08 | 1.20E-06 | 50% | 50% | 1 | 1 | 5.41E-07 | 3.91E-06 | 1.83E-06 | 1.55E-06 | 1.27E-06 | 9.14E-06 | 2.60E-06 |
| PENTACHLOROPHENOL | 4.12E-05 | 1.87E-03 | 50% | 50% | 3.6 | 1 | 2.41E-06 | 4.42E-11 | 3.34E-07 | 2.38E-13 | 2.49E-03 | 4.57E-08 | 2.24E-03 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 5.50E-05 | 2.50E-03 | 50% | 50% | 4.2 | 1 | 6.15E-04 | 1.77E-09 | 2.31E-05 | 8.07E-12 | 8.03E-01 | 2.31E-06 | 8.44E-01 |
| BENZO(A)PYRENE | 4.61E-04 | 2.10E-02 | 50% | 50% | 11 | 1 | 5.42E-07 | 9.32E-07 | 4.74E-09 | 1.23E-09 | 3.79E-08 | 6.53E-08 | 2.84E-07 |
| BENZO(A)ANTHRACENE | 1.64E-04 | 7.44E-03 | 50% | 50% | 8 | 1 | 3.20E-07 | 5.38E-07 | 4.74E-09 | 1.31E-09 | 9.61E-09 | 1.62E-08 | 5.18E-08 |
| BENZO(B)FLUORANTHENE | 5.46E-04 | 2.48E-02 | 50% | 50% | 12 | 1 | 5.66E-06 | 8.94E-06 | 3.70E-08 | 1.08E-08 | 3.89E-07 | 6.28E-07 | 3.05E-06 |
| BENZO(K)FLUORANTHENE | 5.43E-04 | 2.47E-02 | 50% | 50% | 12 | 1 | 3.25E-07 | 6.14E-07 | 4.30E-09 | 7.45E-10 | 2.60E-08 | 4.91E-08 | 2.26E-07 |
| CHRYSENE | 1.88E-04 | 8.56E-03 | 50% | 50% | 8 | 1 | 4.56E-06 | 7.21E-06 | 4.71E-08 | 1.62E-08 | 1.82E-07 | 2.88E-07 | 9.43E-07 |
| DIBENZ(A,H)ANTHRACENE | 1.21E-03 | 5.49E-02 | 50% | 50% | 14 | 1 | 9.24E-08 | 2.66E-07 | 1.46E-08 | 1.96E-10 | 6.47E-09 | 1.79E-08 | 8.57E-08 |
| INDENO(1,2,3-CD)PYRENE | 2.82E-03 | 1.28E-01 | 50% | 50% | 14 | 1 | 1.23E-07 | 3.50E-07 | 7.28E-08 | 1.64E-10 | 9.84E-09 | 2.80E-08 | 1.35E-07 |
| TOTAL PAH | 4.61E-04 | 2.10E-02 | 50% | 50% | 11 | 1 | 4.20E-07 | 1.13E-03 | 3.68E-09 | 2.73E-06 | 3.15E-08 | 8.45E-05 | 2.33E-04 |
| Volatiles | | | | | | | | | | | | | |
| BENZENE | 4.69E-08 | 2.14E-06 | 50% | 50% | 1 | 1 | 2.55E-10 | 3.38E-11 | -- | 1.01E-10 | 1.03E-09 | 1.36E-10 | 2.91E-10 |
| BROMOMETHANE | 4.45E-09 | 2.03E-07 | 50% | 50% | 1 | 1 | 1.76E-11 | 1.37E-10 | -- | 5.98E-10 | 1.03E-11 | 8.00E-11 | 2.26E-11 |
| 1,3-BUTADIENE | 3.35E-08 | 1.52E-06 | 50% | 50% | 1 | 1 | 1.27E-11 | 7.23E-07 | -- | 2.26E-06 | 3.86E-11 | 2.20E-06 | 5.50E-07 |
| CARBON TETRACHLORIDE | 1.78E-07 | 8.12E-06 | 50% | 50% | 1 | 1 | 7.16E-11 | 1.34E-12 | -- | 1.68E-13 | 6.59E-10 | 1.61E-11 | 2.19E-10 |
| CHLOROFORM | 3.04E-08 | 1.38E-06 | 50% | 50% | 1 | 1 | 4.57E-10 | 2.42E-11 | -- | 8.44E-12 | 1.29E-09 | 6.84E-11 | 3.39E-10 |
| CHLOROMETHANE | 2.74E-09 | 1.25E-07 | 50% | 50% | 1 | 1 | 1.79E-12 | 4.61E-06 | -- | 2.27E-05 | 7.01E-13 | 1.81E-06 | 4.62E-07 |
| 1,1-DICHLOROETHYLENE | 4.52E-08 | 2.06E-06 | 50% | 50% | 1 | 1 | 2.31E-11 | 8.58E-09 | -- | 1.98E-08 | 9.00E-11 | 2.57E-08 | 6.44E-09 |
| DICHLOROFLUOROMETHANE | 1.21E-08 | 5.53E-07 | 50% | 50% | 1 | 1 | 7.03E-13 | 1.80E-10 | -- | 6.48E-10 | 9.34E-13 | 2.39E-10 | 5.99E-11 |
| TRANS-1,3-DICHLOROPROPENE | 8.80E-09 | 4.00E-07 | 50% | 50% | 1 | 1 | 9.39E-11 | 7.40E-11 | -- | 2.82E-10 | 9.58E-11 | 7.55E-11 | 4.28E-11 |
| 1,1,2,2-TETRACHLOROETHANE | 1.50E-05 | 6.85E-04 | 50% | 50% | 2 | 1 | 3.44E-09 | 8.75E-10 | -- | 8.40E-12 | 1.56E-06 | 3.97E-07 | 9.78E-07 |
| TRICHLOROFLUOROMETHANE | 1.16E-07 | 5.29E-06 | 50% | 50% | 1 | 1 | 3.87E-11 | 1.11E-12 | -- | 3.01E-12 | 3.27E-10 | 9.37E-12 | 8.40E-11 |
| VINYL CHLORIDE | 4.79E-09 | 2.18E-07 | 50% | 50% | 1 | 1 | 5.80E-13 | 7.08E-08 | -- | 7.17E-08 | 3.59E-13 | 4.39E-08 | 1.10E-08 |
| Dioxins | | | | | | | | | | | | | |
| 2,3,7,8-TCDD (MAMMAL) | 7.41E-04 | 3.37E-02 | 50% | 50% | 14 | 1 | 1.67E-08 | 3.92E-08 | 1.61E-10 | 2.64E-11 | 2.98E-08 | 6.23E-08 | 3.22E-07 |
| 2,3,7,8-TCDD (FISH) | 7.41E-04 | 3.37E-02 | 50% | 50% | 14 | 1 | 2.88E-08 | 5.42E-08 | 2.60E-10 | 3.64E-11 | 4.57E-08 | 8.62E-08 | 4.62E-07 |
| 2,3,7,8-TCDD (BIRD) | 7.41E-04 | 3.37E-02 | 50% | 50% | 14 | 1 | 9.57E-08 | 1.80E-07 | 8.31E-10 | 1.21E-10 | 1.52E-07 | 2.87E-07 | 1.54E-06 |

(1) Per U.S. EPA (1999) guidance, diet assumed to be equal between food items.
BCFs from U.S.EPA, 1999a
FCM from GLWQI, cited for use in U.S. EPA, 1999a
Omnivorous mammal tissue modeled based on parameters for short-tailed shrew.

**TABLE 8-9**
**CHRONIC SCREENING VALUES FOR SURFACE WATER**
**SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT**
**NORLITE FACILITY**
**COHOES, NY**

| CPEC | SCREENING VALUES | | |
|---|---|---|---|
| | CHRONIC SCREENING VALUE (MG/L) | REFERENCE | NOTES |
| **DISSOLVED** | | | |
| **INORGANIC COMPOUNDS** | | | |
| ANTIMONY | 3.00E-02 | U.S.EPA, 1999c | |
| ARSENIC | 1.50E-01 | AWQC | [a] |
| BARIUM | 4.00E-03 | U.S.EPA, 1999c | |
| BERYLLIUM | 6.60E-04 | U.S.EPA, 1999c | |
| CADMIUM | 1.30E-03 | AWQC | [c] |
| CHROMIUM | 4.20E-02 | AWQC | [b,c] |
| CHROMIUM VI | 1.10E-02 | AWQC | |
| LEAD | 1.20E-03 | AWQC | [c] |
| INORGANIC MERCURY | 7.70E-04 | AWQC | |
| METHYL MERCURY | 1.20E-05 | AWQC | [d] |
| NICKEL | 2.90E-02 | AWQC | [c] |
| SELENIUM | 4.60E-03 | AWQC | |
| SILVER | 1.20E-04 | U.S.EPA, 1999c | |
| THALLIUM | 4.00E-02 | U.S.EPA, 1999c | |
| ZINC | 6.60E-02 | AWQC | [c] |
| **TOTAL RECOVERABLE** | | | |
| **ORGANIC COMPOUNDS** | | | |
| **Semivolatile Compounds** | | | |
| HEXACHLOROCYCLOPENTADIENE | 5.20E-04 | U.S.EPA, 1999c | |
| HEXACHLOROBUTADIENE | 9.30E-04 | U.S.EPA, 1999c | |
| 2,4-DINITROTOLUENE | 2.30E-02 | U.S.EPA, 1999c | |
| 2,6-DINITROTOLUENE | 6.00E-02 | U.S.EPA, 1999c | |
| HEXACHLOROBENZENE | 3.68E-03 | U.S.EPA, 1999c | |
| 2-NITROANILINE | -- | | |
| PENTACHLOROPHENOL | 4.00E-04 | NYSDEC, 1999 | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 3.00E-03 | U.S.EPA, 1999c | |
| BENZO(A)PYRENE | 1.40E-05 | U.S.EPA, 1999c | |
| BENZO(A)ANTHRACENE | 2.70E-05 | U.S.EPA, 1999c | |
| BENZO(B)FLUORANTHENE | 2.70E-05 | U.S.EPA, 1999c | |
| BENZO(K)FLUORANTHENE | 2.70E-05 | U.S.EPA, 1999c | |
| CHRYSENE | 2.70E-05 | U.S.EPA, 1999c | |
| DIBENZ(A,H)ANTHRACENE | 2.70E-05 | U.S.EPA, 1999c | |
| INDENO(1,2,3-CD)PYRENE | 2.70E-05 | U.S.EPA, 1999c | |
| TOTAL PAH | 1.40E-05 | U.S.EPA, 1999c | |
| **Volatile Compounds** | | | |
| BENZENE | 2.10E-01 | NYSDEC, 1999 | |
| BROMOMETHANE | -- | | |
| 1,3-BUTADIENE | -- | | |
| CARBON TETRACHLORIDE | 9.80E-03 | SCV | |
| CHLOROFORM | 2.80E-02 | U.S.EPA, 1999c | |
| CHLOROMETHANE | -- | | |
| 1,1-DICHLOROETHYLENE | 5.90E-01 | SCV | |
| DICHLOROFLUOROMETHANE | -- | | |
| TRANS-1,3-DICHLOROPROPENE | -- | | |
| 1,1,2,2-TETRACHLOROETHANE | 6.10E-01 | SCV | |
| TRICHLOROFLUOROMETHANE | -- | | |
| VINYL CHLORIDE | 3.88E+00 | U.S.EPA, 1999c | |
| **Dioxins/Furans** | | | |
| 2,3,7,8-TCDD (MAMMAL) | 3.80E-09 | U.S.EPA, 1999c | |
| 2,3,7,8-TCDD (BIRD) | 3.80E-09 | U.S.EPA, 1999c | |
| 2,3,7,8-TCDD (FISH) | 3.80E-09 | U.S.EPA, 1999c | |

Notes:
-- = Not Available
[a] - Criterion for arsenic III
[b] - Criterion for chromium III
[c] - Normalized to hardness = 50 mg/L as $CaCO_3$
[d] Criterion is based on the Final Residue Value
[e] Pentachlorobenzene screeing value used as a surrogate
AWQC = Ambient Water Quality Criteria (U.S. EPA, 1999)
LOEL = Lowest Observed Effects Level (U.S. EPA, 1993)
SCV = Secondary Chronic Value (ORNL, 1996)
ORNL = Oak Ridge National Laboratory (Suter and Tsao, 1996)
U.S. EPA, 1999 -a Combustion Guidance
NYSDEC, 1999 = New York State Department of Environmental Conservation chronic surface water criterion.

**TABLE 8-10**
**LOW EFFECT SCREENING VALUES FOR SEDIMENT**
**SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT**
**NORLITE FACILITY**
**COHOES, NY**

| CEPC | SCREENING VALUES | | |
|---|---|---|---|
| | LOW EFFECT SCREENING VALUE | REFERENCE | NOTES |
| **INORGANIC COMPOUNDS (MG/KG)** | | | |
| ANTIMONY | 2.00E+00 | NYSDEC, 1999 | |
| ARSENIC | 6.00E+00 | NYSDEC, 1999 | |
| BARIUM | 2.00E+01 | U.S. EPA, 1999c | |
| BERYLLIUM | -- | NA | |
| CADMIUM | 6.00E-01 | NYSDEC, 1999 | |
| CHROMIUM | 2.60E+01 | NYSDEC, 1999 | |
| CHROMIUM VI | -- | | |
| LEAD | 3.10E+01 | NYSDEC, 1999 | |
| INORGANIC MERCURY | 1.50E-01 | U.S. EPA, 1999c | |
| METHYL MERCURY | 1.50E-01 | NYSDEC, 1999 | |
| NICKEL | 1.60E+01 | NYSDEC, 1999 | |
| SELENIUM | 1.00E-01 | U.S. EPA, 1999c | |
| SILVER | 1.00E+00 | NYSDEC, 1999 | |
| THALLIUM | -- | NA | |
| ZINC | 1.10E+02 | U.S. EPA, 1999c | |
| **ORGANIC COMPOUNDS (MG/KG)** | | | |
| **Semivolatile Compounds** | | | |
| HEXACHLOROCYCLOPENTADIENE | 1.98E-01 | U.S. EPA, 1999c | |
| HEXACHLOROBUTADIENE | 2.00E-02 | U.S. EPA, 1999c | |
| 2,4-DINITROTOLUENE | 4.69E-02 | U.S. EPA, 1999c | [A] |
| 2,6-DINITROTOLUENE | 1.01E-01 | U.S. EPA, 1999c | [A] |
| HEXACHLOROBENZENE | 2.23E+02 | NYSDEC, 1999 | [A] |
| 2-NITROANILINE | -- | | |
| PENTACHLOROPHENOL | 1.60E+00 | NYSDEC, 1999 | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 1.33E+01 | U.S. EPA, 1999c | [A] |
| BENZO(A)PYRENE | 8.40E-02 | U.S. EPA, 2000 | |
| BENZO(A)ANTHRACENE | 1.90E-02 | U.S. EPA, 2001 | |
| BENZO(B)FLUORANTHENE | 3.70E-02 | U.S. EPA, 2002 | |
| BENZO(K)FLUORANTHENE | 3.70E-02 | U.S. EPA, 2003 | |
| CHRYSENE | 3.00E-02 | U.S. EPA, 2004 | |
| DIBENZ(A,H)ANTHRACENE | 1.00E-02 | U.S. EPA, 2005 | |
| INDENO(1,2,3-CD)PYRENE | 3.00E-02 | U.S. EPA, 2006 | |
| TOTAL PAH | 4.00E+00 | OMOE LEL | |
| **Volatile Compounds** | | | |
| BENZENE | 1.12E+00 | NYSDEC, 1999 | |
| BROMOMETHANE | -- | | |
| 1,3-BUTADIENE | -- | | |
| CARBON TETRACHLORIDE | 1.88E-01 | ORNL | [A] |
| CHLOROFORM | 5.94E-02 | U.S. EPA, 1999a | [A] |
| CHLOROMETHANE | -- | | |
| 1,1-DICHLOROETHYLENE | 1.24E-01 | ORNL | [A] |
| DICHLOROFLUOROMETHANE | -- | | |
| TRANS-1,3-DICHLOROPROPENE | -- | | |
| 1,1,2,2-TETRACHLOROETHANE | 5.60E+00 | ORNL | [A] |
| TRICHLOROFLUOROMETHANE | -- | | |
| VINYL CHLORIDE | 1.72E+00 | U.S. EPA, 1999c | [A] |
| **Dioxins and Furans** | | | |
| 2,3,7,8-TCDD (MAMMAL) | 4.10E-04 | U.S. EPA, 1999c | [A] |
| 2,3,7,8-TCDD (BIRD) | 4.10E-04 | U.S. EPA, 1999c | [A] |
| 2,3,7,8-TCDD (FISH) | 4.10E-04 | U.S. EPA, 1999c | [A] |

Notes:
NA = Not Available
[A] Value calculated using EqP based on fractional organic carbon content of 0.04; as presented in U.S. EPA, 1999c
[B] Screening value for pentachlorobenzene used as surrogate.
LEL = Low Effects Level
OMOE = Ontario Ministry of the Environment (Persaud, et al., 1996)
ORNL = Oak Ridge National Laboratory (Jones, et al., 1997). Derived values based on Equilibrium Partitioning Methodology (U.S. EPA, 1993) and Tier II Secondary Chronic Values (Suter and Tsao, 1996)
NYSDEC, 1999 = New York State Department of Environmental Conservation sediment criterion.
U.S. EPA, 1999c Screening Level Ecological Risk Assesment Protocol for Hazardous Waste Combustion Facilities. Value derived using EqP.

**TABLE 8-11**
**PLANT AND INVERTEBRATE SCREENING VALUES FOR SURFACE SOILS**
**SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT**
**NORLITE FACILITY**
**COHOES, NY**

| CPEC (mg/kg) | SCREENING VALUES | | | |
|---|---|---|---|---|
| | PLANT | | INVERTEBRATE | |
| | Value | Notes | Value | Notes |
| **INORGANIC COMPOUNDS** | | | | |
| ANTIMONY | 0.5 | (a) | -- | |
| ARSENIC | 1 | (a) | 0.25 | (c) |
| BARIUM | 5 | (a) | -- | |
| BERYLLIUM | 0.1 | (a) | -- | |
| CADMIUM | 0.2 | (a) | 10 | (c) |
| CHROMIUM | 1 | (b) | 0.4 | (d) |
| CHROMIUM VI | -- | | -- | |
| LEAD | 4.6 | (a) | 100 | (c) |
| INORGANIC MERCURY | 0.349 | (a) | 2.5 | (c) |
| METHYL MERCURY | -- | (a) | 2.5 | (c) |
| NICKEL | 25 | (a) | 100 | (c) |
| SELENIUM | 0.05 | (a) | 7.7 | (c) |
| SILVER | 0.02 | (a) | -- | |
| THALLIUM | 0.01 | (a) | -- | |
| ZINC | 0.9 | (a) | 199 | (c) |
| **ORGANIC COMPOUNDS** | | | | |
| **Semivolatile Compounds** | | | | |
| HEXACHLOROCYCLOPENTADIENE | 0.1 | (a) | -- | |
| HEXACHLOROBUTADIENE | -- | | -- | |
| 2,4-DINITROTOLUENE | -- | | -- | |
| 2,6-DINITROTOLUENE | -- | | -- | |
| HEXACHLOROBENZENE | -- | | -- | |
| 2-NITROANILINE | -- | | -- | |
| PENTACHLOROPHENOL | 1.73 | (a) | 10 | (c) |
| BIS(2-ETHYLHEXYL)PHTHALATE | -- | | -- | |
| BENZO(A)PYRENE | 1.2 | (a) | 25 | (c) |
| BENZO(A)ANTHRACENE | 1.2 | (a) | 25 | (c) |
| BENZO(B)FLUORANTHENE | 1.2 | (a) | 25 | (c) |
| BENZO(K)FLUORANTHENE | 1.2 | (a) | 25 | (c) |
| CHRYSENE | 1.2 | (a) | 25 | (c) |
| DIBENZ(A,H)ANTHRACENE | 1.2 | (a) | 25 | (c) |
| INDENO(1,2,3-CD)PYRENE | 1.2 | (a) | 25 | (c) |
| TOTAL PAH | 1.2 | (a) | 25 | (c) |
| **Volatile Compounds** | | | | |
| BENZENE | -- | | -- | |
| BROMOMETHANE | -- | | -- | |
| 1,3-BUTADIENE | -- | | -- | |
| CARBON TETRACHLORIDE | -- | | -- | |
| CHLOROFORM | -- | | -- | |
| CHLOROMETHANE | -- | | -- | |
| 1,1-DICHLOROETHYLENE | -- | | -- | |
| DICHLOROFLUOROMETHANE | -- | | -- | |
| TRANS-1,3-DICHLOROPROPENE | -- | | -- | |
| 1,1,2,2-TETRACHLOROETHANE | -- | | -- | |
| TRICHLOROFLUOROMETHANE | -- | | -- | |
| VINYL CHLORIDE | -- | | -- | |
| **Dioxins/Furans** | | | | |
| 2,3,7,8-TCDD TE | | | | |
| 2,3,7,8-TCDD (MAMMAL) | -- | | 0.5 | (c) |
| 2,3,7,8-TCDD (BIRD) | -- | | 0.5 | (c) |

Notes:

'--' = None Available.
[a] U.S. EPA 1999A. Terrestrial plant toxicity values.
[b] Efroymson, et al., 1997a. These phytotoxicity values were derived by Oak Ridge National Laboratory based on experimental studies of terrestrial plants in soil and include chronic endpoints (e.g., growth).
[c] U.S. EPA 1999c Soil invertebrate toxicity values.
[d] - Efroymson, et al., 1997b. These soil invertebrate values were derived by Oak Ridge National Laboratory based on available studies on earthworms and include chronic effects endpoints (e.g., growth).

## TABLE 8-12
## EXPOSURE PARAMETERS FOR WILDLIFE RECEPTORS
## SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT
## NORLITE FACILITY
## COHOES, NY

| Receptor Species | Body Weight (kg) | Assumed Diet (% of diet) Wetland Invertebrate | Fish TL3 | Fish TL4 | Wetland Plants | Terrestrial Invertebrates | Small Mammals Herbivore | Small Mammals Omnivore | Terrestrial Plants | Food Ingestion Rate (kgdw/kgbw-da | Water Content of Biotic Food Items (kgwater/kgww) | Food Ingestion Rate (kgww/kgbw-da | Weighted Food Consumption Rate (kgww/kgbw-day) | Incidental Ingestion of Abiotic Media (kgdw/kgbw-day) | Water Intake Rate (kg/kgbw-day) | Exposure Duration (unitless) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **HERBIVORES** | | | | | | | | | | | | | | | | |
| Muskrat<br>(*Ondatra zibethicus*) | 0.873 [a] | -- | -- | -- | 100% [b] | -- | -- | -- | -- | 0.0510 [c] | 0.76 Aq Invert. [1]<br>0.75 Fish TL3 [1]<br>0.75 Fish TL4 [1]<br>0.85 Aq Plants [1]<br>0.84 Terr. Invert [1]<br>0.68 Herb.Mami [1]<br>0.68 Omn.Mami [1]<br>0.77 Terr. Plant [1] | 0.3400 [d] | -- Aq Invert.<br>-- Fish TL3<br>-- Fish TL4<br>0.3400 Aq Plants<br>-- Terr. Invert.<br>-- Herb. Mammal<br>-- Omn. Mammal<br>-- Terr. Plants | -- Soil<br>0.00064 Sediment [e] | 0.1004 [f] | 1 [g] |
| Deer Mouse<br>(*Peromyscus maniculatus*) | 0.0153 [a] | -- | -- | -- | -- | -- | -- | -- | 100% [b] | 0.1035 [c] | 0.76 Aq Invert. [1]<br>0.75 Fish TL3 [1]<br>0.75 Fish TL4 [1]<br>0.85 Aq Plants [1]<br>0.84 Terr. Invert [1]<br>0.68 Herb.Mami [1]<br>0.68 Omn.Mami [1]<br>0.77 Terr. Plant [1] | 0.4500 [d] | -- Aq Invert.<br>-- Fish TL3<br>-- Fish TL4<br>-- Aq Plants<br>-- Terr. Invert.<br>-- Herb. Mammal<br>-- Omn. Mammal<br>0.4500 Terr. Plants | 0.00144 Soil [e]<br>-- Sediment | 0.3400 [f] | 1 [g] |
| **OMNIVORES** | | | | | | | | | | | | | | | | |
| Short-tailed shrew<br>(*Blarina brevicauda*) | 0.015 [a] | 45% [b] | -- | -- | 5% [b] | 45% [b] | -- | -- | 5% [b] | 0.1234 [c] | 0.76 Aq Invert. [1]<br>0.75 Fish TL3 [1]<br>0.75 Fish TL4 [1]<br>0.85 Aq Plants [1]<br>0.84 Terr. Invert [1]<br>0.68 Herb.Mami [1]<br>0.68 Omn.Mami [1]<br>0.77 Terr. Plant [1] | 0.6200 [d] | 0.2790 Aq Invert.<br>-- Fish TL3<br>-- Fish TL4<br>0.0310 Aq Plants<br>0.2790 Terr. Invert.<br>-- Herb. Mammal<br>-- Omn. Mammal<br>0.0310 Terr. Plants | 0.0068 Soil [e]<br>0.0068 Sediment | 0.2230 [f] | 1 [g] |
| Raccoon<br>(*Procyon lotor*) | 3.99 [a] | 20% [b] | -- | -- | 20% [b] | 20% [b] | 10% [b] | 10% [b] | 20% [b] | 0.0537 [c] | 0.76 Aq Invert. [1]<br>0.75 Fish TL3 [1]<br>0.75 Fish TL4 [1]<br>0.85 Aq Plants [1]<br>0.84 Terr. Invert [1]<br>0.68 Herb.Mami [1]<br>0.68 Omn.Mami [1]<br>0.77 Terr. Plant [1] | 0.2637 [d] | 0.0448 Aq Invert.<br>-- Fish TL3<br>-- Fish TL4<br>0.0716 Aq Plants<br>0.0671 Terr. Invert.<br>0.0168 Herb. Mammal<br>0.0168 Omn. Mammal<br>0.0467 Terr. Plants | 0.0133 Soil [e]<br>0.0133 Sediment [e] | 0.0976 [f] | 1 [g] |
| American Robin<br>(*Turdus migratorius*) | 0.0773 [a] | -- | -- | -- | -- | 50% [b] | -- | -- | 50% [b] | 0.2964 [c] | 0.76 Aq Invert. [1]<br>0.75 Fish TL3 [1]<br>0.75 Fish TL4 [1]<br>0.85 Aq Plants [1]<br>0.84 Terr. Invert [1]<br>0.68 Herb.Mami [1]<br>0.68 Omn.Mami [1]<br>0.77 Terr. Plant [1] | 1.5200 [d] | -- Aq Invert.<br>-- Fish TL3<br>-- Fish TL4<br>-- Aq Plants<br>0.7600 Terr. Invert.<br>-- Herb. Mammal<br>-- Omn. Mammal<br>0.7600 Terr. Plants | 0.0143 Soil [e]<br>-- Sediment | 0.1373 [f] | 1 [g] |

## TABLE 8-12
## EXPOSURE PARAMETERS FOR WILDLIFE RECEPTORS
## SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT
## NORLITE FACILITY
## COHOES, NY

| Receptor Species | Weight (kg) | Diet (% of diet) Wetland Invertebrate | Fish TL3 | Fish TL4 | Wetland Plants | Terrestrial Invertebrates | Small Mammals Herbivore | Small Mammals Omnivore | Terrestrial Plants | Ingestion Rate (kgdw/kgbw-da | of Biotic Food Items (kgwater/kgww) | Ingestion Rate (kgww/kgbw-d | Food Consumption Rate (kgww/kgbw-day) | Ingestion of Abiotic Media (kgdw/kgbw-day) | Intake Rate (kg/kgbw-day) | Duration (unitless) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CARNIVORES** | | | | | | | | | | | | | | | | |
| Red-tailed Hawk<br>(*Buteo jamaicensis*) | 1.0555 [a] | -- | -- | -- | -- | -- | 55% [b] | 45% [b] | -- | 0.0352 [c] | 0.76 Aq Invert. [1]<br>0.75 Fish TL3 [1]<br>0.75 Fish TL4 [1]<br>0.85 Aq Plants [1]<br>0.84 Terr. Invert [1]<br>0.68 Herb.Mam [1]<br>0.68 Omn.Mam [1]<br>0.77 Terr. Plants [1] | 0.1100 [d] | -- Aq Invert.<br>-- Fish TL3<br>-- Fish TL4<br>-- Aq Plants<br>-- Terr. Invert.<br>0.0605 Herb. Mammal<br>0.0495 Omn. Mammal<br>-- Terr. Plants | 0.00995 Soil [e]<br>-- Sediment | 0.0580 [f] | 1 [g] |
| Mink<br>(*Mustela vison*) | 1.354 [a] | -- | 55% [b] | 45% [b] | -- | -- | -- | -- | -- | 0.0651 [c] | 0.76 Aq Invert. [1]<br>0.75 Fish TL3 [1]<br>0.75 Fish TL4 [1]<br>0.85 Aq Plants [1]<br>0.84 Terr. Invert [1]<br>0.68 Herb.Mam [1]<br>0.68 Omn.Mam [1]<br>0.77 Terr. Plants [1] | 0.2604 [d] | -- Aq Invert.<br>0.1432 Fish TL3<br>0.1172 Fish TL4<br>-- Aq Plants<br>-- Terr. Invert.<br>-- Herb. Mammal<br>-- Omn. Mammal<br>-- Terr. Plants | -- Soil<br>0.0019 Sediment [e] | 0.0987 [f] | 1 [g] |
| Osprey<br>(*Pandion haliaetus*) | 1.4855 [a] | -- | 50% [b] | 50% [b] | -- | -- | -- | -- | -- | 0.0525 [c] | 0.76 Aq Invert. [1]<br>0.75 Fish TL3 [1]<br>0.75 Fish TL4 [1]<br>0.85 Aq Plants [1]<br>0.84 Terr. Invert [1]<br>0.68 Herb.Mam [1]<br>0.68 Omn.Mam [1]<br>0.77 Terr. Plants [1] | 0.2100 [d] | -- Aq Invert.<br>0.1050 Fish TL3<br>0.1050 Fish TL4<br>-- Aq Plants<br>-- Terr. Invert.<br>-- Herb. Mammal<br>-- Omn. Mammal<br>-- Terr. Plants | -- Soil [e]<br>0.0005 Sediment | 0.0518 [f] | 1 [g] |
| Great Blue Heron<br>(*Ardea herodias*)<br>Diet at Hudson River, Erie Canal, & Wright/Bradley Lake | 2.229 [a] | -- | 70% [b] | 30% [b] | -- | -- | -- | -- | -- | 0.0450 [c] | 0.76 Aq Invert. [1]<br>0.75 Fish TL3 [1]<br>0.75 Fish TL4 [1]<br>0.85 Aq Plants [1]<br>0.84 Terr. Invert [1]<br>0.68 Herb.Mam [1] | 0.1800 [d] | -- Aq Invert.<br>0.1260 Fish TL3<br>0.0540 Fish TL4<br>-- Aq Plants<br>-- Terr. Invert.<br>-- Herb. Mammal | -- Soil [e]<br>0.0045 Sediment | 0.0453 [f] | 1 [g] |
| Great Blue Heron<br>(*Ardea herodias*)<br>Diet at Green Island | 2.229 [a] | 100% [b] | -- | -- | -- | -- | -- | -- | -- | 0.0432 [c] | 0.76 Aq Invert. [1]<br>0.75 Fish TL3 [1]<br>0.75 Fish TL4 [1]<br>0.85 Aq Plants [1]<br>0.84 Terr. Invert [1] | 0.1800 [d] | 0.1800 Aq Invert.<br>-- Fish TL3<br>-- Fish TL4<br>-- Aq Plants<br>-- Terr. Invert. | -- Soil [e]<br>0.0045 Hydric Soil | 0.0453 [f] | 1 [g] |

General Notes:
Refer to Appendix GEN-A for a comprehensive list of acronyms used in this table.
[1] Water content of organisms from EPA (1993); Wildlife Exposure Factors Handbook.
[2] Food ingestion rates are wet weight for food items and dry weight for sediment/soil ingestion. As needed, rate may be converted. See individual organism notes for source, units, and conversion.
kg = kilogram
dw = dry weight
ww = wet weight
bw = body weight

Footnotes for individual species parameters and assumptions continued on next page.

**TABLE 8-12**
**EXPOSURE PARAMETERS FOR WILDLIFE RECEPTORS**
**SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT**
**NORLITE FACILITY**
**COHOES, NY**

Notes for Muskrat (*Ondatra zibethicus*):
[a] Average weight of male and female muskrat in Idaho. Lowest body weight in U.S. EPA 1993.
[b] Estimation of dietary composition (U.S. EPA, 1993).
[c] Wet weight food ingestion rate converted to dry weight using the following equation:

$FIR_{dw}$ = Sum[(Proportion of $food_i$ in diet) x ($FIR_{ww}$) x (1-moisture $content_i$)]

[d] Diet of greens in Lousiana captive muskrat. Highest ingestion rate in U.S. EPA (1993).
[e] Recommended value from U.S. EPA 1999.
[f] Water intake rate calculated using equation of Calder and Braun (1983).
[g] Muskrat assumed to be present and actively foraging year-round.

Notes for Deer Mouse (*Peromyscus maniculatus*):
[a] Average weight of male and female mice. Lowest body weight in U.S. EPA 1993.
[b] Approximate diet based on qualitative assumptions. DeGraaf and Rudis, 1987
[c] Wet weight food ingestion rate converted to dry weight using the following equation:

$FIR_{dw}$ = Sum[(Proportion of $food_i$ in diet) x ($FIR_{ww}$) x (1-moisture $content_i$)]

[d] Ingestion rate of lactating female in Manitoba lab. Highest ingestion rate in U.S. EPA 1993.
[e] Recommended value from U.S. EPA 1999.
[f] Water intake rate of juvenile male mice in South Dakota lab. Highest ingestion rate in U.S. EPA 1993.
[g] Deer mouse assumed to be present and actively foraging year-round.

Notes for Short-tailed Shrew (*Blarina brevicauda*):
[a] Body weight of adult shrews in New Hamphire study. Lowest weight in U.S. EPA 1993.
[b] Estimated diet based on volume in stomach from a New York study (June through October) and a year-long study of diet based on frequency of occurrence in stomach contents in Eastern U.S. states (USEPA, 1993).
[c] Wet weight food ingestion rate converted to dry weight using the following equation:

$FIR_{dw}$ = Sum[(Proportion of $food_i$ in diet) x ($FIR_{ww}$) x (1-moisture $content_i$)]

[d] Ingestion rate of shrews in Wisconsin lab at 25 degrees C. Highest value reported in U.S. EPA 1993.
[e] Recommended value from U.S. EPA 1999.
[f] Water intake rate of shrews in Illinois lab. Highest value reported in U.S. EPA 1993.
[g] Short-tailed shrew assumed to be present and actively foraging year-round.

Notes for Raccoon (*Procyon lotor*):
[a] Average body weight of adult male and female raccoon from study in Alabama. Lowest value reported in U.S. EPA, 1993.
[b] As the raccoon is an opportunitistic feeder, prey items were assumed to be equally available and ingested.
[c] Average food ingestion rate (FIR) of *P. lotor* calculated using equation recommended in U.S. EPA 1993: Food Ingestion (kg dry weight/day) = 0.0687 x Wt.0.822
[d] Dry weight food ingestion rate converted to wet weight food ingestion rate:

$FIR_{ww}$ Sum {[(Proportion of $food_i$ in diet) x ($FIR_{dw}$)] / (1-moisture $content_i$)}

[e] Beyer, er al., as cited in USEPA, 1993
[f] Estimated water ingestion rate (kg/kgbw-day) using the allometric equation developed by Calder and Braun (1983) where Wl = (0.099*Wt^0.90)/Wt
[g] Raccoon assumed to be present and actively foraging year-round

Notes for American robin (*Turdus migratorius*):
[a] Average body weight of adult male and female robins from study in Pennsylvania. Lowest value reported in U.S. EPA, 1993.
[b] Average spring, summer, and fall dietary composition for adult T.migratorius in Eastern United States study (U.S. EPA, 1993) .
[c] Wet weight food ingestion rate converted to dry weight using the following equation:

$FIR_{dw}$ = Sum[(Proportion of $food_i$ in diet) x ($FIR_{ww}$) x (1-moisture $content_i$)]

[d] Ingestion rate of robins in Kansas study. Highest value reported in U.S. EPA 1993.
[e] Recommended value from U.S. EPA 1999.
[f] Estimated water ingestion rate (kg/kgbw-day) using the allometric equation developed by Calder and Braun (1983) where Wl = (0.059*Wt^0.67)/Wt
[g] American robin assumed assumed to be present and foraging year-round.

**TABLE 8-12**
**EXPOSURE PARAMETERS FOR WILDLIFE RECEPTORS**
**SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT**
**NORLITE FACILITY**
**COHOES, NY**

<u>Notes for Red-tailed Hawk</u>
[a] Average body weight of adult male and female hawks from study in southwest Idaho. Lowest value reported in U.S. EPA, 1993.
[b] Estimation of relative ingestion rate
[c] Wet weight food ingestion rate converted to dry weight using the following equation:
$FIR_{dw}$ = Sum((Proportion of $food_i$ in diet) x ($FIR_{ww}$) x (1-moisture $content_i$))
[d] Ingestion rate of female hawks in wintertime in Michigan captive/outdoor study. Highest value reported in U.S. EPA 1993.
[e] Recommended value from U.S. EPA 1999.
[f] Estimated water ingestion rate (kg/kgbw-day) using the allometric equation developed by Calder and Braun (1983) where WI = (0.059*Wt^0.67)/Wt
[g] Red-tailed hawk assumed to be present and actively foraging year-round.

<u>Notes for Mink</u>
[a] Average body weight of male and female farm-raised mink in Michigan. Highest body weight in U.S. EPA 1993.
[b] Assumed diet for evaluation of freshwater food web exposure pathway, based on Michigan study assuming all animal material is fish (U.S. EPA, 1993)
[c] Average food ingestion rate (FIR) of mink calculated using equation recommended in U.S. EPA 1993: Food ingestion (kg dry weight/day) = 0.0687 x Wt.0.822
[d] Dry weight food ingestion rate converted to wet weight food ingestion rate:
$FIR_{ww}$ Sum [[(Proportion of $food_i$ in diet) x ($FIR_{dw}$)] / (1-moisture $content_i$)]
[e] Recommended value from U.S. EPA 1999.
[f] Estimated water ingestion rate (kg/kgbw-day) using the allometric equation developed by Calder and Braun (1983) where WI = (0.099*Wt^0.90)/Wt
[g] Mink assumed to be present and actively foraging year-round.

<u>Notes for Osprey (*Pandion haliaetus*):</u>
[a] Average body weight of male and female osprey. Lowest value in U.S. EPA, 1993.
[b] Estimation of relative ingestion rate
[c] Wet weight food ingestion rate converted to dry weight using the following equation:
$FIR_{dw}$ = Sum((Proportion of $food_i$ in diet) x ($FIR_{ww}$) x (1-moisture $content_i$))
[d] Food ingestion rate of fmeale osprey during courtship in southeast Massachusetts. Highest value in U.S. EPA, 1993.
[e] Assumption based on best professional judgement.
[f] Estimated water ingestion rate (kg/kgbw-day) using the allometric equation developed by Calder and Braun (1983) where WI = (0.059*Wt^0.67)/Wt
[g] Osprey assumed assumed to be present and foraging year-round.

<u>Notes for Great Blue Heron (*Ardea herodias*):</u>
[a] Body weight of male and female great blue heron in eastern North America. Lowest weight reported in U.S. EPA 1993.
[b] Estimation of relative ingestion rate
[c] Wet weight food ingestion rate converted to dry weight using the following equation:
$FIR_{dw}$ = Sum((Proportion of $food_i$ in diet) x ($FIR_{ww}$) x (1-moisture $content_i$))
[d] Average food ingestion rate of adult male and female heron. Highest value reported in U.S. EPA 1993.
[e] Assumption based on best professional judgement.
[f] Estimated water ingestion rate (kg/kgbw-day) using the allometric equation developed by Calder and Braun (1983) where WI = (0.059*Wt^0.67)/Wt
[g] Great blue heron assumed assumed to be present and foraging year-round.

**TABLE 8-13**
**TOXICITY REFERENCE VALUES FOR VERTEBRATE WILDLIFE**
**SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT**
**NORLITE FACILITY**
**COHOES, NY**

| CPEC | Test Species | Body Weight (kg) | Test NOAEL (mg/$kg_{bw}$-day) | Scaling Factor: Muskrat body wt (kg) 0.87 | Scaling Factor: Raccoon body wt (kg) 3.99 | Scaling Factor: Deer Mouse body wt (kg) 0.02 | Scaling Factor: Short-Tailed Shrew body wt (kg) 0.02 | Scaling Factor: Mink body wt (kg) 1.35 | TRV (mg/$kg_{bw}$-day): Muskrat | TRV: All birds | TRV: Deer Mouse | TRV: Short-Tailed Shrew | TRV: Mink | TRV: Raccoon |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **INORGANICS** | | | | | | | | | | | | | | |
| ANTIMONY | Mouse<br>NA | 0.03<br>-- | 0.125<br>NA | 0.43 | 0.29 | 1.18 | 1.19 | 0.39 | 5.38E-02 | -- | 1.48E-01 | 1.49E-01 | 4.88E-02 | 3.63E-02 |
| ARSENIC | Mouse<br>Mallard | 0.03<br>1 | 0.126<br>5.14 | 0.43 | 0.29 | 1.18 | 1.19 | 0.39 | 5.42E-02 | 5.14E+00 | 1.49E-01 | 1.50E-01 | 4.91E-02 | 3.65E-02 |
| BARIUM | Rat<br>Chick | 0.44<br>0.12 | 5.06<br>20.8 | 0.84 | 0.58 | 2.32 | 2.33 | 0.76 | 4.25E+00 | 2.08E+01 | 1.17E+01 | 1.18E+01 | 3.85E+00 | 2.93E+00 |
| BERYLLIUM | Rat<br>NA | 0.35<br>-- | 0.66<br>NA | 0.80 | 0.54 | 2.19 | 2.2 | 0.71 | 5.28E-01 | -- | 1.45E+00 | 1.45E+00 | 4.69E-01 | 3.56E-01 |
| CADMIUM | Rat<br>Mallard | 0.303<br>1.153 | 1<br>1.45 | 0.77 | 0.52 | 2.11 | 2.12 | 0.69 | 7.70E-01 | 1.45E+00 | 2.11E+00 | 2.12E+00 | 6.90E-01 | 5.20E-01 |
| CHROMIUM | Rat<br>Black duck | 0.35<br>1.25 | 2737<br>1 | 0.80 | 0.54 | 2.19 | 2.2 | 0.71 | 2.19E+03 | 1.00E+00 | 5.99E+03 | 6.02E+03 | 1.94E+03 | 1.48E+03 |
| CHROMIUM VI | Rat<br>Black duck | 0.35<br>-- | 3.28<br>1 | 0.8 | 0.54 | 2.19 | 2.2 | 0.71 | 2.62E+00 | 1.00E+00 | 7.18E+00 | 7.22E+00 | 2.33E+00 | 1.77E+00 |
| LEAD | Rat<br>Japanese Quail | 0.35<br>0.15 | 8<br>1.13 | 0.80 | 0.54 | 2.19 | 2.2 | 0.71 | 6.40E+00 | 1.13E+00 | 1.75E+01 | 1.76E+01 | 5.68E+00 | 4.32E+00 |
| INORGANIC MERCURY | Mouse<br>Japanese Quail | 0.03<br>0.15 | 13.2<br>0.45 | 0.43 | 0.29 | 1.18 | 1.19 | 0.39 | 5.68E+00 | 4.50E-01 | 1.56E+01 | 1.57E+01 | 5.15E+00 | 3.83E+00 |
| METHYL MERCURY | Rat<br>Mallard | 0.35<br>1 | 0.032<br>0.0064 | 0.8 | 0.54 | 2.19 | 2.2 | 0.71 | 2.56E-02 | 6.40E-03 | 7.01E-02 | 7.04E-02 | 2.27E-02 | 1.73E-02 |
| NICKEL | Rat<br>Mallard duckling | 0.35<br>0.782 | 40<br>77.4 | 0.80 | 0.54 | 2.19 | 2.2 | 0.71 | 3.20E+01 | 7.74E+01 | 8.76E+01 | 8.80E+01 | 2.84E+01 | 2.16E+01 |
| SELENIUM | Rat<br>Mallard | 0.35<br>1 | 0.2<br>0.5 | 0.80 | 0.54 | 2.19 | 2.2 | 0.71 | 1.60E-01 | 5.00E-01 | 4.38E-01 | 4.40E-01 | 1.42E-01 | 1.08E-01 |
| SILVER | Rat<br>Chick | 0.35<br>0.07 | 18.1<br>2.29 | 0.8 | 0.54 | 2.19 | 2.2 | 0.71 | 1.45E+01 | 2.29E+00 | 3.96E+01 | 3.98E+01 | 1.29E+01 | 9.77E+00 |
| THALLIUM | Rat<br>Starling | 0.35<br>-- | 0.0131<br>0.35 | 0.8 | 0.54 | 2.19 | 2.2 | 0.71 | 1.05E-02 | 3.50E-01 | 2.87E-02 | 2.88E-02 | 9.30E-03 | 7.07E-03 |
| ZINC | Rat<br>Hens | 0.35<br>1.935 | 160<br>14.5 | 0.8 | 0.54 | 2.19 | 2.2 | 0.71 | 1.28E+02 | 1.45E+01 | 3.50E+02 | 3.52E+02 | 1.14E+02 | 8.64E+01 |
| **SEMI-VOLATILE ORGANICS** | | | | | | | | | | | | | | |
| HEXACHLOROCYCLOPENTADIENE | Rat<br>NA | 0.35<br>-- | 3.8<br>NA | 0.8 | 0.54 | 2.19 | 2.2 | 0.71 | 3.04E+00 | -- | 8.32E+00 | 8.36E+00 | 2.70E+00 | 2.05E+00 |
| HEXACHLOROBUTADIENE | Rat<br>Japanese Quail | 0.35<br>-- | 0.2<br>3.185 | 0.8 | 0.54 | 2.19 | 2.2 | 0.71 | 1.60E-01 | 3.19E+00 | 4.38E-01 | 4.40E-01 | 1.42E-01 | 1.08E-01 |
| 2,4-DINITROTOLUENE | Dog<br>NA | 12.7<br>-- | 0.7<br>NA | 1.95 | 1.34 | 5.37 | 5.39 | 1.75 | 1.37E+00 | -- | 3.76E+00 | 3.77E+00 | 1.23E+00 | 9.38E-01 |
| 2,6-DINITROTOLUENE | Dog<br>NA | 12.7<br>-- | 0.4<br>NA | 1.95 | 1.34 | 5.37 | 5.39 | 1.75 | 7.80E-01 | -- | 2.15E+00 | 2.16E+00 | 7.00E-01 | 5.36E-01 |
| HEXACHLOROBENZENE | Rat<br>Quail | 0.35<br>-- | 1.6<br>0.225 | 0.8 | 0.54 | 2.19 | 2.2 | 0.71 | 1.28E+00 | 2.25E-01 | 3.50E+00 | 3.52E+00 | 1.14E+00 | 8.64E-01 |
| 2-NITROANILINE | NA<br>NA | --<br>-- | NA<br>NA | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| PENTACHLOROPHENOL | Rat<br>Quail | 0.35<br>-- | 0.3<br>4.03 | 0.8 | 0.54 | 2.19 | 2.2 | 0.71 | 2.40E-01 | 4.03E+00 | 6.57E-01 | 6.60E-01 | 2.13E-01 | 1.62E-01 |
| BIS(2-ETHYLHEXYL)PHTHALATE | Mouse<br>Dove | 0.03<br>0.16 | 18.3<br>1.11 | 0.43 | 0.29 | 1.18 | 1.19 | 0.39 | 7.87E+00 | 1.11E+00 | 2.16E+01 | 2.18E+01 | 7.14E+00 | 5.31E+00 |
| BENZO(A)PYRENE | Mouse<br>Chicken embyo | 0.03<br>0.058 | 0.1<br>0.001 | 0.43 | 0.29 | 1.18 | 1.19 | 0.39 | 4.30E-02 | 1.00E-03 | 1.18E-01 | 1.19E-01 | 3.90E-02 | 2.90E-02 |
| BENZO(A)ANTHRACENE | Mouse<br>Chicken embyo | 0.03<br>0.058 | 0.167<br>0.00079 | 0.43 | 0.29 | 1.18 | 1.19 | 0.39 | 7.18E-02 | 7.90E-04 | 1.97E-01 | 1.99E-01 | 6.51E-02 | 4.84E-02 |
| BENZO(B)FLUORANTHENE | Mouse (BaP)<br>Chicken embyo | 0.03<br>0.058 | 0.1<br>0.00014 | 0.43 | 0.29 | 1.18 | 1.19 | 0.39 | 4.30E-02 | 1.40E-04 | 1.18E-01 | 1.19E-01 | 3.90E-02 | 2.90E-02 |
| BENZO(K)FLUORANTHENE | Mouse (BaP)<br>Chicken embyo | 0.03<br>0.058 | 0.1<br>0.00014 | 0.43 | 0.29 | 1.18 | 1.19 | 0.39 | 4.30E-02 | 1.40E-04 | 1.18E-01 | 1.19E-01 | 3.90E-02 | 2.90E-02 |

## TABLE 8-13
## TOXICITY REFERENCE VALUES FOR VERTEBRATE WILDLIFE
## SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT
## NORLITE FACILITY
## COHOES, NY

| CPEC | Test Species | Body Weight (kg) | Test NOAEL (mg/kg$_{bw}$-day) | Scaling Factor | | | | | TRV (mg/kg$_{bw}$-day) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Muskrat body wt (kg) 0.87 | Racoon body wt (kg) 3.99 | Deer Mouse body wt (kg) 0.02 | Short-Tailed Shrew body wt (kg) 0.02 | Mink body wt (kg) 1.35 | Muskrat | All birds | Deer Mouse | Short-Tailed Shrew | Mink | Racoon |
| CHRYSENE | Mouse (BaP)<br>Chicken embyo | 0.03<br>0.058 | 0.1<br>0.001 | 0.43 | 0.29 | 1.18 | 1.19 | 0.39 | 4.30E-02 | 1.00E-03 | 1.18E-01 | 1.19E-01 | 3.90E-02 | 2.90E-02 |
| DIBENZ(A,H)ANTHRACENE | Rat<br>Chicken embyo | 0.35<br>0.058 | 0.002<br>0.00039 | 0.8 | 0.64 | 2.19 | 2.2 | 0.71 | 1.60E-03 | 3.90E-04 | 4.38E-03 | 4.40E-03 | 1.42E-03 | 1.08E-03 |
| INDENO(1,2,3-CD)PYRENE | Mouse (BaP)<br>Chicken embyo | 0.03<br>0.058 | 0.1<br>0.001 | 0.43 | 0.29 | 1.18 | 1.19 | 0.39 | 4.30E-02 | 1.00E-03 | 1.18E-01 | 1.19E-01 | 3.90E-02 | 2.90E-02 |
| TOTAL PAH | Mouse<br>Mallard | 0.03<br>1 | 1<br>40 | 0.43 | 0.29 | 1.18 | 1.19 | 0.39 | 4.30E-01 | 4.00E+01 | 1.18E+00 | 1.19E+00 | 3.90E-01 | 2.90E-01 |
| **VOLATILE ORGANICS** | | | | | | | | | | | | | | |
| BENZENE | Mouse<br>NA | 0.03<br>-- | 26.36<br>NA | 0.43 | 0.29 | 1.18 | 1.19 | 0.39 | 1.13E+01 | -- | 3.11E+01 | 3.14E+01 | 1.03E+01 | 7.64E+00 |
| BROMOMETHANE | NA<br>NA | --<br>-- | NA<br>NA | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,3-BUTADIENE | NA<br>NA | --<br>-- | NA<br>NA | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CARBON TETRACHLORIDE | Rat<br>NA | 0.35<br>-- | 16<br>NA | 0.80 | 0.64 | 2.19 | 2.2 | 0.71 | 1.28E+01 | -- | 3.50E+01 | 3.52E+01 | 1.14E+01 | 8.64E+00 |
| CHLOROFORM | Rat<br>NA | 0.35<br>-- | 15<br>NA | 0.8 | 0.64 | 2.19 | 2.2 | 0.71 | 1.20E+01 | -- | 3.29E+01 | 3.30E+01 | 1.07E+01 | 8.10E+00 |
| CHLOROMETHANE | NA<br>NA | --<br>-- | NA<br>NA | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,1-DICHLOROETHYLENE | Rat<br>Chicken | 0.35<br>1.6 | 30<br>17.2 | 0.80 | 0.64 | 2.19 | 2.2 | 0.71 | 2.40E+01 | 1.72E+01 | 6.57E+01 | 6.60E+01 | 2.13E+01 | 1.62E+01 |
| DICHLOROFLUOROMETHANE | NA<br>NA | --<br>-- | NA<br>NA | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TRANS-1,3-DICHLOROPROPENE | NA<br>NA | --<br>-- | NA<br>NA | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,1,2,2-TETRACHLOROETHANE | Mouse (1122PCE)<br>Chicken embyo | 0.03<br>0.058 | 1.4<br>3.968 | 0.43 | 0.29 | 1.18 | 1.19 | 0.39 | 6.02E-01 | 3.97E+00 | 1.65E+00 | 1.67E+00 | 5.46E-01 | 4.06E-01 |
| TRICHLOROFLUOROMETHANE | NA<br>NA | --<br>-- | NA<br>NA | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| VINYL CHLORIDE | Rat<br>NA | 0.35<br>-- | 0.17<br>NA | 0.8 | 0.64 | 2.19 | 2.2 | 0.71 | 1.36E-01 | -- | 3.72E-01 | 3.74E-01 | 1.21E-01 | 9.18E-02 |
| **DIOXINS** | | | | | | | | | | | | | | |
| 2,3,7,8-TCDD TE | Rat<br>Pheasant | 0.35<br>1 | 0.000001<br>0.000014 | 0.8 | 0.64 | 2.19 | 2.2 | 0.71 | 8.00E-07 | 1.40E-05 | 2.19E-06 | 2.20E-06 | 7.10E-07 | 5.40E-07 |

Notes:
NA - Not available
NOAEL - No Observed Adverse Effects Level
Surrogate compound listed with test organism (i.e., Mouse (1122PCE)).

**TABLE 8-14**
**TOXICITY EQUIVALENCY FACTORS FOR WILDLIFE**
**SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT**
**NORLITE FACILITY**
**COHOES, NY**

| Dioxin Congener | Fish TEFs | Bird TEFs | Mammal TEFs |
|---|---|---|---|
| 2,3,7,8-Cl4-Dibenzofuran (DB5) | 0.05 | 1 | 0.1 |
| 2,3,7,8-Cl4-Dibenzo-p-dioxin | 1 | 1 | 1 |
| 1,2,3,7,8-Cl5-Dibenzofuran | 0.05 | 0.1 | 0.05 |
| 2,3,4,7,8-Cl5-Dibenzofuran | 0.5 | 1 | 0.5 |
| 1,2,3,7,8-Cl5-Dibenzo-p-dioxin | 1 | 0.1 | 1 |
| 1,2,3,4,7,8-Cl6-Dibenzofuran | 0.1 | 0.1 | 0.1 |
| 1,2,3,6,7,8-Cl6-Dibenzofuran | 0.1 | 0.1 | 0.1 |
| 2,3,4,6,7,8-Cl6-Dibenzofuran | 0.1 | 0.1 | 0.1 |
| 1,2,3,7,8,9-Cl6-Dibenzofuran | 0.1 | 0.1 | 0.1 |
| 1,2,3,4,7,8-Cl6-Dibenzo-p-dioxin | 0.5 | 0.05 | 0.1 |
| 1,2,3,6,7,8-Cl6-Dibenzo-p-dioxin | 0.01 | 0.01 | 0.1 |
| 1,2,3,7,8,9-Cl6-Dibenzo-p-dioxin | 0.01 | 0.1 | 0.1 |
| 1,2,3,4,6,7,8-Cl7-Dibenzofuran | 0.01 | 0.01 | 0.01 |
| 1,2,3,4,7,8,9-Cl7-Dibenzofuran | 0.01 | 0.01 | 0.01 |
| 1,2,3,4,6,7,8-Cl7-Dibenzo-p-dioxin | 0.001 | 0.001 | 0.01 |
| 1,2,3,4,6,7,8,9-Cl8-Dibenzofuran | 0.0001 | 0.0001 | 0.0001 |
| 1,2,3,4,6,7,8,9-Cl8-Dibenzo-p-dioxin | 0.0001 | 0.0001 | 0.0001 |

As presented in U.S. EPA 1999c

**TABLE 8-15**
**EVALUATION OF AQUATIC COMMUNITY RECEPTOR EXPOSURE TO MODELED CONCENTRATIONS OF CPECs IN THE HUDSON RIVER: SURFACE WATER SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT**
**NORLITE FACILITY**
**COHOES, NY**

| CPEC (MG/L) | Surface Water EPC | Surface Water Screening Value | Hazard Quotient |
|---|---|---|---|
| **INORGANICS** | | | |
| **DISSOLVED** | | | |
| ANTIMONY | 7.57E-10 | 3.00E-02 | 2.52E-08 |
| ARSENIC | 1.50E-10 | 1.50E-01 | 1.00E-09 |
| BARIUM | 2.66E-10 | 4.00E-03 | 6.64E-08 |
| BERYLLIUM | 3.26E-11 | 6.60E-04 | 4.94E-08 |
| CADMIUM | 1.70E-10 | 1.30E-03 | 1.31E-07 |
| CHROMIUM | 7.04E-12 | 4.20E-02 | 1.68E-10 |
| CHROMIUM VI | 6.18E-11 | 1.10E-02 | 5.62E-09 |
| LEAD | 1.50E-10 | 1.20E-03 | 1.25E-07 |
| INORGANIC MERCURY | 5.32E-10 | 7.70E-04 | 6.91E-07 |
| METHYL MERCURY | 1.10E-10 | 1.20E-05 | 9.18E-06 |
| NICKEL | 3.14E-09 | 2.90E-02 | 1.08E-07 |
| SELENIUM | 4.18E-11 | 4.60E-03 | 9.09E-09 |
| SILVER | 5.50E-10 | 1.20E-04 | 4.58E-06 |
| THALLIUM | 2.54E-10 | 4.00E-02 | 6.36E-09 |
| ZINC | 7.56E-09 | 6.60E-02 | 1.15E-07 |
| **ORGANICS** | | | |
| **Semivolatiles** | | | |
| HEXACHLOROCYCLOPENTADIENE | 4.50E-10 | 5.20E-04 | 8.66E-07 |
| HEXACHLOROBUTADIENE | 2.25E-11 | 9.30E-04 | 2.41E-08 |
| 2,4-DINITROTOLUENE | 8.60E-09 | 2.30E-02 | 3.74E-07 |
| 2,6-DINITROTOLUENE | 1.79E-08 | 6.00E-02 | 2.99E-07 |
| HEXACHLOROBENZENE | 1.69E-10 | 3.68E-03 | 4.59E-08 |
| 2-NITROANILINE | 3.01E-09 | -- | NC |
| PENTACHLOROPHENOL | 1.76E-09 | 4.00E-04 | 4.41E-06 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 4.17E-09 | 3.00E-03 | 1.39E-06 |
| BENZO(A)PYRENE | 2.17E-12 | 1.40E-05 | 1.55E-07 |
| BENZO(A)ANTHRACENE | 1.58E-12 | 2.70E-05 | 5.83E-08 |
| BENZO(B)FLUORANTHENE | 2.29E-11 | 2.70E-05 | 8.48E-07 |
| BENZO(K)FLUORANTHENE | 1.33E-12 | 2.70E-05 | 4.92E-08 |
| CHRYSENE | 2.10E-11 | 2.70E-05 | 7.79E-07 |
| DIBENZ(A,H)ANTHRACENE | 3.78E-13 | 2.70E-05 | 1.40E-08 |
| INDENO(1,2,3-CD)PYRENE | 4.96E-13 | 2.70E-05 | 1.84E-08 |
| TOTAL PAH | 1.68E-12 | 1.40E-05 | 1.20E-07 |
| **Volatiles** | | | |
| BENZENE | 7.39E-10 | 2.10E-01 | 3.52E-09 |
| BROMOMETHANE | 5.07E-10 | -- | NC |
| 1,3-BUTADIENE | 5.05E-10 | -- | NC |
| CARBON TETRACHLORIDE | 1.54E-10 | 9.80E-03 | 1.57E-08 |
| CHLOROFORM | 5.11E-10 | 2.80E-02 | 1.82E-08 |
| CHLOROMETHANE | 5.05E-10 | -- | NC |
| 1,1-DICHLOROETHYLENE | 1.70E-10 | 5.90E-01 | 2.88E-10 |
| DICHLOROFLUOROMETHANE | 5.08E-10 | -- | NC |
| TRANS-1,3-DICHLOROPROPENE | 1.71E-10 | -- | NC |
| 1,1,2,2-TETRACHLOROETHANE | 1.86E-10 | 6.10E-01 | 3.05E-10 |
| TRICHLOROFLUOROMETHANE | 5.07E-10 | -- | NC |
| VINYL CHLORIDE | 5.06E-10 | 3.88E+00 | 1.30E-10 |
| **Dioxins** | | | |
| 2,3,7,8-TCDD TE | | | |
| 2,3,7,8-TCDD (FISH) | 1.14E-13 | 3.80E-09 | 2.99E-05 |

Notes:
Surface water screening values are presented in Table 8-9

**TABLE 8-16**
**EVALUATION OF BENTHIC COMMUNITY RECEPTOR EXPOSURE TO MODELED CONCENTRATIONS OF CPECs IN THE HUDSON RIVER: SEDIMENT SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT**
**NORLITE FACILITY**
**COHOES, NY**

| CONSTITUENT (MG/KG) | Bed Sediment EPC | Sediment Screening Value[2] | Hazard Quotient |
|---|---|---|---|
| **INORGANICS** | | | |
| ANTIMONY | | | |
| ARSENIC | 6.77E-09 | 6.00E+00 | 1.13E-09 |
| BARIUM | 1.09E-08 | 2.00E+01 | 5.45E-10 |
| BERYLLIUM | 2.58E-08 | -- | NC |
| CADMIUM | 1.27E-08 | 6.00E-01 | 2.12E-08 |
| CHROMIUM | 1.27E-05 | 2.60E+01 | 4.87E-07 |
| CHROMIUM VI | 1.18E-09 | -- | NC |
| LEAD | 1.35E-07 | 3.10E+01 | 4.35E-09 |
| INORGANIC MERCURY | 2.66E-05 | 1.50E-01 | 1.77E-04 |
| METHYL MERCURY | 3.31E-07 | 1.50E-01 | 2.20E-06 |
| NICKEL | 2.04E-07 | 1.60E+01 | 1.27E-08 |
| SELENIUM | 2.09E-10 | 1.00E-01 | 2.09E-09 |
| SILVER | 4.57E-09 | 1.00E+00 | 4.57E-09 |
| THALLIUM | 1.81E-08 | -- | NC |
| ZINC | 4.69E-07 | 1.10E+02 | 4.26E-09 |
| **ORGANICS** | | | |
| **Semivolatiles** | | | |
| HEXACHLOROCYCLOPENTADIENE | 1.70E-07 | 1.98E-01 | 8.59E-07 |
| HEXACHLOROBUTADIENE | 6.19E-09 | 2.00E-02 | 3.09E-07 |
| 2,4-DINITROTOLUENE | 1.75E-08 | 4.69E-02 | 3.74E-07 |
| 2,6-DINITROTOLUENE | 3.01E-08 | 1.01E-01 | 2.99E-07 |
| HEXACHLOROBENZENE | 5.10E-07 | 2.23E+02 | 2.29E-09 |
| 2-NITROANILINE | 4.72E-09 | -- | NC |
| PENTACHLOROPHENOL | 3.56E-08 | 1.60E+00 | 2.22E-08 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 1.71E-05 | 1.33E+01 | 1.29E-06 |
| BENZO(A)PYRENE | 4.87E-08 | 8.40E-02 | 5.80E-07 |
| BENZO(A)ANTHRACENE | 1.37E-08 | 1.90E-02 | 7.22E-07 |
| BENZO(B)FLUORANTHENE | 4.70E-07 | 3.70E-02 | 1.27E-05 |
| BENZO(K)FLUORANTHENE | 2.72E-08 | 3.70E-02 | 7.36E-07 |
| CHRYSENE | 2.05E-07 | 3.00E-02 | 6.82E-06 |
| DIBENZ(A,H)ANTHRACENE | 1.16E-08 | 1.00E-02 | 1.16E-06 |
| INDENO(1,2,3-CD)PYRENE | 1.99E-08 | 3.00E-02 | 6.64E-07 |
| TOTAL PAH | 3.77E-08 | 4.00E+00 | 9.44E-09 |
| **Volatiles** | | | |
| BENZENE | 1.83E-09 | 1.12E+00 | 1.64E-09 |
| BROMOMETHANE | 1.83E-10 | -- | NC |
| 1,3-BUTADIENE | 1.02E-09 | -- | NC |
| CARBON TETRACHLORIDE | 9.35E-10 | 1.88E-01 | 4.98E-09 |
| CHLOROFORM | 1.08E-09 | 5.94E-02 | 1.82E-08 |
| CHLOROMETHANE | 1.21E-10 | -- | NC |
| 1,1-DICHLOROETHYLENE | 4.42E-10 | 1.24E-01 | 3.56E-09 |
| DICHLOROFLUOROMETHANE | 1.39E-09 | -- | NC |
| TRANS-1,3-DICHLOROPROPENE | 1.85E-10 | -- | NC |
| 1,1,2,2-TETRACHLOROETHANE | 5.87E-10 | 5.60E+00 | 1.05E-10 |
| TRICHLOROFLUOROMETHANE | 2.71E-09 | -- | NC |
| VINYL CHLORIDE | 2.25E-10 | 1.72E+00 | 1.30E-10 |
| **Dioxins** | | | |
| 2,3,7,8-TCDD TE | | | |
| 2,3,7,8-TCDD (FISH) | 4.06E-09 | 4.10E-04 | 9.91E-06 |

Notes:
Sediment screening values presented in Table 8-10

**TABLE 8-17**
**EVALUATION OF AQUATIC COMMUNITY RECEPTOR EXPOSURE TO MODELED CONCENTRATIONS OF CPECs IN THE ERIE CANAL: SURFACE WATER SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT**
**NORLITE FACILITY**
**COHOES, NY**

| CPEC (MG/L) | Surface Water EPC | Surface Water Screening Value | Hazard Quotient |
|---|---|---|---|
| INORGANICS | | | |
| DISSOLVED | | | |
| ANTIMONY | 1.05E-08 | 3.00E-02 | 3.50E-07 |
| ARSENIC | 2.12E-09 | 1.50E-01 | 1.41E-08 |
| BARIUM | 3.73E-09 | 4.00E-03 | 9.32E-07 |
| BERYLLIUM | 6.11E-10 | 6.60E-04 | 9.25E-07 |
| CADMIUM | 2.46E-09 | 1.30E-03 | 1.89E-06 |
| CHROMIUM | 6.11E-11 | 4.20E-02 | 1.46E-09 |
| CHROMIUM VI | 8.49E-10 | 1.10E-02 | 7.72E-08 |
| LEAD | 2.85E-09 | 1.20E-03 | 2.37E-06 |
| INORGANIC MERCURY | 8.79E-09 | 7.70E-04 | 1.14E-05 |
| METHYL MERCURY | 2.76E-09 | 1.20E-05 | 2.30E-04 |
| NICKEL | 4.50E-08 | 2.90E-02 | 1.55E-06 |
| SELENIUM | 5.65E-10 | 4.60E-03 | 1.23E-07 |
| SILVER | 7.46E-09 | 1.20E-04 | 6.22E-05 |
| THALLIUM | 3.66E-09 | 4.00E-02 | 9.16E-08 |
| ZINC | 1.08E-07 | 6.60E-02 | 1.64E-06 |
| ORGANICS - TOTAL | | | |
| Semivolatiles | | | |
| HEXACHLOROCYCLOPENTADIENE | 2.04E-09 | 5.20E-04 | 3.92E-06 |
| HEXACHLOROBUTADIENE | 1.01E-10 | 9.30E-04 | 1.09E-07 |
| 2,4-DINITROTOLUENE | 1.95E-07 | 2.30E-02 | 8.46E-06 |
| 2,6-DINITROTOLUENE | 4.08E-07 | 6.00E-02 | 6.80E-06 |
| HEXACHLOROBENZENE | 1.50E-09 | 3.68E-03 | 4.08E-07 |
| 2-NITROANILINE | 7.08E-08 | -- | NC |
| PENTACHLOROPHENOL | 3.50E-08 | 4.00E-04 | 8.75E-05 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 1.35E-07 | 3.00E-03 | 4.50E-05 |
| BENZO(A)PYRENE | 5.79E-11 | 1.40E-05 | 4.13E-06 |
| BENZO(A)ANTHRACENE | 5.24E-11 | 2.70E-05 | 1.94E-06 |
| BENZO(B)FLUORANTHENE | 6.61E-10 | 2.70E-05 | 2.45E-05 |
| BENZO(K)FLUORANTHENE | 3.43E-11 | 2.70E-05 | 1.27E-06 |
| CHRYSENE | 6.89E-10 | 2.70E-05 | 2.55E-05 |
| DIBENZ(A,H)ANTHRACENE | 6.32E-12 | 2.70E-05 | 2.34E-07 |
| INDENO(1,2,3-CD)PYRENE | 7.28E-12 | 2.70E-05 | 2.70E-07 |
| TOTAL PAH | 4.49E-11 | 1.40E-05 | 3.20E-06 |
| Volatiles | | | |
| BENZENE | 3.26E-09 | 2.10E-01 | 1.55E-08 |
| BROMOMETHANE | 2.15E-09 | -- | NC |
| 1,3-BUTADIENE | 2.05E-09 | -- | NC |
| CARBON TETRACHLORIDE | 6.67E-10 | 9.80E-03 | 6.81E-08 |
| CHLOROFORM | 2.28E-09 | 2.80E-02 | 8.13E-08 |
| CHLOROMETHANE | 2.08E-09 | -- | NC |
| 1,1-DICHLOROETHYLENE | 7.27E-10 | 5.90E-01 | 1.23E-09 |
| DICHLOROFLUOROMETHANE | 2.21E-09 | -- | NC |
| TRANS-1,3-DICHLOROPROPENE | 7.80E-10 | -- | NC |
| 1,1,2,2-TETRACHLOROETHANE | 1.21E-09 | 6.10E-01 | 1.98E-09 |
| TRICHLOROFLUOROMETHANE | 2.18E-09 | -- | NC |
| VINYL CHLORIDE | 2.12E-09 | 3.88E+00 | 5.48E-10 |
| Dioxins | | | |
| 2,3,7,8-TCDD TE | | | |
| 2,3,7,8-TCDD (FISH) | 2.54E-12 | 3.80E-09 | 6.70E-04 |

Notes:
Surface water screening values are presented in Table 8-9

**TABLE 8-18**
**EVALUATION OF BENTHIC COMMUNITY RECEPTOR EXPOSURE TO MODELED CONCENTRATIONS OF CPECs IN THE ERIE CANAL: SEDIMENT SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT**
**NORLITE FACILITY**
**COHOES, NY**

| CPEC (MG/KG) | Bed Sediment EPC | Sediment Screening Value | Hazard Quotient |
|---|---|---|---|
| **INORGANICS** | | | |
| ANTIMONY | 3.05E-07 | 2.00E+00 | 1.52E-07 |
| ARSENIC | 9.54E-08 | 6.00E+00 | 1.59E-08 |
| BARIUM | 1.53E-07 | 2.00E+01 | 7.64E-09 |
| BERYLLIUM | 4.82E-07 | -- | NC |
| CADMIUM | 1.84E-07 | 6.00E-01 | 3.07E-07 |
| CHROMIUM | 1.10E-04 | 2.60E+01 | 4.23E-06 |
| CHROMIUM VI | 1.61E-08 | -- | NC |
| LEAD | 2.56E-06 | 3.10E+01 | 8.27E-08 |
| INORGANIC MERCURY | 4.39E-04 | 1.50E-01 | 2.93E-03 |
| METHYL MERCURY | 8.27E-06 | 1.50E-01 | 5.51E-05 |
| NICKEL | 2.92E-06 | 1.60E+01 | 1.83E-07 |
| SELENIUM | 2.82E-09 | 1.00E-01 | 2.82E-08 |
| SILVER | 6.19E-08 | 1.00E+00 | 6.19E-08 |
| THALLIUM | 2.60E-07 | -- | NC |
| ZINC | 6.71E-06 | 1.10E+02 | 6.10E-08 |
| **ORGANICS** | | | |
| **Semivolatiles** | | | |
| HEXACHLOROCYCLOPENTADIENE | 7.69E-07 | 1.98E-01 | 3.89E-06 |
| HEXACHLOROBUTADIENE | 2.78E-08 | 2.00E-02 | 1.39E-06 |
| 2,4-DINITROTOLUENE | 3.97E-07 | 4.69E-02 | 8.47E-06 |
| 2,6-DINITROTOLUENE | 6.85E-07 | 1.01E-01 | 6.81E-06 |
| HEXACHLOROBENZENE | 4.53E-06 | 2.23E+02 | 2.03E-08 |
| 2-NITROANILINE | 1.11E-07 | -- | NC |
| PENTACHLOROPHENOL | 7.07E-07 | 1.60E+00 | 4.42E-07 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 5.53E-04 | 1.33E+01 | 4.16E-05 |
| BENZO(A)PYRENE | 1.30E-06 | 8.40E-02 | 1.54E-05 |
| BENZO(A)ANTHRACENE | 4.56E-07 | 1.90E-02 | 2.40E-05 |
| BENZO(B)FLUORANTHENE | 1.36E-05 | 3.70E-02 | 3.67E-04 |
| BENZO(K)FLUORANTHENE | 7.04E-07 | 3.70E-02 | 1.90E-05 |
| CHRYSENE | 6.71E-06 | 3.00E-02 | 2.24E-04 |
| DIBENZ(A,H)ANTHRACENE | 1.93E-07 | 1.00E-02 | 1.93E-05 |
| INDENO(1,2,3-CD)PYRENE | 2.93E-07 | 3.00E-02 | 9.75E-06 |
| TOTAL PAH | 1.01E-06 | 4.00E+00 | 2.51E-07 |
| **Volatiles** | | | |
| BENZENE | 8.09E-09 | 1.12E+00 | 7.22E-09 |
| BROMOMETHANE | 7.74E-10 | -- | NC |
| 1,3-BUTADIENE | 4.13E-09 | -- | NC |
| CARBON TETRACHLORIDE | 4.06E-09 | 1.88E-01 | 2.16E-08 |
| CHLOROFORM | 4.83E-09 | 5.94E-02 | 8.13E-08 |
| CHLOROMETHANE | 5.00E-10 | -- | NC |
| 1,1-DICHLOROETHYLENE | 1.89E-09 | 1.24E-01 | 1.52E-08 |
| DICHLOROFLUOROMETHANE | 6.05E-09 | -- | NC |
| TRANS-1,3-DICHLOROPROPENE | 8.42E-10 | -- | NC |
| 1,1,2,2-TETRACHLOROETHANE | 3.82E-09 | 5.60E+00 | 6.81E-10 |
| TRICHLOROFLUOROMETHANE | 1.16E-08 | -- | NC |
| VINYL CHLORIDE | 9.43E-10 | 1.72E+00 | 5.48E-10 |
| **Dioxins** | | | |
| 2,3,7,8-TCDD TE | | | |
| 2,3,7,8-TCDD (FISH) | 9.10E-08 | 4.10E-04 | 2.22E-04 |

Notes:
Sediment screening values presented in Table 8-10

**TABLE 8-19**
**EVALUATION OF AQUATIC COMMUNITY RECEPTOR EXPOSURE TO MODELED CONCENTRATIONS OF CPECs IN WRIGHT-BRADLEY LAKE: SURFACE WATER SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT**
**NORLITE FACILITY**
**COHOES, NY**

| CPEC (MG/L) | Surface Water EPC | Surface Water Screening Value | Hazard Quotient |
|---|---|---|---|
| **INORGANICS** | | | |
| **DISSOLVED** | | | |
| ANTIMONY | 5.91E-08 | 3.00E-02 | 1.97E-06 |
| ARSENIC | 1.20E-08 | 1.50E-01 | 7.98E-08 |
| BARIUM | 2.10E-08 | 4.00E-03 | 5.26E-06 |
| BERYLLIUM | 3.53E-09 | 6.60E-04 | 5.35E-06 |
| CADMIUM | 1.40E-08 | 1.30E-03 | 1.08E-05 |
| CHROMIUM | 6.21E-11 | 4.20E-02 | 1.48E-09 |
| CHROMIUM VI | 4.76E-09 | 1.10E-02 | 4.33E-07 |
| LEAD | 1.63E-08 | 1.20E-03 | 1.36E-05 |
| INORGANIC MERCURY | 1.59E-08 | 7.70E-04 | 2.06E-05 |
| METHYL MERCURY | 1.38E-08 | 1.20E-05 | 1.15E-03 |
| NICKEL | 2.55E-07 | 2.90E-02 | 8.81E-06 |
| SELENIUM | 3.15E-09 | 4.60E-03 | 6.85E-07 |
| SILVER | 4.17E-08 | 1.20E-04 | 3.47E-04 |
| THALLIUM | 2.08E-08 | 4.00E-02 | 5.21E-07 |
| ZINC | 6.14E-07 | 6.60E-02 | 9.30E-06 |
| **ORGANICS - TOTAL** | | | |
| **Semivolatiles** | | | |
| HEXACHLOROCYCLOPENTADIENE | 5.01E-09 | 5.20E-04 | 9.64E-06 |
| HEXACHLOROBUTADIENE | 2.48E-10 | 9.30E-04 | 2.67E-07 |
| 2,4-DINITROTOLUENE | 8.71E-07 | 2.30E-02 | 3.79E-05 |
| 2,6-DINITROTOLUENE | 1.82E-06 | 6.00E-02 | 3.04E-05 |
| HEXACHLOROBENZENE | 3.35E-09 | 3.68E-03 | 9.10E-07 |
| 2-NITROANILINE | 3.16E-07 | – | NC |
| PENTACHLOROPHENOL | 1.20E-07 | 4.00E-04 | 3.00E-04 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 4.03E-07 | 3.00E-03 | 1.34E-04 |
| BENZO(A)PYRENE | 9.44E-11 | 1.40E-05 | 6.74E-06 |
| BENZO(A)ANTHRACENE | 1.26E-10 | 2.70E-05 | 4.66E-06 |
| BENZO(B)FLUORANTHENE | 1.10E-09 | 2.70E-05 | 4.06E-05 |
| BENZO(K)FLUORANTHENE | 5.89E-11 | 2.70E-05 | 2.18E-06 |
| CHRYSENE | 1.62E-09 | 2.70E-05 | 6.00E-05 |
| DIBENZ(A,H)ANTHRACENE | 9.35E-12 | 2.70E-05 | 3.46E-07 |
| INDENO(1,2,3-CD)PYRENE | 9.53E-12 | 2.70E-05 | 3.53E-07 |
| TOTAL PAH | 7.32E-11 | 1.40E-05 | 5.23E-06 |
| **Volatiles** | | | |
| BENZENE | 7.42E-09 | 2.10E-01 | 3.53E-08 |
| BROMOMETHANE | 4.63E-09 | – | NC |
| 1,3-BUTADIENE | 4.07E-09 | – | NC |
| CARBON TETRACHLORIDE | 1.53E-09 | 9.80E-03 | 1.56E-07 |
| CHLOROFORM | 5.08E-09 | 2.80E-02 | 1.82E-07 |
| CHLOROMETHANE | 4.29E-09 | – | NC |
| 1,1-DICHLOROETHYLENE | 1.61E-09 | 5.90E-01 | 2.74E-09 |
| DICHLOROFLUOROMETHANE | 5.19E-09 | – | NC |
| TRANS-1,3-DICHLOROPROPENE | 1.79E-09 | – | NC |
| 1,1,2,2-TETRACHLOROETHANE | 2.96E-09 | 6.10E-01 | 4.85E-09 |
| TRICHLOROFLUOROMETHANE | 4.97E-09 | – | NC |
| VINYL CHLORIDE | 4.59E-09 | 3.88E+00 | 1.18E-09 |
| **Dioxins** | | | |
| 2,3,7,8-TCDD TE | | | |
| 2,3,7,8-TCDD (FISH) | 3.47E-12 | 3.80E-09 | 9.14E-04 |

Notes:
Surface water screening values are presented in Table 8-9

**TABLE 8-20**
**EVALUATION OF BENTHIC COMMUNITY RECEPTOR EXPOSURE TO MODELED CONCENTRATIONS OF CPECs IN WRIGHT-BRADLEY LAKE: SEDIMENT SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT**
**NORLITE FACILITY**
**COHOES, NY**

| CPEC (MG/KG) | Bed Sediment EPC | Sediment Screening Value | Hazard Quotient |
|---|---|---|---|
| **INORGANICS** | | | |
| ANTIMONY | 1.71E-06 | 2.00E+00 | 8.57E-07 |
| ARSENIC | 5.39E-07 | 6.00E+00 | 8.98E-08 |
| BARIUM | 8.63E-07 | 2.00E+01 | 4.31E-08 |
| BERYLLIUM | 2.79E-06 | -- | NC |
| CADMIUM | 1.05E-06 | 6.00E-01 | 1.75E-06 |
| CHROMIUM | 1.12E-04 | 2.60E+01 | 4.30E-06 |
| CHROMIUM VI | 9.04E-08 | -- | NC |
| LEAD | 1.47E-05 | 3.10E+01 | 4.75E-07 |
| INORGANIC MERCURY | 7.93E-04 | 1.50E-01 | 5.28E-03 |
| METHYL MERCURY | 4.15E-05 | 1.50E-01 | 2.76E-04 |
| NICKEL | 1.66E-05 | 1.60E+01 | 1.04E-06 |
| SELENIUM | 1.58E-08 | 1.00E-01 | 1.58E-07 |
| SILVER | 3.46E-07 | 1.00E+00 | 3.46E-07 |
| THALLIUM | 1.48E-06 | -- | NC |
| ZINC | 3.80E-05 | 1.10E+02 | 3.46E-07 |
| **ORGANICS** | | | |
| **Semivolatiles** | | | |
| HEXACHLOROCYCLOPENTADIENE | 1.89E-06 | 1.98E-01 | 9.56E-06 |
| HEXACHLOROBUTADIENE | 6.85E-08 | 2.00E-02 | 3.42E-06 |
| 2,4-DINITROTOLUENE | 1.78E-06 | 4.69E-02 | 3.79E-05 |
| 2,6-DINITROTOLUENE | 3.07E-06 | 1.01E-01 | 3.05E-05 |
| HEXACHLOROBENZENE | 1.01E-05 | 2.23E+02 | 4.54E-08 |
| 2-NITROANILINE | 4.96E-07 | -- | NC |
| PENTACHLOROPHENOL | 2.43E-06 | 1.60E+00 | 1.52E-06 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 1.65E-03 | 1.33E+01 | 1.24E-04 |
| BENZO(A)PYRENE | 2.12E-06 | 8.40E-02 | 2.52E-05 |
| BENZO(A)ANTHRACENE | 1.09E-06 | 1.90E-02 | 5.76E-05 |
| BENZO(B)FLUORANTHENE | 2.25E-05 | 3.70E-02 | 6.09E-04 |
| BENZO(K)FLUORANTHENE | 1.21E-06 | 3.70E-02 | 3.26E-05 |
| CHRYSENE | 1.58E-05 | 3.00E-02 | 5.25E-04 |
| DIBENZ(A,H)ANTHRACENE | 2.86E-07 | 1.00E-02 | 2.86E-05 |
| INDENO(1,2,3-CD)PYRENE | 3.83E-07 | 3.00E-02 | 1.28E-05 |
| TOTAL PAH | 1.64E-06 | 4.00E+00 | 4.10E-07 |
| **Volatiles** | | | |
| BENZENE | 1.84E-08 | 1.12E+00 | 1.64E-08 |
| BROMOMETHANE | 1.67E-09 | -- | NC |
| 1,3-BUTADIENE | 8.23E-09 | -- | NC |
| CARBON TETRACHLORIDE | 9.31E-09 | 1.88E-01 | 4.95E-08 |
| CHLOROFORM | 1.08E-08 | 5.94E-02 | 1.81E-07 |
| CHLOROMETHANE | 1.03E-09 | -- | NC |
| 1,1-DICHLOROETHYLENE | 4.20E-09 | 1.24E-01 | 3.38E-08 |
| DICHLOROFLUOROMETHANE | 1.42E-08 | -- | NC |
| TRANS-1,3-DICHLOROPROPENE | 1.94E-09 | -- | NC |
| 1,1,2,2-TETRACHLOROETHANE | 9.36E-09 | 5.60E+00 | 1.67E-09 |
| TRICHLOROFLUOROMETHANE | 2.65E-08 | -- | NC |
| VINYL CHLORIDE | 2.04E-09 | 1.72E+00 | 1.18E-09 |
| **Dioxins** | | | |
| 2,3,7,8-TCDD TE | | | |
| 2,3,7,8-TCDD (FISH) | 1.24E-07 | 4.10E-04 | 3.03E-04 |

Notes:
Sediment screening values presented in Table 8-10

TABLE 8-21
EVALUATION OF WETLAND/AQUATIC COMMUNITY RECEPTOR EXPOSURE
TO MODELED CONCENTRATIONS OF CPECs IN THE GREEN ISLAND WETLAND:
SURFACE WATER
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT
NORLITE FACILITY
COHOES, NY

| CPEC (MG/L) | Surface Water EPC | Surface Water Screening Value | Hazard Quotient |
|---|---|---|---|
| INORGANICS | | | |
| DISSOLVED | | | |
| ANTIMONY | 8.57E-07 | 3.00E-02 | 2.86E-05 |
| ARSENIC | 1.71E-07 | 1.50E-01 | 1.14E-06 |
| BARIUM | 3.02E-07 | 4.00E-03 | 7.54E-05 |
| BERYLLIUM | 3.75E-08 | 6.60E-04 | 5.68E-05 |
| CADMIUM | 1.95E-07 | 1.30E-03 | 1.50E-04 |
| CHROMIUM | 2.35E-10 | 4.20E-02 | 5.59E-09 |
| CHROMIUM VI | 6.97E-08 | 1.10E-02 | 6.33E-06 |
| LEAD | 1.68E-07 | 1.20E-03 | 1.40E-04 |
| INORGANIC MERCURY | 8.49E-08 | 7.70E-04 | 1.10E-04 |
| METHYL MERCURY | 2.27E-07 | 1.20E-05 | 1.89E-02 |
| NICKEL | 3.59E-06 | 2.90E-02 | 1.24E-04 |
| SELENIUM | 4.67E-08 | 4.60E-03 | 1.02E-05 |
| SILVER | 6.16E-07 | 1.20E-04 | 5.13E-03 |
| THALLIUM | 2.91E-07 | 4.00E-02 | 7.28E-06 |
| ZINC | 8.64E-06 | 6.60E-02 | 1.31E-04 |
| ORGANICS - TOTAL | | | |
| HEXACHLOROCYCLOPENTADIENE | 8.36E-08 | 5.20E-04 | 1.61E-04 |
| HEXACHLOROBUTADIENE | 4.14E-09 | 9.30E-04 | 4.45E-06 |
| 2,4-DINITROTOLUENE | 3.03E-06 | 2.30E-02 | 1.32E-04 |
| 2,6-DINITROTOLUENE | 6.29E-06 | 6.00E-02 | 1.05E-04 |
| HEXACHLOROBENZENE | 2.63E-08 | 3.68E-03 | 7.15E-06 |
| 2-NITROANILINE | 8.71E-07 | -- | NC |
| PENTACHLOROPHENOL | 2.95E-07 | 4.00E-04 | 7.37E-04 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 5.31E-07 | 3.00E-03 | 1.77E-04 |
| BENZO(A)PYRENE | 1.38E-10 | 1.40E-05 | 9.89E-06 |
| BENZO(A)ANTHRACENE | 1.50E-10 | 2.70E-05 | 5.56E-06 |
| BENZO(B)FLUORANTHENE | 1.21E-09 | 2.70E-05 | 4.49E-05 |
| BENZO(K)FLUORANTHENE | 1.05E-10 | 2.70E-05 | 3.87E-06 |
| CHRYSENE | 2.10E-09 | 2.70E-05 | 7.76E-05 |
| DIBENZ(A,H)ANTHRACENE | 3.34E-11 | 2.70E-05 | 1.24E-06 |
| INDENO(1,2,3-CD)PYRENE | 3.51E-11 | 2.70E-05 | 1.30E-06 |
| TOTAL PAH | 1.07E-10 | 1.40E-05 | 7.67E-06 |
| Volatiles | | | |
| BENZENE | 1.11E-07 | 2.10E-01 | 5.28E-07 |
| BROMOMETHANE | 6.83E-08 | -- | NC |
| 1,3-BUTADIENE | 5.82E-08 | -- | NC |
| CARBON TETRACHLORIDE | 2.37E-08 | 9.80E-03 | 2.42E-06 |
| CHLOROFORM | 7.34E-08 | 2.80E-02 | 2.62E-06 |
| CHLOROMETHANE | 6.23E-08 | -- | NC |
| 1,1-DICHLOROETHYLENE | 2.45E-08 | 5.90E-01 | 4.14E-08 |
| DICHLOROFLUOROMETHANE | 8.26E-08 | -- | NC |
| TRANS-1,3-DICHLOROPROPENE | 2.60E-08 | -- | NC |
| 1,1,2,2-TETRACHLOROETHANE | 2.93E-08 | 6.10E-01 | 4.81E-08 |
| TRICHLOROFLUOROMETHANE | 7.71E-08 | -- | NC |
| VINYL CHLORIDE | 6.89E-08 | 3.88E+00 | 1.78E-08 |
| Dioxins | | | |
| 2,3,7,8-TCDD TE | | | |
| 2,3,7,8-TCDD (FISH) | 5.14E-12 | 3.80E-09 | 1.35E-03 |

Notes:
Surface water screening values are presented in Table 8-9

TABLE 8-22
EVALUATION OF COMMUNITY RECEPTOR EXPOSURE TO
MODELED CONCENTRATIONS OF CPECs IN THE GREEN ISLAND WETLAND:
HYDRIC SOIL
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT
NORLITE FACILITY
COHOES, NY

| CPEC (MG/KG) | Hydric Soil EPC | Benthic Invertebrates | | Terrestrial Plants | | Terrestrial Invertebrates | |
|---|---|---|---|---|---|---|---|
| | | Screening Benchmark | HQ | Screening Benchmark | HQ | Screening Benchmark | HQ |
| INORGANICS | | | | | | | |
| ANTIMONY | 3.08E-05 | 2.00E+00 | 1.54E-05 | 5.00E-01 | 6.16E-05 | -- | -- |
| ARSENIC | 9.15E-06 | 6.00E+00 | 1.53E-06 | 1.00E+00 | 9.15E-06 | 2.50E-01 | 3.66E-05 |
| BARIUM | 1.49E-05 | 2.00E+01 | 7.43E-07 | 5.00E+00 | 2.97E-06 | -- | -- |
| BERYLLIUM | 1.47E-05 | -- | -- | 1.00E-01 | 1.47E-04 | -- | -- |
| CADMIUM | 1.62E-05 | 6.00E-01 | 2.69E-05 | 2.00E-01 | 8.08E-05 | 1.00E+01 | 1.62E-06 |
| CHROMIUM | 1.02E-04 | 2.60E+01 | 3.92E-06 | 1.00E+00 | 1.02E-04 | 4.00E-01 | 2.55E-04 |
| CHROMIUM VI | 1.69E-06 | -- | -- | -- | -- | -- | -- |
| LEAD | 7.12E-05 | 3.10E+01 | 2.30E-06 | 4.60E+00 | 1.55E-05 | 1.00E+02 | 7.12E-07 |
| INORGANIC MERCURY | 1.61E-03 | 1.50E-01 | 1.08E-02 | 3.49E-01 | 4.62E-03 | 2.50E+00 | 6.46E-04 |
| METHYL MERCURY | 2.48E-04 | 1.50E-01 | 1.65E-03 | -- | -- | 2.50E+00 | 9.92E-05 |
| NICKEL | 2.64E-04 | 1.60E+01 | 1.65E-05 | 2.50E+01 | 1.06E-05 | 1.00E+02 | 2.64E-06 |
| SELENIUM | 3.16E-07 | 1.00E-01 | 3.16E-06 | 5.00E-02 | 6.33E-06 | 7.70E+00 | 4.11E-08 |
| SILVER | 6.79E-06 | 1.00E+00 | 6.79E-06 | 2.00E-02 | 3.39E-04 | -- | -- |
| THALLIUM | 2.31E-05 | -- | -- | 1.00E-02 | 2.31E-03 | -- | -- |
| ZINC | 6.11E-04 | 1.10E+02 | 5.55E-06 | 9.00E-01 | 6.79E-04 | 1.99E+02 | 3.07E-06 |
| ORGANICS | | | | | | | |
| HEXACHLOROCYCLOPENTADIENE | 1.03E-06 | 1.98E-01 | 5.23E-06 | 1.00E-01 | 1.03E-05 | -- | -- |
| HEXACHLOROBUTADIENE | 6.58E-06 | 2.00E-02 | 3.29E-04 | -- | -- | -- | -- |
| 2,4-DINITROTOLUENE | 7.03E-06 | 4.69E-02 | 1.50E-04 | -- | -- | -- | -- |
| 2,6-DINITROTOLUENE | 3.42E-12 | 1.01E-01 | 3.40E-11 | -- | -- | -- | -- |
| HEXACHLOROBENZENE | 4.89E-10 | 2.23E+02 | 2.19E-12 | -- | -- | -- | -- |
| 2-NITROANILINE | 3.91E-06 | -- | -- | -- | -- | -- | -- |
| PENTACHLOROPHENOL | 4.42E-11 | 1.60E+00 | 2.76E-11 | 1.73E+00 | 2.55E-11 | 1.00E+01 | 4.42E-12 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 1.77E-09 | 1.33E+01 | 1.33E-10 | -- | -- | -- | -- |
| BENZO(A)PYRENE | 9.32E-07 | 8.40E-02 | 1.11E-05 | 1.20E+00 | 7.77E-07 | 2.50E+01 | 3.73E-08 |
| BENZO(A)ANTHRACENE | 5.38E-07 | 1.90E-02 | 2.83E-05 | 1.20E+00 | 4.49E-07 | 2.50E+01 | 2.15E-08 |
| BENZO(B)FLUORANTHENE | 8.94E-06 | 3.70E-02 | 2.42E-04 | 1.20E+00 | 7.45E-06 | 2.50E+01 | 3.57E-07 |
| BENZO(K)FLUORANTHENE | 6.14E-07 | 3.70E-02 | 1.66E-05 | 1.20E+00 | 5.12E-07 | 2.50E+01 | 2.46E-08 |
| CHRYSENE | 7.21E-06 | 3.00E-02 | 2.40E-04 | 1.20E+00 | 6.01E-06 | 2.50E+01 | 2.88E-07 |
| DIBENZ(A,H)ANTHRACENE | 2.56E-07 | 1.00E-02 | 2.56E-05 | 1.20E+00 | 2.13E-07 | 2.50E+01 | 1.02E-08 |
| INDENO(1,2,3-CD)PYRENE | 3.50E-07 | 3.00E-02 | 1.17E-05 | 1.20E+00 | 2.92E-07 | 2.50E+01 | 1.40E-08 |
| TOTAL PAH | 1.13E-03 | 4.00E+00 | 2.82E-04 | 1.20E+00 | 9.39E-04 | 2.50E+01 | 4.51E-05 |
| Volatiles | | | | | | | |
| BENZENE | 3.38E-11 | 1.12E+00 | 3.01E-11 | -- | -- | -- | -- |
| BROMOMETHANE | 1.37E-10 | -- | -- | -- | -- | -- | -- |
| 1,3-BUTADIENE | 7.23E-07 | -- | -- | -- | -- | -- | -- |
| CARBON TETRACHLORIDE | 1.34E-12 | 1.88E-01 | 7.15E-12 | -- | -- | -- | -- |
| CHLOROFORM | 2.42E-11 | 5.94E-02 | 4.08E-10 | -- | -- | -- | -- |
| CHLOROMETHANE | 4.61E-06 | -- | -- | -- | -- | -- | -- |
| 1,1-DICHLOROETHYLENE | 6.58E-09 | 1.24E-01 | 5.31E-08 | -- | -- | -- | -- |
| DICHLOROFLUOROMETHANE | 1.80E-10 | -- | -- | -- | -- | -- | -- |
| TRANS-1,3-DICHLOROPROPENE | 7.40E-11 | -- | -- | -- | -- | -- | -- |
| 1,1,2,2-TETRACHLOROETHANE | 8.75E-10 | 5.60E+00 | 1.56E-10 | -- | -- | -- | -- |
| TRICHLOROFLUOROMETHANE | 1.11E-12 | -- | -- | -- | -- | -- | -- |
| VINYL CHLORIDE | 7.08E-08 | 1.72E+00 | 4.11E-08 | -- | -- | -- | -- |
| Dioxins | | | | | | | |
| 2,3,7,8-TCDD TE | | | | | | | |
| 2,3,7,8-TCDD (FISH) | 5.42E-08 | 4.10E-04 | 1.32E-04 | -- | -- | 5.00E-01 | 1.08E-07 |

Notes:
Sediment screening values presented in Table 8-10
Surface soil screening values presented in Table 8-11.

**TABLE 8-23**
**EVALUATION OF TERRESTRIAL PLANT AND INVERTEBRATE COMMUNITY RECEPTOR EXPOSURE TO MODELED CONCENTRATION OF CPECs AT THE GREEN ISLAND UPLAND AREA: SURFACE SOIL**
**SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT**
**NORLITE FACILITY**
**COHOES, NY**

| CPEC (MG/KG) | Surface Soil EPC | Terrestrial Plants | | Terrestrial Invertebrates | |
|---|---|---|---|---|---|
| | | Screening Benchmark | HQ | Screening Benchmark | HQ |
| **INORGANICS** | | | | | |
| ANTIMONY | 7.92E-06 | 5.00E-01 | 1.58E-05 | -- | -- |
| ARSENIC | 2.40E-06 | 1.00E+00 | 2.40E-06 | 2.50E-01 | 9.62E-06 |
| BARIUM | 3.88E-06 | 5.00E+00 | 7.76E-07 | -- | -- |
| BERYLLIUM | 4.57E-06 | 1.00E-01 | 4.57E-05 | -- | -- |
| CADMIUM | 4.40E-06 | 2.00E-01 | 2.20E-05 | 1.00E+01 | 4.40E-07 |
| CHROMIUM | 3.23E-05 | 1.00E+00 | 3.23E-05 | 4.00E-01 | 8.08E-05 |
| CHROMIUM VI | 4.29E-07 | -- | -- | -- | -- |
| LEAD | 2.22E-05 | 4.60E+00 | 4.83E-06 | 1.00E+02 | 2.22E-07 |
| INORGANIC MERCURY | 4.77E-04 | 3.49E-01 | 1.37E-03 | 2.50E+00 | 1.91E-04 |
| METHYL MERCURY | 8.48E-06 | -- | -- | 2.50E+00 | 3.39E-06 |
| NICKEL | 7.11E-05 | 2.50E+01 | 2.84E-06 | 1.00E+02 | 7.11E-07 |
| SELENIUM | 7.87E-08 | 5.00E-02 | 1.57E-06 | 7.70E+00 | 1.02E-08 |
| SILVER | 1.70E-06 | 2.00E-02 | 8.48E-05 | -- | -- |
| THALLIUM | 6.26E-06 | 1.00E-02 | 6.26E-04 | -- | -- |
| ZINC | 1.64E-04 | 9.00E-01 | 1.82E-04 | 1.99E+02 | 8.24E-07 |
| **ORGANICS** | | | | | |
| HEXACHLOROCYCLOPENTADIENE | 3.70E-08 | 1.00E-01 | 3.70E-07 | -- | -- |
| HEXACHLOROBUTADIENE | 9.25E-10 | -- | -- | -- | -- |
| 2,4-DINITROTOLUENE | 2.04E-06 | -- | -- | -- | -- |
| 2,6-DINITROTOLUENE | 3.67E-06 | -- | -- | -- | -- |
| HEXACHLOROBENZENE | 3.44E-06 | -- | -- | -- | -- |
| 2-NITROANILINE | 5.41E-07 | -- | -- | -- | -- |
| PENTACHLOROPHENOL | 2.41E-06 | 1.73E+00 | 1.39E-06 | 1.00E+01 | 2.41E-07 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 6.15E-04 | -- | -- | -- | -- |
| BENZO(A)PYRENE | 5.42E-07 | 1.20E+00 | 4.51E-07 | 2.50E+01 | 2.17E-08 |
| BENZO(A)ANTHRACENE | 3.20E-07 | 1.20E+00 | 2.67E-07 | 2.50E+01 | 1.28E-08 |
| BENZO(B)FLUORANTHENE | 5.56E-06 | 1.20E+00 | 4.64E-06 | 2.50E+01 | 2.23E-07 |
| BENZO(K)FLUORANTHENE | 3.25E-07 | 1.20E+00 | 2.71E-07 | 2.50E+01 | 1.30E-08 |
| CHRYSENE | 4.56E-06 | 1.20E+00 | 3.80E-06 | 2.50E+01 | 1.82E-07 |
| DIBENZ(A,H)ANTHRACENE | 9.24E-08 | 1.20E+00 | 7.70E-08 | 2.50E+01 | 3.69E-09 |
| INDENO(1,2,3-CD)PYRENE | 1.23E-07 | 1.20E+00 | 1.02E-07 | 2.50E+01 | 4.92E-09 |
| TOTAL PAH | 4.20E-07 | 1.20E+00 | 3.50E-07 | 2.50E+01 | 1.68E-08 |
| **Volatiles** | | | | | |
| BENZENE | 2.55E-10 | -- | -- | -- | -- |
| BROMOMETHANE | 1.76E-11 | -- | -- | -- | -- |
| 1,3-BUTADIENE | 1.27E-11 | -- | -- | -- | -- |
| CARBON TETRACHLORIDE | 7.16E-11 | -- | -- | -- | -- |
| CHLOROFORM | 4.57E-10 | -- | -- | -- | -- |
| CHLOROMETHANE | 1.79E-12 | -- | -- | -- | -- |
| 1,1-DICHLOROETHYLENE | 2.31E-11 | -- | -- | -- | -- |
| DICHLOROFLUOROMETHANE | 7.03E-13 | -- | -- | -- | -- |
| TRANS-1,3-DICHLOROPROPENE | 9.39E-11 | -- | -- | -- | -- |
| 1,1,2,2-TETRACHLOROETHANE | 3.44E-09 | -- | -- | -- | -- |
| TRICHLOROFLUOROMETHANE | 3.87E-11 | -- | -- | -- | -- |
| VINYL CHLORIDE | 5.80E-13 | -- | -- | -- | -- |
| **Dioxins** | | | | | |
| 2,3,7,8-TCDD TE | | | | | |
| 2,3,7,8-TCDD (MAMMAL) | 1.87E-08 | -- | -- | 5.00E-01 | 3.75E-08 |
| 2,3,7,8-TCDD (BIRD) | 9.57E-08 | -- | -- | 5.00E-01 | 1.91E-07 |

Notes:
Surface soil screening values presented in Table 8-11.
NA = Not available
-- = HQ could not be calculated

**TABLE 8-24**
**SUMMARY OF DIET COMPOSITIONS FOR ALL WILDLIFE RECEPTOR MODELS**
**SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT**
**NORLITE**
**COHOES, NY**

| Receptor Species | | Biotic Media/Prey Items | | | | | | | | Abiotic Media | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Wetland/Aquatic Invertebrate | Fish Trophic Level 3 | Fish Trophic Level 4 | Wetland/Aquatic Plants | Terrestrial Invertebrates | Small Mammals: Herbivores | Small Mammals: Omnivores | Terrestrial Plants | Soil | Sediment | Hydric Soil | Water |
| **HUDSON RIVER** | | | | | | | | | | | | | |
| Osprey (*Pandion haliaetus*) | | | ✓ | ✓ | | | | | | | ✓ | | ✓ |
| Great Blue Heron (*Ardea herodias*) | | | ✓ | ✓ | | | | | | | ✓ | | ✓ |
| Mink (*Mustela vison*) | | | ✓ | ✓ | | | | | | | ✓ | | ✓ |
| **ERIE CANAL** | | | | | | | | | | | | | |
| Osprey (*Pandion haliaetus*) | | | ✓ | ✓ | | | | | | | ✓ | | ✓ |
| Great Blue Heron (*Ardea herodias*) | | | ✓ | ✓ | | | | | | | ✓ | | ✓ |
| Mink (*Mustela vison*) | | | ✓ | ✓ | | | | | | | ✓ | | ✓ |
| **WRIGHT/BRADLEY LAKE** | | | | | | | | | | | | | |
| Osprey (*Pandion haliaetus*) | | | ✓ | ✓ | | | | | | | ✓ | | ✓ |
| Great Blue Heron (*Ardea herodias*) | | | ✓ | ✓ | | | | | | | ✓ | | ✓ |
| Mink (*Mustela vison*) | | | ✓ | ✓ | | | | | | | ✓ | | ✓ |
| **GREEN ISLAND** | | | | | | | | | | | | | |
| Muskrat (*Ondatra zibethicus*) | | | | | ✓ | | | | | | | ✓ | ✓ |
| Deer Mouse (*Peromyscus maniculatus*) | | | | | | | | | ✓ | ✓ | | | ✓ |
| Short-tailed Shrew (*Blarina brevicauda*) | | ✓ | | | ✓ | ✓ | | | ✓ | | | ✓ | ✓ |
| Raccoon (*Procyon lotor*) | | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ |
| American Robin (*Turdus migratorius*) | | | | | | ✓ | | | ✓ | ✓ | | | ✓ |
| Great Blue Heron (*Ardea herodias*) | | ✓ | | | | | | | | | | ✓ | ✓ |
| Red-tailed Hawk (*Buteo jamaicensis*) | | | | | | | ✓ | ✓ | | ✓ | | | ✓ |
| **EXCLUSIVE DIETS: UNCERTAINTY EVALUATION** | | | | | | | | | | | | | |
| Raccoon (*Procyon lotor*) | Diet 1 | ✓ | | | | | | | | ✓ | | ✓ | ✓ |
| | Diet 2 | | | | ✓ | | | | | ✓ | | ✓ | ✓ |
| | Diet 3 | | | | | ✓ | | | | ✓ | | ✓ | ✓ |
| | Diet 4 | | | | | | ✓ | | | ✓ | | ✓ | ✓ |
| | Diet 5 | | | | | | | ✓ | | ✓ | | ✓ | ✓ |
| | Diet 6 | | | | | | | | ✓ | ✓ | | ✓ | ✓ |
| Short-tailed Shrew (*Blarina brevicauda*) | Diet 1 | ✓ | | | | | | | | ✓ | | ✓ | ✓ |
| | Diet 2 | | | | ✓ | | | | | ✓ | | ✓ | ✓ |
| | Diet 3 | | | | | ✓ | | | | ✓ | | ✓ | ✓ |
| | Diet 4 | | | | | | | | ✓ | ✓ | | ✓ | ✓ |

Refer to Table 8-12 for ingestion rates specific to each receptor and prey item

TABLE 8-25
SUMMARY OF POTENTIAL RISKS TO WILDLIFE IN THE HUDSON RIVER:
PROPORTIONED DIETS
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT
NORLITE FACILITY
COHOES, NY

| CPEC | Hazard Quotient | | |
|---|---|---|---|
| | Osprey | Great Blue Heron | Mink |
| **INORGANICS** | | | |
| ANTIMONY | NC | NC | 1.64E-07 |
| ARSENIC | 7.03E-10 | 6.08E-10 | 9.15E-08 |
| BARIUM | 1.70E-09 | 1.46E-09 | 1.14E-08 |
| BERYLLIUM | NC | NC | 1.24E-09 |
| CADMIUM | 2.23E-08 | 1.92E-08 | 5.82E-08 |
| CHROMIUM | 6.37E-09 | 5.70E-08 | 1.26E-11 |
| CHROMIUM VI | 2.51E-10 | 2.20E-10 | 1.35E-10 |
| LEAD | 6.92E-11 | 5.46E-10 | 4.91E-11 |
| INORGANIC MERCURY | 6.65E-06 | 4.43E-06 | 6.80E-07 |
| METHYL MERCURY | 3.05E-04 | 1.92E-04 | 9.95E-05 |
| NICKEL | 6.68E-10 | 5.83E-10 | 2.27E-09 |
| SELENIUM | 2.27E-09 | 1.95E-09 | 9.92E-09 |
| SILVER | 4.44E-09 | 3.81E-09 | 9.82E-10 |
| THALLIUM | 1.53E-06 | 1.31E-06 | 7.12E-05 |
| ZINC | 2.26E-07 | 1.94E-07 | 3.57E-08 |
| **ORGANICS** | | | |
| **Semivolatiles** | | | |
| HEXACHLOROCYCLOPENTADIENE | NC | NC | 1.81E-08 |
| HEXACHLOROBUTADIENE | 7.09E-10 | 6.54E-10 | 2.01E-08 |
| 2,4-DINITROTOLUENE | NC | NC | 3.92E-08 |
| 2,6-DINITROTOLUENE | NC | NC | 1.43E-07 |
| HEXACHLOROBENZENE | 2.53E-07 | 2.21E-07 | 6.25E-08 |
| 2-NITROANILINE | NC | NC | NC |
| PENTACHLOROPHENOL | 3.40E-08 | 2.99E-08 | 8.04E-07 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 2.14E-07 | 2.49E-07 | 4.47E-08 |
| BENZO(A)PYRENE | 1.94E-06 | 1.70E-06 | 6.18E-08 |
| BENZO(A)ANTHRACENE | 1.59E-06 | 1.37E-06 | 2.39E-08 |
| BENZO(B)FLUORANTHENE | 1.70E-04 | 1.45E-04 | 7.56E-07 |
| BENZO(K)FLUORANTHENE | 9.91E-06 | 8.45E-06 | 4.39E-08 |
| CHRYSENE | 1.64E-05 | 1.42E-05 | 5.21E-07 |
| DIBENZ(A,H)ANTHRACENE | 8.62E-07 | 7.78E-07 | 2.96E-07 |
| INDENO(1,2,3-CD)PYRENE | 2.71E-07 | 2.85E-07 | 9.04E-09 |
| TOTAL PAH | 3.76E-11 | 3.30E-11 | 4.79E-09 |
| **Volatiles** | | | |
| BENZENE | NC | NC | 5.85E-11 |
| BROMOMETHANE | NC | NC | NC |
| 1,3-BUTADIENE | NC | NC | NC |
| CARBON TETRACHLORIDE | NC | NC | 1.07E-10 |
| CHLOROFORM | NC | NC | 4.98E-11 |
| CHLOROMETHANE | NC | NC | NC |
| 1,1-DICHLOROETHYLENE | 6.17E-12 | 5.40E-12 | 6.48E-12 |
| DICHLOROFLUOROMETHANE | NC | NC | NC |
| TRANS-1,3-DICHLOROPROPENE | NC | NC | NC |
| 1,1,2,2-TETRACHLOROETHANE | 8.84E-11 | 8.06E-11 | 8.21E-10 |
| TRICHLOROFLUOROMETHANE | NC | NC | NC |
| VINYL CHLORIDE | NC | NC | 2.39E-09 |
| **Dioxins** | | | |
| 2,3,7,8-TCDD TE | 1.59E-04 | 1.24E-04 | 7.63E-04 |

Notes:
Hazard quotients (HQs) greater than 1 are shaded.
CPEC - Compound of Potential Ecological Concern

**TABLE 8-26**
**SUMMARY OF POTENTIAL RISKS TO WILDLIFE IN THE ERIE CANAL:**
**PROPORTIONED DIETS**
**SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT**
**NORLITE FACILITY**
**COHOES, NY**

| CPEC | Hazard Quotient | | |
|---|---|---|---|
| | Osprey | Great Blue Heron | Mink |
| **INORGANICS** | | | |
| ANTIMONY | NC | NC | 3.33E-08 |
| ARSENIC | 3.06E-11 | 1.02E-10 | 8.00E-09 |
| BARIUM | 1.30E-11 | 4.12E-11 | 1.72E-10 |
| BERYLLIUM | NC | NC | 2.12E-09 |
| CADMIUM | 1.51E-10 | 6.49E-10 | 8.67E-10 |
| CHROMIUM | 5.51E-08 | 4.95E-07 | 1.09E-10 |
| CHROMIUM VI | 5.20E-11 | 1.11E-10 | 4.94E-11 |
| LEAD | 1.27E-09 | 1.03E-08 | 9.21E-10 |
| INORGANIC MERCURY | 4.90E-07 | 4.39E-06 | 1.65E-07 |
| METHYL MERCURY | 7.00E-07 | 5.86E-06 | 7.30E-07 |
| NICKEL | 4.90E-11 | 1.96E-10 | 3.55E-10 |
| SELENIUM | 6.13E-11 | 7.66E-11 | 4.31E-10 |
| SILVER | 1.82E-10 | 2.69E-10 | 6.66E-11 |
| THALLIUM | 9.70E-10 | 3.87E-09 | 9.55E-08 |
| ZINC | 6.68E-10 | 2.46E-09 | 2.16E-10 |
| **ORGANICS** | | | |
| **Semivolatiles** | | | |
| HEXACHLOROCYCLOPENTADIENE | NC | NC | 6.24E-10 |
| HEXACHLOROBUTADIENE | 6.01E-12 | 4.07E-11 | 4.48E-10 |
| 2,4-DINITROTOLUENE | NC | NC | 1.63E-08 |
| 2,6-DINITROTOLUENE | NC | NC | 5.94E-08 |
| HEXACHLOROBENZENE | 1.04E-08 | 9.09E-08 | 7.82E-09 |
| 2-NITROANILINE | NC | NC | NC |
| PENTACHLOROPHENOL | 5.38E-10 | 1.18E-09 | 2.26E-08 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 2.56E-07 | 2.25E-06 | 1.51E-07 |
| BENZO(A)PYRENE | 6.52E-07 | 5.84E-06 | 6.43E-08 |
| BENZO(A)ANTHRACENE | 2.92E-07 | 2.60E-06 | 1.36E-08 |
| BENZO(B)FLUORANTHENE | 4.87E-05 | 4.37E-04 | 6.74E-07 |
| BENZO(K)FLUORANTHENE | 2.53E-06 | 2.27E-05 | 3.49E-08 |
| CHRYSENE | 3.39E-06 | 3.02E-05 | 3.34E-07 |
| DIBENZ(A,H)ANTHRACENE | 2.49E-07 | 2.23E-06 | 2.63E-07 |
| INDENO(1,2,3-CD)PYRENE | 1.47E-07 | 1.32E-06 | 1.45E-08 |
| TOTAL PAH | 1.26E-11 | 1.13E-10 | 4.99E-09 |
| **Volatiles** | | | |
| BENZENE | NC | NC | 3.28E-11 |
| BROMOMETHANE | NC | NC | NC |
| 1,3-BUTADIENE | NC | NC | NC |
| CARBON TETRACHLORIDE | NC | NC | 6.49E-12 |
| CHLOROFORM | NC | NC | 2.20E-11 |
| CHLOROMETHANE | NC | NC | NC |
| 1,1-DICHLOROETHYLENE | 2.24E-12 | 2.41E-12 | 3.54E-12 |
| DICHLOROFLUOROMETHANE | NC | NC | NC |
| TRANS-1,3-DICHLOROPROPENE | NC | NC | NC |
| 1,1,2,2-TETRACHLOROETHANE | 1.62E-11 | 1.81E-11 | 2.32E-10 |
| TRICHLOROFLUOROMETHANE | NC | NC | NC |
| VINYL CHLORIDE | NC | NC | 1.75E-09 |
| **Dioxins** | | | |
| 2,3,7,8-TCDD TE | 1.08E-05 | 9.74E-05 | 1.53E-04 |

Notes:
Hazard quotients (HQs) greater than 1 are shaded.
CPEC - Compound of Potential Ecological Concern

## TABLE 8-27
## SUMMARY OF POTENTIAL RISKS TO WILDLIFE IN WRIGHT-BRADLEY LAKE: PROPORTIONED DIETS
## SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT
## NORLITE FACILITY
## COHOES, NY

| CPEC | Hazard Quotient | | |
|---|---|---|---|
| | Osprey | Great Blue Heron | Mink |
| **INORGANICS** | | | |
| ANTIMONY | NC | NC | 1.28E-05 |
| ARSENIC | 5.60E-08 | 4.84E-08 | 7.28E-06 |
| BARIUM | 1.35E-07 | 1.16E-07 | 9.03E-07 |
| BERYLLIUM | NC | NC | 1.34E-07 |
| CADMIUM | 1.84E-06 | 1.58E-06 | 4.79E-06 |
| CHROMIUM | 5.62E-08 | 5.03E-07 | 1.11E-10 |
| CHROMIUM VI | 1.93E-08 | 1.69E-08 | 1.04E-08 |
| LEAD | 7.54E-09 | 5.95E-08 | 5.35E-09 |
| INORGANIC MERCURY | 1.98E-04 | 1.32E-04 | 2.03E-05 |
| METHYL MERCURY | 3.83E-02 | 2.41E-02 | 1.25E-02 |
| NICKEL | 5.43E-08 | 4.74E-08 | 1.85E-07 |
| SELENIUM | 1.71E-07 | 1.47E-07 | 7.48E-07 |
| SILVER | 3.36E-07 | 2.89E-07 | 7.44E-08 |
| THALLIUM | 1.25E-04 | 1.07E-04 | 5.83E-03 |
| ZINC | 1.83E-05 | 1.57E-05 | 2.90E-06 |
| **ORGANICS** | | | |
| **Semivolatiles** | | | |
| HEXACHLOROCYCLOPENTADIENE | NC | NC | 2.02E-07 |
| HEXACHLOROBUTADIENE | 7.85E-09 | 7.24E-09 | 2.22E-07 |
| 2,4-DINITROTOLUENE | NC | NC | 3.97E-06 |
| 2,6-DINITROTOLUENE | NC | NC | 1.45E-05 |
| HEXACHLOROBENZENE | 5.02E-06 | 4.38E-06 | 1.24E-06 |
| 2-NITROANILINE | NC | NC | NC |
| PENTACHLOROPHENOL | 2.32E-06 | 2.04E-06 | 5.48E-05 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 2.07E-05 | 2.41E-05 | 4.31E-06 |
| BENZO(A)PYRENE | 8.43E-05 | 7.40E-05 | 2.69E-06 |
| BENZO(A)ANTHRACENE | 1.27E-04 | 1.09E-04 | 1.90E-06 |
| BENZO(B)FLUORANTHENE | 8.18E-03 | 6.97E-03 | 3.62E-05 |
| BENZO(K)FLUORANTHENE | 4.39E-04 | 3.74E-04 | 1.95E-06 |
| CHRYSENE | 1.26E-03 | 1.10E-03 | 4.01E-05 |
| DIBENZ(A,H)ANTHRACENE | 2.13E-05 | 1.92E-05 | 7.33E-06 |
| INDENO(1,2,3-CD)PYRENE | 5.22E-06 | 5.48E-06 | 1.74E-07 |
| TOTAL PAH | 1.63E-09 | 1.43E-09 | 2.08E-07 |
| **Volatiles** | | | |
| BENZENE | NC | NC | 5.87E-10 |
| BROMOMETHANE | NC | NC | NC |
| 1,3-BUTADIENE | NC | NC | NC |
| CARBON TETRACHLORIDE | NC | NC | 1.07E-09 |
| CHLOROFORM | NC | NC | 4.95E-10 |
| CHLOROMETHANE | NC | NC | NC |
| 1,1-DICHLOROETHYLENE | 5.86E-11 | 5.13E-11 | 6.15E-11 |
| DICHLOROFLUOROMETHANE | NC | NC | NC |
| TRANS-1,3-DICHLOROPROPENE | NC | NC | NC |
| 1,1,2,2-TETRACHLOROETHANE | 1.41E-09 | 1.28E-09 | 1.31E-08 |
| TRICHLOROFLUOROMETHANE | NC | NC | NC |
| VINYL CHLORIDE | NC | NC | 2.17E-08 |
| **Dioxins** | | | |
| 2,3,7,8-TCDD TE | 4.88E-03 | 3.80E-03 | 2.05E-02 |

Notes:
Hazard quotients (HQs) greater than 1 are shaded.
CPEC = Compound of Potential Ecological Concern.

**TABLE 8-28**
**SUMMARY OF POTENTIAL RISKS TO WILDLIFE AT GREEN ISLAND:**
**PROPORTIONED DIETS**
**SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT**
**NORLITE FACILITY**
**COHOES, NY**

| CPEC | Hazard Quotient: Terrestrial | | | Hazard Quotient: Wetland | | | |
|---|---|---|---|---|---|---|---|
| | Deer Mouse | American Robin | Red-tailed Hawk | Muskrat | Short-tailed Shrew | Raccoon | Great Blue Heron |
| **INORGANICS** | | | | | | | |
| ANTIMONY | 2.92E-06 | NC | NC | 7.39E-06 | 1.92E-05 | 2.30E-05 | NC |
| ARSENIC | 7.72E-07 | 6.78E-08 | 8.35E-09 | 1.50E-06 | 3.18E-06 | 5.03E-06 | 4.48E-08 |
| BARIUM | 1.69E-08 | 4.32E-08 | 3.92E-09 | 3.35E-08 | 1.15E-07 | 1.38E-07 | 3.22E-08 |
| BERYLLIUM | 1.90E-08 | NC | NC | 4.93E-08 | 9.10E-07 | 1.05E-06 | NC |
| CADMIUM | 1.41E-07 | 2.54E-06 | 8.30E-08 | 1.25E-07 | 2.70E-06 | 2.07E-06 | 1.98E-06 |
| CHROMIUM | 1.76E-11 | 8.05E-07 | 3.34E-07 | 3.07E-11 | 2.15E-10 | 9.65E-10 | 6.42E-07 |
| CHROMIUM VI | 4.73E-09 | 3.53E-08 | 9.68E-09 | 1.21E-08 | 5.07E-09 | 1.60E-08 | 1.38E-08 |
| LEAD | 9.67E-09 | 8.69E-07 | 2.30E-07 | 1.88E-08 | 8.36E-08 | 2.55E-07 | 6.30E-07 |
| INORGANIC MERCURY | 5.68E-07 | 7.78E-05 | 1.38E-05 | 1.95E-07 | 2.44E-06 | 6.67E-06 | 4.20E-05 |
| METHYL MERCURY | 3.14E-05 | 9.13E-03 | 9.16E-05 | 1.40E-05 | 8.67E-03 | 5.56E-03 | 5.95E-02 |
| NICKEL | 2.29E-08 | 4.83E-08 | 1.37E-08 | 5.47E-08 | 5.71E-08 | 1.87E-07 | 2.97E-08 |
| SELENIUM | 5.17E-08 | 6.39E-08 | 8.83E-09 | 1.30E-07 | 8.60E-08 | 1.07E-07 | 3.21E-08 |
| SILVER | 9.98E-09 | 3.07E-07 | 4.08E-08 | 1.90E-08 | 1.85E-08 | 2.45E-08 | 1.43E-07 |
| THALLIUM | 5.03E-06 | 3.53E-06 | 2.42E-07 | 1.36E-05 | 7.18E-05 | 8.29E-05 | 2.95E-06 |
| ZINC | 2.52E-08 | 5.71E-06 | 1.99E-07 | 3.28E-08 | 3.65E-07 | 3.09E-07 | 4.46E-06 |
| **ORGANICS** | | | | | | | |
| **Semivolatiles** | | | | | | | |
| HEXACHLOROCYCLOPENTADIENE | 3.54E-09 | NC | NC | 1.23E-08 | 2.67E-05 | 1.70E-05 | NC |
| HEXACHLOROBUTADIENE | 3.28E-09 | 1.18E-07 | 9.51E-10 | 3.77E-08 | 2.23E-03 | 1.34E-03 | 1.99E-04 |
| 2,4-DINITROTOLUENE | 9.73E-07 | NC | NC | 9.81E-07 | 2.34E-06 | 1.93E-06 | NC |
| 2,6-DINITROTOLUENE | 3.47E-06 | NC | NC | 3.55E-06 | 2.11E-06 | 2.67E-06 | NC |
| HEXACHLOROBENZENE | 1.60E-08 | 2.66E-02 | 1.84E-07 | 9.05E-09 | 6.25E-04 | 6.49E-04 | 9.02E-07 |
| 2-NITROANILINE | NC | NC | NC | NC | NC | NC | NC |
| PENTACHLOROPHENOL | 3.87E-07 | 4.70E-04 | 1.52E-08 | 5.41E-07 | 1.05E-03 | 9.62E-04 | 5.35E-09 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 5.31E-07 | 5.50E-01 | 6.80E-06 | 2.97E-08 | 1.03E-02 | 9.54E-03 | 3.97E-07 |
| BENZO(A)PYRENE | 2.51E-08 | 4.02E-05 | 5.74E-06 | 1.53E-08 | 3.28E-07 | 7.75E-07 | 1.59E-05 |
| BENZO(A)ANTHRACENE | 1.34E-08 | 1.96E-05 | 4.49E-06 | 5.72E-09 | 6.65E-08 | 2.15E-07 | 6.76E-06 |
| BENZO(B)FLUORANTHENE | 2.13E-07 | 2.88E-03 | 4.16E-04 | 1.45E-07 | 3.22E-06 | 7.73E-06 | 1.09E-03 |
| BENZO(K)FLUORANTHENE | 2.07E-08 | 1.98E-04 | 2.53E-05 | 1.02E-08 | 2.31E-07 | 5.27E-07 | 8.30E-05 |
| CHRYSENE | 2.41E-07 | 2.40E-04 | 4.91E-05 | 1.29E-07 | 1.79E-06 | 5.17E-06 | 8.45E-05 |
| DIBENZ(A,H)ANTHRACENE | 1.54E-06 | 4.45E-05 | 4.66E-06 | 1.12E-07 | 2.19E-06 | 5.65E-06 | 1.12E-05 |
| INDENO(1,2,3-CD)PYRENE | 2.79E-07 | 6.45E-05 | 5.64E-06 | 5.57E-09 | 1.35E-07 | 3.59E-07 | 6.62E-06 |
| TOTAL PAH | 1.95E-09 | 8.18E-10 | 3.49E-09 | 1.68E-06 | 2.63E-05 | 5.88E-05 | 5.07E-07 |
| **Volatiles** | | | | | | | |
| BENZENE | 1.21E-09 | NC | NC | 4.30E-09 | 9.07E-10 | 1.06E-09 | NC |
| BROMOMETHANE | NC | NC | NC | NC | NC | NC | NC |
| 1,3-BUTADIENE | NC | NC | NC | NC | NC | NC | NC |
| CARBON TETRACHLORIDE | 2.30E-10 | NC | NC | 8.16E-10 | 1.78E-10 | 2.09E-10 | NC |
| CHLOROFORM | 7.60E-10 | NC | NC | 2.69E-09 | 5.77E-10 | 6.83E-10 | NC |
| CHLOROMETHANE | NC | NC | NC | NC | NC | NC | NC |
| 1,1-DICHLOROETHYLENE | 1.27E-10 | 1.99E-10 | 1.39E-10 | 4.49E-10 | 2.04E-10 | 2.42E-10 | 3.35E-10 |
| DICHLOROFLUOROMETHANE | NC | NC | NC | NC | NC | NC | NC |
| TRANS-1,3-DICHLOROPROPENE | NC | NC | NC | NC | NC | NC | NC |
| 1,1,2,2-TETRACHLOROETHANE | 6.04E-09 | 3.00E-07 | 4.37E-10 | 2.14E-08 | 3.32E-07 | 2.60E-07 | 1.83E-08 |
| TRICHLOROFLUOROMETHANE | NC | NC | NC | NC | NC | NC | NC |
| VINYL CHLORIDE | 6.29E-08 | NC | NC | 2.23E-07 | 8.08E-08 | 1.24E-07 | NC |
| **Dioxins** | | | | | | | |
| 2,3,7,8-TCDD TE | 4.59E-05 | 8.40E-03 | 7.21E-05 | 3.35E-05 | 1.19E-02 | 1.55E-02 | 3.75E-03 |

Notes:
Hazard quotients (HQs) greater than 1 are shaded.
CPEC - Compound of Potential Ecological Concern

**TABLE 8-29**
**SUMMARY OF POTENTIAL RISKS TO WILDLIFE IN THE GREEN ISLAND WETLAND:**
**EXCLUSIVE DIETS - TROPHIC LEVEL 3 WILDLIFE RECEPTOR - RACCOON**
**SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT**
**NORLITE FACILITY**
**COHOES, NY**

| CPEC | Potential Risks Associated With Exclusive Diets | | | | | |
|---|---|---|---|---|---|---|
| | RACCOON | | | | | |
| | Aquatic Invertebrates | Wetland Plant | Terrestrial Invertebrates | Herbivorous Mammal | Omnivorous Mammal | Terrestrial Plant |
| INORGANICS | | | | | | |
| ANTIMONY | **6.59E-05** | 2.19E-05 | 2.92E-05 | 1.66E-05 | 3.21E-05 | 1.86E-05 |
| ARSENIC | **1.19E-05** | 4.96E-06 | 6.58E-06 | 4.68E-06 | 6.97E-06 | 5.53E-06 |
| BARIUM | **3.89E-07** | 1.19E-07 | 1.72E-07 | 9.52E-08 | 1.88E-07 | 1.13E-07 |
| BERYLLIUM | **3.12E-06** | 7.44E-07 | 1.47E-06 | 7.31E-07 | 1.51E-06 | 7.44E-07 |
| CADMIUM | **8.44E-06** | 9.22E-07 | 2.71E-06 | 5.64E-07 | 3.07E-06 | 8.18E-07 |
| CHROMIUM | **1.39E-09** | 1.23E-09 | 1.27E-09 | 1.21E-09 | 1.27E-09 | 1.23E-09 |
| CHROMIUM VI | 2.23E-08 | 2.00E-08 | 2.04E-08 | 1.98E-08 | 2.06E-08 | **2.30E-08** |
| LEAD | **4.22E-07** | 3.16E-07 | 3.33E-07 | 2.92E-07 | 3.35E-07 | 3.03E-07 |
| INORGANIC MERCURY | **1.17E-05** | 7.79E-06 | 8.60E-06 | 7.29E-06 | 1.09E-05 | 8.53E-06 |
| METHYL MERCURY | **3.24E-02** | 2.63E-04 | 1.30E-03 | 2.01E-04 | 2.12E-02 | 2.70E-04 |
| NICKEL | **2.88E-07** | 2.36E-07 | 2.41E-07 | 2.23E-07 | 2.44E-07 | 2.42E-07 |
| SELENIUM | **2.61E-07** | 9.25E-08 | 1.33E-07 | 9.11E-08 | 1.44E-07 | 1.27E-07 |
| SILVER | **5.80E-08** | 2.65E-08 | 2.78E-08 | 1.77E-08 | 3.03E-08 | 2.87E-08 |
| THALLIUM | **2.49E-04** | 5.98E-05 | 1.11E-04 | 5.94E-05 | 1.20E-04 | 6.24E-05 |
| ZINC | **1.17E-06** | 1.29E-07 | 4.10E-07 | 1.29E-07 | 4.60E-07 | 1.68E-07 |
| ORGANICS | | | | | | |
| Semivolatiles | | | | | | |
| HEXACHLOROCYCLOPENTADIENE | **9.91E-05** | 1.18E-08 | 3.56E-06 | 1.09E-08 | 7.19E-05 | 1.12E-08 |
| HEXACHLOROBUTADIENE | **8.60E-03** | 9.53E-07 | 2.03E-06 | 8.16E-07 | 4.73E-03 | 8.17E-07 |
| 2,4-DINITROTOLUENE | **6.53E-06** | 1.09E-06 | 2.21E-06 | 4.44E-07 | 2.41E-06 | 2.09E-06 |
| 2,6-DINITROTOLUENE | 1.24E-06 | 1.24E-06 | 5.76E-06 | 1.24E-06 | 2.37E-06 | **7.05E-06** |
| HEXACHLOROBENZENE | 3.98E-07 | 5.61E-08 | 2.41E-03 | 5.62E-08 | **3.79E-03** | 8.46E-08 |
| 2-NITROANILINE | NC | NC | NC | NC | NC | NC |
| PENTACHLOROPHENOL | 4.50E-07 | 3.76E-07 | **4.06E-03** | 3.77E-07 | 3.65E-03 | 9.20E-07 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 1.67E-06 | 1.56E-06 | 3.99E-02 | 1.56E-06 | **4.19E-02** | 2.70E-06 |
| BENZO(A)PYRENE | 1.27E-06 | 6.90E-07 | 1.02E-06 | 6.79E-07 | **3.26E-06** | 7.21E-07 |
| BENZO(A)ANTHRACENE | 3.25E-07 | 2.44E-07 | 2.89E-07 | 2.37E-07 | **5.18E-07** | 2.63E-07 |
| BENZO(B)FLUORANTHENE | 1.24E-05 | 6.77E-06 | 1.02E-05 | 6.68E-06 | **3.44E-05** | 7.01E-06 |
| BENZO(K)FLUORANTHENE | 8.80E-07 | 4.39E-07 | 6.69E-07 | 4.33E-07 | **2.49E-06** | 4.72E-07 |
| CHRYSENE | 8.04E-06 | 5.57E-06 | 7.08E-06 | 5.42E-06 | **1.40E-05** | 5.85E-06 |
| DIBENZ(A,H)ANTHRACENE | 8.68E-06 | 4.35E-06 | 5.88E-06 | 4.40E-06 | **2.52E-05** | 7.88E-06 |
| INDENO(1,2,3-CD)PYRENE | 4.72E-07 | 2.19E-07 | 3.07E-07 | 2.59E-07 | **1.45E-06** | 8.79E-07 |
| TOTAL PAH | 1.29E-04 | 5.43E-05 | 5.19E-05 | 5.19E-05 | **2.64E-04** | 5.19E-05 |
| Volatiles | | | | | | |
| BENZENE | 1.42E-09 | 1.42E-09 | **1.45E-09** | 1.42E-09 | 1.43E-09 | NC |
| BROMOMETHANE | NC | NC | NC | NC | NC | NC |
| 1,3-BUTADIENE | NC | NC | NC | NC | NC | NC |
| CARBON TETRACHLORIDE | 2.69E-10 | 2.68E-10 | **2.94E-10** | 2.68E-10 | 2.75E-10 | NC |
| CHLOROFORM | 8.88E-10 | 8.86E-10 | **9.28E-10** | 8.86E-10 | 8.97E-10 | NC |
| CHLOROMETHANE | NC | NC | NC | NC | NC | NC |
| 1,1-DICHLOROETHYLENE | **5.71E-10** | 4.75E-10 | 1.54E-10 | 1.53E-10 | 2.58E-10 | NC |
| DICHLOROFLUOROMETHANE | NC | NC | NC | NC | NC | NC |
| TRANS-1,3-DICHLOROPROPENE | NC | NC | NC | NC | NC | NC |
| 1,1,2,2-TETRACHLOROETHANE | 2.65E-07 | 7.20E-09 | **1.02E-06** | 7.19E-09 | 6.43E-07 | NC |
| TRICHLOROFLUOROMETHANE | NC | NC | NC | NC | NC | NC |
| VINYL CHLORIDE | 2.10E-07 | **2.89E-07** | 8.36E-08 | 8.36E-08 | 1.15E-07 | NC |
| Dioxins | | | | | | |
| 2,3,7,8-TCDD TE | 3.19E-02 | 1.44E-03 | 1.60E-02 | 1.43E-03 | **1.59E-01** | 1.51E-03 |

Notes:
The higher hazard quotient (HQ) from every prey item for each receptor are presented in boldface text.
CPEC - Compound of Potential Ecological Concern

## TABLE 8-30
## SUMMARY OF POTENTIAL RISKS TO WILDLIFE IN THE GREEN ISLAND WETLAND: EXCLUSIVE DIETS - TROPHIC LEVEL 3 WILDLIFE RECEPTORS - SHORT-TAILED SHREW
## SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT
## NORLITE FACILITY
## COHOES, NY

| CPEC | Potential Risks Associated With Exclusive Diets | | | |
|---|---|---|---|---|
| | SHORT-TAILED SHREW | | | |
| | Aquatic Invertebrates | Wetland Plant | Terrestrial Invertebrates | Terrestrial Plant |
| **INORGANICS** | | | | |
| ANTIMONY | **3.13E-05** | 6.14E-06 | 1.03E-05 | 4.24E-06 |
| ARSENIC | **1.37E-05** | 2.61E-06 | 5.18E-06 | 3.50E-06 |
| BARIUM | **5.23E-07** | 8.48E-08 | 1.70E-07 | 7.51E-08 |
| BERYLLIUM | **4.06E-06** | 2.84E-07 | 1.44E-06 | 2.85E-07 |
| CADMIUM | **1.27E-05** | 8.07E-07 | 3.64E-06 | 6.41E-07 |
| CHROMIUM | **7.05E-10** | 4.43E-10 | 5.09E-10 | 4.53E-10 |
| CHROMIUM VI | 1.54E-08 | 1.18E-08 | 1.24E-08 | **1.65E-08** |
| LEAD | **3.12E-07** | 1.42E-07 | 1.70E-07 | 1.22E-07 |
| INORGANIC MERCURY | **9.56E-06** | 3.30E-06 | 4.60E-06 | 4.48E-06 |
| METHYL MERCURY | **5.11E-02** | 1.71E-04 | 1.82E-03 | 1.82E-04 |
| NICKEL | **1.99E-07** | 1.16E-07 | 1.24E-07 | 1.26E-07 |
| SELENIUM | **3.62E-07** | 8.43E-08 | 1.49E-07 | 1.39E-07 |
| SILVER | **7.74E-08** | 2.74E-08 | 2.95E-08 | 3.09E-08 |
| THALLIUM | **3.26E-04** | 2.59E-05 | 1.07E-04 | 3.00E-05 |
| ZINC | **1.71E-06** | 5.62E-08 | 5.01E-07 | 1.17E-07 |
| **ORGANICS** | | | | |
| **Semivolatiles** | | | | |
| HEXACHLOROCYCLOPENTADIENE | **1.57E-04** | 9.96E-09 | 5.63E-06 | 8.98E-09 |
| HEXACHLOROBUTADIENE | **1.37E-02** | 5.03E-07 | 2.20E-06 | 2.86E-07 |
| 2,4-DINITROTOLUENE | **1.04E-05** | 1.58E-06 | 3.40E-06 | 3.19E-06 |
| 2,6-DINITROTOLUENE | 1.83E-06 | 1.83E-06 | 9.14E-06 | **1.12E-05** |
| HEXACHLOROBENZENE | 5.65E-07 | 2.29E-08 | **3.82E-03** | 6.81E-08 |
| 2-NITROANILINE | NC | NC | NC | NC |
| PENTACHLOROPHENOL | 4.60E-07 | 3.42E-07 | **6.43E-03** | 1.21E-06 |
| BIS(2-ETHYLHEXYL)PHTHALATE | 7.29E-07 | 5.46E-07 | **6.33E-02** | 2.37E-06 |
| BENZO(A)PYRENE | **1.17E-06** | 2.52E-07 | 7.80E-07 | 3.02E-07 |
| BENZO(A)ANTHRACENE | **2.21E-07** | 9.30E-08 | 1.65E-07 | 1.23E-07 |
| BENZO(B)FLUORANTHENE | **1.13E-05** | 2.46E-06 | 7.91E-06 | 2.83E-06 |
| BENZO(K)FLUORANTHENE | **8.58E-07** | 1.60E-07 | 5.24E-07 | 2.11E-07 |
| CHRYSENE | **6.03E-06** | 2.11E-06 | 4.50E-06 | 2.55E-06 |
| DIBENZ(A,H)ANTHRACENE | **8.42E-06** | 1.56E-06 | 3.99E-06 | 7.16E-06 |
| INDENO(1,2,3-CD)PYRENE | 4.79E-07 | 7.73E-08 | 2.17E-07 | **1.12E-06** |
| TOTAL PAH | **1.40E-04** | 2.18E-05 | 1.79E-05 | 1.78E-05 |
| **Volatiles** | | | | |
| BENZENE | 2.19E-09 | 2.19E-09 | **2.24E-09** | NC |
| BROMOMETHANE | NC | NC | NC | NC |
| 1,3-BUTADIENE | NC | NC | NC | NC |
| CARBON TETRACHLORIDE | 4.14E-10 | 4.13E-10 | **4.55E-10** | NC |
| CHLOROFORM | 1.37E-09 | 1.37E-09 | **1.43E-09** | NC |
| CHLOROMETHANE | NC | NC | NC | NC |
| 1,1-DICHLOROETHYLENE | **8.92E-10** | 7.41E-10 | 2.31E-10 | NC |
| DICHLOROFLUOROMETHANE | NC | NC | NC | NC |
| TRANS-1,3-DICHLOROPROPENE | NC | NC | NC | NC |
| 1,1,2,2-TETRACHLOROETHANE | 4.20E-07 | 1.09E-08 | **1.82E-06** | NC |
| TRICHLOROFLUOROMETHANE | NC | NC | NC | NC |
| VINYL CHLORIDE | 3.17E-07 | **4.43E-07** | 1.16E-07 | NC |
| **Dioxins** | | | | |
| 2,3,7,8-TCDD TE | **4.88E-02** | 5.14E-04 | 2.36E-02 | 6.18E-04 |

Notes:
The higher hazard quotient (HQ) from every prey item for each receptor are presented in boldface text.
CPEC - Compound of Potential Ecological Concern

# 9.0 CONCLUSIONS

The current preliminary risk assessment has utilized an updated projection of the proposed future emission rates for all of the metals associated with Norlite operations, along with a set of maximum emission rates for all of the organic chemical species measured during a sequence of "Trail Burn" and "Risk Burn" tests at the Norlite Light-Weight Aggregate Kiln facilities in Cohoes, New York. The initial Trial Burn testing was performed in April 1999 to establish system performance parameters for permit renewal. Additional measurement obtained on metals and dioxin/furan emissions in a May 2000 set of tests to determine the risk that would be associated with a more normal set of operating conditions utilized an artificial spiking method for metals. The result of those test strongly suggested that the metal spiking technique used appeared to have interfered with normal incinerator performance. A July 2001 set of follow-up Risk Burn tests was conducted with a more realistic system configuration. These tests yielded data more representative of expected operating conditions, and therefore this newer data replaced that obtained in May 2000. There was one exception: the supplemental set of "mercury speciation" tests included in the May 2000 testing has been utilized without repetition in the latest test series, because that set of test for mercury did appear to adequately represent the long-term potential behavior of mercury emissions.

This MRA report has assessed the maximum potential risks associated with the present and predicted near-future operational configuration. For the updated MRA, however, several assumptions have been retained that are certain to provide increased estimates of long term risks, when compared with a more precise description of the expected operations. For example, the plant would not be likely to operate constantly in the "stressed" mode chosen for test purposes for the next thirty years. Although it is normal risk assessment practice to make assumptions of this type, it generally leads to conservatively high estimates of possible future risks. Since there are continuing needs for process change and performance improvement with time, the current assessment is very likely to exaggerate the typical risks to actual residents that would be likely to occur in the future..

The results of the current analysis show that projected emissions of dioxins and furans have been successfully reduced to levels that predict risks well below both New York and U.S. EPA target risk guideline levels, regardless of possible variations in modeling input assumptions recommended by alternative guidance documents. Several improvements in incinerator operation and more realistic testing techniques have combined to achieve these results.

The total noncarcinogenic Hazard Index (HI) comes very close to an exact match with recommended total HI benchmark level of 0.25. In all but one case the calculated HI value is just under the guideline. In one case it is just slightly over (by 16%). This result is completely dominated by methyl mercury that is predicted to be created by transformation in the evironment of inorganic mercury vapor emitted from the kiln stacks. The hazard Index contributions of all of the other chemicals together do not contibute as much as 1% of the HI benchmark. These results were obtained under the modified conditions of the 2000 Risk Burn and the updated "Base Case" modeling assumptions agreed upon with NYSDEC and NYSDOH as a refinement of those used in 2001 and originally specified in the approved MRA risk Protocol.

Based upon comments received from the U.S. EPA on the 2001 MRA, a comparative "EPA Alternative Case" was analyzed. It utilized somewhat more conservative U.S. EPA "default" exposure and risk modeling assumptions and produced HI estimates that were significantly higher (by a factor of two to three). Although the alternative version of the predictions were well above the preferred benchmark of 0.25, all of the evaluated receptors had predicted HI values less than 1.0. A benchmark of 1.0 has been used widely for many other regulatory programs, as an index value not expected to produce any observable adverse impact on human receptors. That is because the toxicological dose response factors used in the computation of the hazard quotients that combined into the HI values are designed to incorporate various uncertainty factors that normally ensure an adequate margin of safety, even when the value of 1.0 is exceeded by a modest factor.

Review of the modeling factors responsible for the maximum values of HI indicates that some of the results were significantly influenced a new set of fate and transport models that indicate much higher risks than previous models. Unfortunately there are few measurements of mercury in the surrounding bodies of water or fish that are appropriate for direct comparison with model predictions. Until there is more such data against which to "validate" these newer models, it is best to proceed with caution in interpreting their results. Sensitivity analyses performed outside this MRA and reported in Appendix H indicate that use of all of the most conservative factors in the new model produces predictions of water and fish concentrations that are highly unlikely because they tend to exceed most known measurements.

The target health benchmark levels utilized in the current MRA are not necessarily meant to serve as a definitive boundary between "acceptable" and "unacceptable" risks. They are intended to identify situations which have risk levels that are clearly below regulatory concern, and separate them from those which may be of some concern, and may need more careful examination. When they are exceeded, it is expected that the contributing factors will be reviewed by both the regulatory agencies and the facility owners to determine whether the risk predicted is realistic, or likely to be somewhat exaggerated by the risk analysis methodology. The object is to ensure the continued safety of the neighboring public. The improvements noted in this and the October 2001 risk assessment, regarding dioxins and furans are one example of how such progress is accomplished. The results for mercury emissions and potential long-term effects are inherently more uncertain, but the HI levels predicted are within a range that has been generally considered acceptable in similar circumstances at other facilities, and in other states.

The final section of the SLERA study evaluated potential ecological risk to both community and individual receptors in the three adjacent water bodies, the Hudson River, the Erie Canal of the Mohawk River, and Wright/Bradley Lakes in Troy, as well as terrestrial upland and wetland areas on Green Island. The results of the SLERA indicate no potential ecological concern for any of the subject receptors in the study area, and more distant locations would be expected to experience even less effect. Uncertainties in the analysis were given due consideration, but due to the unambiguous pattern of results across a wide variety of species, trophic levels, and habitats, it has been concluded that emissions from the Norlite kilns do not pose any adverse risk to ecological receptors.

# 10.0 REFERENCES


Anderson, E., N. Browne, S. Duletsky, J. Ramig, and T. Warn. 1985. Development of Statistical Distributions for Ranges of Standard Factors Used in Exposure Assessments. Office of Health and Environmental Assessment. Washington, D.C. EPA-600/8-85-010.

Auer, A.H., 1978. Correlation of Land Use and Cover With Meteorological Anomalies. J. Appl. Meteor., 17:636-643.

Bacci, E., M.J. Carejeira, C. Gaggi, G. Chemello, D. Calamari, and M. Vighi. 1992. Chlorinated Dioxins: Volatilization from Soils and Bioconcentration in Plant Leaves. Bulletin of Environmental Contamination and Toxicology 48(3):401-408.

Baes, C.F., R.D. Sharp, A.L. Sjoreen, and R.W. Schor. 1984. A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides Through Agriculture. ORNL-5786. Oak Ridge National Laboratory, Oak Ridge, TN.

Bowman, C.R., Jr., H.V. Geary, Jr., and G.J. Schewe. 1987. Incorporation of Wet Deposition in the ISC Model, 80th Annual Meeting of APCA, New York, NY, June 21-26.

CAPCOA. 1992. Air Toxics "Hot Spots" Program. Risk Assessment Guidelines. Prepared by the AB 2588 Risk Assessment Committee of the California Air Pollution Control OfficersAssociation (CAPCOA).

Cramer, H.E., J.R. Bjorklund, F.A. Record, R.K. Dumbauld, R.N. Swanson, J.E. Faulkner, and A.G. Tingle. 1972. Development of Dosage Models and Concepts. DTC-TR-72-609. Deseret Test Center, Fort Douglas, UT.

DeGraaf, R.M. and M. Yamasaki, 2000. New England Wildlife: Habitat, Natural History, and Distribution. University of New England Press, Hanover, NH.

Dempsey, C. R. 1992. A Comparison: Organic Emissions for Hazardous Waste Incinerators versus 1990 Toxics Release Inventory. Paper presented at the 85th Annual Meeting and Exhibition of the Air and Waste Management Assoc. June 21-26

EarthInfo, Inc. 1997. EarthInfo CD USGS Daily Values. EarthInfo, Inc. 5541 Central Avenue, Boulder, CO 80301. (303) 938-1788.

Efroymson, R.A., M.E. Will, and G.W. Suter II, 1997b. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and

Heterotrophic Processes: 1997 Revision. U.S. Department of Energy, Oak Ridge National Laboratory, Oak Ridge, TN. ES/ER/TM-126/R2.

Efroymson, R.A., M.E. Will, G.W. Suter II, and A.C. Wooten, 1997a. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision. U.S. Department of Energy, Oak Ridge National Laboratory, Oak Ridge, TN. ES/ER/TM-85/R3.

ENSR. 1991a. Norlite Corporation Plant, Cohoes, NY. Human Health Risk Assessment. ENSR Document No. 9504-010-300. December.

ENSR. 1991b. Allowable Metal Concentrations in the Shale and Low Grade Fuel (LGF) Used at the Lightweight Aggregate Plant. ENSR Document No. 9504-008-R3. December.

ENSR. 1996. Protocol for a Multipathway Risk Assessment. ENSR Document No. 9514-039-700. May 3, 1996.

ENSR. 1998. Trial Burn Plan Kiln No. 1. ENSR Document No. 9514-038-100.

ENSR. 1999. RCRA Trial Burn Report for Light-Weight Aggregate Kilns 1 and 2. Final Report, ENSR Document No. 9514-040-400.

ENSR. 2000. Risk Burn Final Report for Light-Weight Aggregate Kilns 1 and 2. ENSR Document No. 9514-049-400. August 25, 2000.

ENSR. 2001. Risk Burn - Phase 2. Final Report for Light-Weight Aggregate Kilns 1 and 2. Vol. 1 Main Report. Doc. No. 9514-051-400. September 12, 2001.

ENSR. 2002. Conference Call with NYSDEC, NYSDOH, and U.S. EPA Region 2 regarding Agency Comments on Oct. 2001 Risk Assessment for Norlite Light-Weight Aggregate Kilns. February 28, 2002.

Eschenroeder, A.C. Petito, and S. Wolff. 1987. A Public Health Risk Assessment for the Proposed Sander Facility in San Diego, California (85-AFC-4).

Garcia Nieto, P.J., B.A. Garcia, J.M. Diaz and M.A.R. Brana, 1994. Parametric Study of Selective Removal of Atmospheric Aerosol by Below-Cloud Scavenging Atmospheric Environment, Vol. 28, 2335-2342.

Geraghty, J.J., D.W. Miller, F. Van der Leeden, and F.L. Troise. 1973. Water Atlas of the United States. A Water Information Center Publication. 44 Sintsink Drive East, Port Washington, NY 11050.

Hoffman, et al. 1992. Quantification of the Interception and Initial Retention of Radioactive Contaminants Deposited on Pasture Grass by Simulated Rain. Atmospheric Environment 26A (18):3313-3321.

Jensen, D.J. and R.A. Hummel. 1981. A Residue Study on Beef Cattle Consuming 2,3,7,8-Tetrachlorodibenzo-p-dioxin. J. Agric. Food Chem. 29:265-268.

Jindal, M. and D. Heinold. 1991. Development of Particulate Scavenging Coefficients to Model Wet Deposition from Industrial Combustion Sources, Proceedings of the 84th Annual Meeting, SWMA, Vancouver, BC. June.

Jones, D.S., G.W Suter II, and R. N. Hull, 1997. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Sediment-Associated Biota: 1997 Revision. Environmental Sciences Division, Oak Ridge National Laboratory. Oak Ridge, TN.

Kuehl, D.W., P.M. Cook, A.R. Batterman and B.C. Butterworth. 1987a. Isomer dependent bioavailability of polychlorinated dibenzo-p-dioxins and dibenzofurans from municipal incinerator ash to carp. Chemosphere, 16(4):657-666.

Kuehl, D.W., P.M. Cook, A.R. Batterman, D.B. Lothenbach and B.C. Butterworth. 1987b. Bioavailability of polychlorinated dibenzo-p-dioxins and dibenzofurans from contaminated Wisconsin River sediment to carp. Chemosphere, 16(4):657-666.

Lindberg, S.E., R.R. Turner, T.P. Meyers, G.E. Taylor, and W.H. Schroeder, 1991. Atmospheric Concentrations and Deposition of Airborne Hg to Walker Branch Watershed. Water, Air, Soil Pollut. 56, pp. 577-94.

Lindberg, S.E., T.P. Meyers, G.E. Taylor, R.R. Turner, and W.H. Schroeder, 1992. Atmosphere-Surface Exchange of Mercury in a Forest: Results of Modeling and Gradient Approaches. Journal of Geophys. Res. V97 No. D2 pp. 2519-28.

Lorber, M. 1995. "Further Issues for Modeling the Indirect Exposure Impacts from Combustor Emissions", Memorandum, Office of Research and Development, U.S. EPA, Washington D. C., 20pp.

McCrady, J.K. and S.P. Maggard. 1993. Uptake and photodegradation of 2,3,7,8-tetrachlorodibenzo-p-dioxin sorbed to grass foliage. Env. Sci. Technol. 27:343-350.

McLachlan, M.S., H. Thomas, M. Reissinger, and O. Hutzinger. 1990. Chemosphere, 20, 1013-1020.

Miller, C.W. and F.O. Hoffman, 1983. An Examination of the Environmental Half-Time for Radionuclides Deposited on Vegetation. Health Physics 45:731-744.

Moller, L., I. Lax, U.B. Torndal, and L.C. Eriksson. 1993. Risk Assessment of Nitrated Polycyclic Aromatic Hydrocarbons. Risk Analysis. 13(3):291.

National Academy of Sciences (NAS). 1983. Risk Assessment in the Federal Government: Managing the Process. National Academy Press. Washington, D.C.

NCDEHNR. 1997. North Carolina Protocol for Performing Indirect Exposure Risk Assessments for Hazardous Waste Combustion Units. State of North Carolina Department of Environment, Health, and Natural Resources. Division of Waste Management. January.

NOAA. 1979. Climate Atlas of the United States. National Climate Center, Federal Building, Ashville, NC 28801.

NYSDEC, 1999. Technical Guidance for Screening Contaminated Sediments. New York State Department of Environmental Conservation, Division of Fish, Wildlife, and Marine Resources. January 25, 1999.

NYSDEC. 1991. New York State Air Guide-1, Guidelines for the Control of Toxic Ambient Air Contaminants. NYSDEC, Division of Air Resources. 1991.

NYSDEC. 1998. Ambient Water Quality Standards and Guidance Values. Division of Water Technical and Operational Guidance Series (1.1.1). Title 6, Chapter X, Subchapter A, Article 2, Part 706. February 10, 1998.

NYSDOH. 1991. Guidance for Exposure Assessment of Municipal Solid Waste and Hospital Waste Incinerator Emissions. Draft 6/27/91.

NYSDOH. 1993. Correspondence dated May 4, 1993 from Robert Chinery to David Guthrie.

Pankow, J.F. 1987. Review and Comparative Analysis of the Theories on Partitioning Between the Gas and Aerosol Phases in the Atmosphere. Atmos. Environ. 21:2275.

Pao, E.M., K.H. Fleming, P.M. Guenther. 1982. Foods Commonly Eaten by Individuals: Amount per Day and per Eating Occasion. U.S. Department of Agriculture. Home Economics Report No. 44.

Persaud, D., R. Jaagumagi, and A. Hayton, 1996. Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario. Ontario Ministry of the Environment, ISBN 0-7778-9248-7. January, 1996 reprint.

Rogaar, H. and J.A. Boswinkel. 1978. Some Soil Morphological Effects of Earthworm Activity: Field Data and X-Ray Radiography. Neth. J. Agric. Sci. 26: 145-160.

Ruffle, B., D.E. Burmaster, P.D. Anderson, and H.D. Gordon, 1994. Lognormal Distributions for Fish consumption by the General U.S. Population. Risk Analysis, V14, No 4.

Sample, B.E., D.M. Opresko, and G.W. Suter II, 1996. Toxicological Benchmarks for Wildlife: 1996 Revision. Environmental Sciences Division, Oak Ridge National Laboratory. Oak Ridge, TN.

Smith, C.L., 1985. Inland Fishes of New York State. New York State Department of Environmental Conservation, Albany,N.Y.

Smith, D.G., and D. Heinold. 1995. Deposition Modeling for Dioxins/Furans: Realistic Alternatives to the 1993 EPA Addendum Approach for Plant Uptake of Vapors and Particles. Proceedings of the 88th Annual Meeting of the AWMA, San Antonio, June, 1995.

Smith, D.G., and M. Garcia, Risk Modeling Implications of Mercury MACT Limits and Detection Sensitivity for RCRA Regulated Combustion Facilities--I. Proceedings of the 94th Annual Meeting of the Air and Waste Management Association. Tampa, FL. June.

Smith, D.G., and M. Garcia, Risk Modeling Implications of Mercury MACT Limits and Detection Sensitivity for RCRA Regulated Combustion Facilities--II. Proceedings of the 2001 International Conference on Incineration and Thermal Treatment Technologies. Philadelphia, PA. May

Sparmacher, H., K. Fuller and H. Bonka, 1993. Below-Cloud Scavenging of Aerosol Particles: Particle-Bound Radionuclides - Experimental. Atmospheric Environment. Vol. 27A, 605-618.

Stevens, J.B. and E.N. Gerbec. 1988. Dioxin in the Agricultural Foodchain. Risk Analysis. 8(3):329-335.

Suter G.W., and C.L. Taao. 1996. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Environmental Sciences Division, Oak Ridge National Laboratory. Oak Ridge, TN.

Tessitore, J. L., J. G. Pinion, and E. DeCresie. 1990. Thermal Destruction of Organic Air Toxics. Pollution Engineering, March. Pp 58-66.

Travis, C.C. and A.D. Arms. 1988. Bioconcentration of Organics in Beef, Milk and Vegetation. Environ. Sci. Technol. 22:271-276.

USDA. 1997. Predicting Soil Erosion by Water. A Guide to Conservation Planning with the Revised Universal Soil Loss Equation (RUSLE). Agricultural Handbook Number 703.

U.S. EPA. 1980. Dietary Consumption Distribution of Selected Food Groups for the U.S. Population. Office of Pesticides and Toxic Substances. EPA 560/11-80/012.

U.S. EPA. 1985. Guideline for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations), Revised. EPA Publication No. EPA-450/4-80-023R. RTP, NC. (NTIS No. PB 85-225241).

U.S. EPA. 1986a. Interim Procedures for Estimating Risks associated with Exposures to Mixtures of Chlorinated Dibenzo-p-Dioxins and Dibenzofurans (CDDs and CDFs) and 1989 Update. EPA\625/3-89/016. March 1989.

U.S. EPA, 1986b. Guideline on Air Quality Models (Revised). PB86-245248.

U.S. EPA. 1987. Municipal Waste Combustion Study - Assessment of Health Risks Associated with Municipal Waste Combustion Emissions, Appendix C. Wet Deposition Model, Report No. EPA/530-SW-87-02.

U.S. EPA. 1988. Superfund Exposure Assessment Manual. Office of Remedial Response, Washington, D.C. EPA-540/1-88-001.

U.S. EPA. 1989a. Risk Assessment Guidance for Superfund. Human Health Evaluation Manual. Part A - Office of Solid Waste and Emergency Response, Washington, D.C.

U.S. EPA. 1989b. Interim Final Guidance on Soil Ingestion Rates. Office of Solid Waste and Emergency Response, Washington, D.C.

U.S. EPA. 1989c. Exposure Factors Handbook. Office of Health and Environmental Assessment, Washington, D.C. EPA 600/8-89/043.

U.S. EPA. 1989d. Ecological Assessment of Hazardous Waste Sites: A Field and Laboratory Reference. Office of Health and Environmental Assessment, Washington, D.C.

U.S. EPA. 1989e. Risk Assessment Guidance for Superfund. Vol. II. Environmental Evaluation Manual Interim Final. Office of Solid Waste and Emergency Response, Washington, D.C.

U.S. EPA. 1990. Methodology for Assessing Health Risks Associated with Indirect Exposure to Combustor Emissions. Interim Final. Office of Health and Environmental Assessment. Cincinnati, OH. PB90-187055.

U.S. EPA. 1992a. "Guidelines for Exposure Assessment," Federal Register, 57(104):22888-22938, May 29, 1992.

U.S. EPA. 1992b. Estimating Exposure to Dioxin-Like Compounds. Review Draft. Office of Research and Development. Washington, D.C.. August 1992. EPA/600/6-88/005B.

U.S. EPA. 1992c. Dermal Exposure Assessment: Principles and Applications. Interim Report. Exposure Assessment Group, Office of Health and Environmental Assessment. Washington, D.C. EPA/600/8-91/011B. January.

U.S. EPA. 1992d. Framework for Ecological Risk Assessment. EPA/630/R-92/001.

U.S. EPA. 1993a. Addendum to the Methodology for Assessing Health Risks Associated with Indirect Exposure to Combustor Emissions. EPA/600/AP-93/003.

U.S. EPA. 1993b. Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons. EPA/600/-93/089.

U.S. EPA. 1993c. Water Quality Guidance for the Great Lakes System and Correction; Proposed Rules. Part II. 40 CFR Parts 122 et al. Federal Register 58(72):20801-21047. Friday, April 16, 1993.

U.S. EPA, 1993d. Wildlife Exposure Factors Handbook. United States Environmental Protection Agency, Office of Research and Development. EPA/600/R-93/187a,b. December, 1993.

U.S. EPA. 1994a. U.S. EPA. 1994a. Implementation Guidance for Conducting Indirect Exposure Analysis at RCRA Combustion Units. (Attachment to Exposure Assessment Guidance for RCRA Hazardous Waste Combustion Facilities.) EPA 540-R-94-021. Revised April 22, 1994.

U.S. EPA. 1994b. Guidance for Performing Screening Level Risk Analyses at Combustion Facilities Burning Hazardous Wastes. Revision of Guidance on Trial Burn - Attachment B. June 14, 1994; and Errata. Revised Draft. October 4, 1994.

U.S. EPA. 1994c. Guidance for Performing Screening Level Risk Analyses at Combustion Facilities Burning Hazardous Wastes. Revised Attachment C to the April 22, 1994 Implementation Guidance. December 14, 1994. (This is a Draft Update to the April 15, 1994 Attachment C and October 4, 1994 Errata.)

U.S. EPA. 1994d. (Draft) Implementation Guidance for Conducting Indirect Exposure Analysis at RCRA Combustion Facilities. October 4, 1994.

U.S. EPA. 1994e. Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. OSWER Directive #9355.4-12. EPA-540/F94/043. July 1994.

U.S. EPA. 1995a. User's Guide for the Industrial Source Complex (ISC3) Dispersion Models - Volumes I (User Instructions) and II (Description of Model Algorithm). Research Triangle Park, NC. Sept. 1995. EPA-454/B-95-003a and b.

U.S. EPA. 1995b. Norlite Corporation Human Health Risk Assessment Review. Letter from A. Bellino.

U.S. EPA. 1995c. Great Lakes Water Quality Initiative Technical Support Document for the Procedure to Determine Bioaccumulation Factors. Office of Water. EPA-820-B-95-005, March, 1995.

U.S. EPA. 1997a. Mercury Study Report to Congress, Volumes I to VIII. OAQPS and ORD, EPA/452/R-97-001. December.

U.S. EPA. 1997b. Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessment Interim Final. Environmental Response Team. Edison, NJ.

U.S. EPA. 1998a. Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities. Office of Solid Waste and Emergency Response EPA-530-D-98-001A, July 1998 and Errata, July 1999.

U.S. EPA. 1998b. Methodology for assessing health Risks Associated with Multiple Pathways of Exposure to Combustor Emissions. (Update to EPA/600/6-90/003) National Center for Environmental Assessment, EPA-R6-98-002, December 1998.

U.S. EPA. 1998c. Region 6 Risk Management Addendum – Draft Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities. Office of Solid Waste and Emergency Response EPA-R6-98-002, July 1998.

U.S. EPA. 1998d. Guidelines for Ecological Risk Assessment. Risk Assessment Forum, U.S. Environmental Protection Agency, Washington, DC. EPA/630/R-95/002F.

U.S. EPA. 1999a. Integrated Risk Information System (IRIS). Environmental Criteria and Assessment Office, Cincinnati, OH. Solid Waste. August.

U.S. EPA. 1999b National Ambient Water Quality Criteria Summary. Office of Standards. Washington, D.C.

U.S. EPA. 1999c. Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities: Peer Review Draft. Office of Solid Waste and Emergency Response EPA-530-D-99-001A, August, 1999.

U. S. EPA. 2001. Combustion Human Health Risk Assessment for DuPont Dow Elastomers, L.L.C. LaPlace, LA. U.S. EPA Region 6 Center for Combustion Science and Engineering, Dallas, January 5.