

**TABLE C-1-8**

**HAZARD QUOTIENT: NONCARCINOGENS**

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**Description**

This equation calculates the hazard quotient for indirect exposure to noncarcinogenic COPCs. The following uncertainty is associated with this equation.

A chronic *RfD* is an estimate of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during a lifetime. Chronic *RfDs* are specifically developed to be protective for long-term exposure (from 7 years to a lifetime) to a compound. COPC-specific reference doses (*RfD*) are unlikely to underestimate a chemical potential for causing adverse effects.

**Equation**

$$HQ = \frac{I \cdot ED \cdot EF}{RfD \cdot AT \cdot 365}$$

Variable	Description	Units	Value																					
<i>HQ</i>	Hazard quotient	unitless																						
<i>I<sub>i</sub></i>	Daily intake of COPC <i>i</i> from animal tissue <i>j</i>	mg COPC/ kg-day	<b>Varies</b> This variable is COPC- and site-specific, and is calculated by using the equation in Table C-1-6. The value for this variable will vary for each exposure pathway and each exposure scenario location. Uncertainties associated with this variable are site-specific.																					
<i>ED</i>	Exposure duration	yr	<b>6, 30, or 40</b> Consistent with U.S. EPA (1994b) and NC DEHNR (1997), U.S. EPA OSW recommends the use of the following default values.  <table border="0"> <tr> <td><u>Exposure Scenario</u></td> <td><u>ED</u></td> <td></td> </tr> <tr> <td>Subsistence Farmer</td> <td>40</td> <td>(U.S. EPA 1994a)</td> </tr> <tr> <td>Subsistence Farmer Child</td> <td>6</td> <td>(U.S. EPA 1989)</td> </tr> <tr> <td>Subsistence Fisher</td> <td>30</td> <td>(U.S. EPA 1994a)</td> </tr> <tr> <td>Subsistence Fisher Child</td> <td>6</td> <td>(U.S. EPA 1989)</td> </tr> <tr> <td>Adult Resident</td> <td>30</td> <td>(U.S. EPA 1989)</td> </tr> <tr> <td>Child Resident</td> <td>6</td> <td>(U.S. EPA 1989)</td> </tr> </table> Uncertainty associated with this variable includes:  These exposure durations are single values that represent the highest exposure that is reasonably expected to occur at a site. These values may overestimate <i>ED</i> for some individuals.	<u>Exposure Scenario</u>	<u>ED</u>		Subsistence Farmer	40	(U.S. EPA 1994a)	Subsistence Farmer Child	6	(U.S. EPA 1989)	Subsistence Fisher	30	(U.S. EPA 1994a)	Subsistence Fisher Child	6	(U.S. EPA 1989)	Adult Resident	30	(U.S. EPA 1989)	Child Resident	6	(U.S. EPA 1989)
<u>Exposure Scenario</u>	<u>ED</u>																							
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Variable	Description	Units	Value
<i>EF</i>	Exposure frequency	days/yr	<p style="text-align: center;"><b>350</b></p> <p>This variable is site-specific. U.S. EPA OSW recommends the use of this default value in the absence of site-specific data. This value is based on U.S. EPA (1991) and is consistent with U.S. EPA (1994b).</p> <p>Uncertainty associated with this variable includes:</p> <p style="padding-left: 40px;">This exposure frequency is a single value that represents the most frequent exposure that is reasonably expected to occur at a site with two weeks of vacation or travel. This recommended value may overestimate <i>EF</i> for individuals who are away from their home for more than two weeks each year. On the other hand, some individuals such as subsistence farmers, may remain at their home (or farm) for more than 350 days per year. In either case, the degree of over- or underestimation is not expected to be significant in most cases.</p>
<i>RfD</i>	Reference Dose	mg/kg-day	<p style="text-align: center;"><b>Varies</b></p> <p>This variable is COPC-specific, and should be determined from the COPC tables in Appendix A-3.</p> <p>The following uncertainty is associated with this variable:</p> <p style="padding-left: 40px;">A chronic <i>RfD</i> is an estimate of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during a lifetime. Chronic <i>RfDs</i> are specifically developed to be protective for long-term exposure (from 7 years to a lifetime) to a compound. COPC-specific <i>RfDs</i> are unlikely to underestimate a COPC's potential for causing adverse health effects.</p>
365	Units conversion factor	day/yr	
<i>AT</i>	Averaging time	yr	<p style="text-align: center;"><b>6, 30, or 40</b></p> <p>This variable is site-specific and related to <i>ED</i>. Specifically, the <i>AT</i> for noncarcinogens is numerically the same as <i>ED</i>. This default value is consistent with U.S. EPA (1989), U.S. EPA (1991), and U.S. EPA (1994a).</p> <p>Uncertainty associated with this variable includes:</p> <p style="padding-left: 40px;">The recommendation for averaging time may not accurately represent site-specific time; specifically this single value may under- or overestimate the length of an average adult lifetime.</p>

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#### REFERENCES AND DISCUSSION

NC DEHNR (1997). *Draft North Carolina Protocol for Performing Indirect Exposure Risk Assessments for Hazardous Waste Exposure Risk Assessments for Hazardous Waste Combustion Units*. January.

U.S. EPA. 1989. *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A)*. Interim Final. Office of Emergency and Remedial Response. EPA/540/1-89/002. December.

This document is cited as the reference source document of the exposure duration for adult and child residents. U.S. EPA OSW assumes that the recommended exposure duration for the child resident may also reasonably be applied to the subsistence farmer child and to the subsistence fisher child.

U.S. EPA. 1991. *Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors*. Office of Solid Waste and Emergency Response. OSWER Directive 9285.6-03. Washington, D.C.

This document is cited as a source document for exposure frequency and averaging time.

U.S. EPA. 1994a. *Estimating Exposure to Dioxin-like Components - Volume III: Site-Specific Assessment Procedure*. Review Draft. Office of Research and Development. Washington D.C. EPA/600/6-88/005Cc. June.

This document is cited by U.S. EPA (1994b) as the same document for the recommended default exposure duration (*ED*) values for the subsistence farmer and subsistence fisher. The *ED* value of 40 years recommended for both the subsistence farmer and the subsistence fisher is based on the assumption that “farmers live in one location longer than the general population”.

U.S. EPA. 1994b. *Revised Draft Guidance for Performing Screening Level Risk Analyses at Combustion Facilities Burning Hazardous Wastes. Attachment C, Draft Exposure Assessment Guidance for RCRA Hazardous Waste Combustion Facilities*. Office of Emergency and Remedial Response. Office of Solid Waste. December 14.

This document recommends the following:

- An exposure frequency of 350 days per year
- Receptor-specific exposure duration values as presented in U.S. EPA (1994a)—subsistence fisher (40 years) and subsistence farmer (40 years) and U.S. EPA (1989)—adult resident (30 years) and child resident (6 years)
- Adult and child body weights of 70 kg and 15 kg, respectively