Appendix M
Ecological Hazard Profile Methodology

The environmental hazard assessment of chemicals consists of the identification of the effects that a chemical may have on organisms in the environment. And overview of this assessment process has been reported by Zeeman and Gilford (1993a). The effects are expressed in terms of the toxicity of a chemical on the organisms and are generally given as the effective concentration (EC) that describe the type and seriousness of the effect for a known concentration of a chemical. When the effective concentrations for a range of species for a chemical is tabulated, the tabulation is called a Hazard Profile or Toxicity Profile. A more detailed discussion of a comprehensive hazard profile has been presented by now blahs, 1991. The most frequently used hazard profile for the aquatic environment consists of six effective concentrations as reported by Nabholz, et al., (1993 a). These are:

- A Fish Acute Value (usually a fish and 96-hour LC_{50} value)
- An Aquatic Invertebrate acute value (usually a Daphnid 48-hour LC_{50} value)
- A Green Algal Toxicity value (usually an Algal 96-hour EC_{50} value)
- A Fish Chronic value (usually it fish 28-day chronic value (ChV))
- An Aquatic Invertebrate Chronic value (usually a Daphnid 21-day ChV value)
- An Algal Chronic value (usually an Algal 96-hour NEC value for biomass)

For the acute values, the LC_{50} (mortality) (EC_{50}) (effects) refers to the concentration that resulted in 50% of the test organism's affected at the end of the specified exposure period. the chronic values represent the concentration of the chemical that results in no statistically significant effects on the test organism following a chronic.

The hazard profile can be constructed using effective concentrations based on toxicity test data (measured) were estimated toxicity values based on structure activity relationships (SARs). The measured values are preferred, but in the absence of test data SAR estimates, if available for the chemical class, can be used. Thus the Hazard Profile may consist of only measured data, only projected values, or combination of both. Also, the amount of data in that has a profile may range from a minimum of one acute or chronic in value to the full complement of three acute values and three chronic the values.

In the absence of measured toxicity values, estimates of these values can be made using the Structure Activity Relationships (SAR). But SAR methods include Quantitative Structure Activity Relationships (QSARs), qualitative SARs or use of the best analogue. The use of SARs buying OPPT

has been described (Clemens, 1988, et al., 1994 in Press). The use and application of the QSARs for the hazard assessment of new chemicals have been presented (Clemens, et al., 1993a). The development, validation and application of SARs in OPPT have been presented by OPPT staff (Zeeman, et al., 1993; Boethling, 1993; Clemens, et al., 1993b; Nabholz, et al., 1993b; Newsome, et al., 1993 and Lipnick, 1993).

The predicted equations (QSARs) are used in lieu of test data to estimate a toxicity value for aquatic organisms within a specific chemical class. Although the equations are derived from correlation and linear regression analysis based on measure data, the confidence interval associated with the equation are not used to provide a range of toxicity values. Even with measure test data the use of the confidence limits to determine the range of values is not used.

Determination of concern concentration

Upon completion of a hazard profile, it concern concentration is determined. Is concerned concentration is the concentration of the chemical in the aquatic and garment which, if exceeded, because is significant risk. Conversely, if the CC is not exceeded, the assumption is made that probability of a significant risks occurring is low and no regulatory action is required. The CC for each chemical is determined by applying assessment factors to the effect concentrations in the hazard profile.

Assessment factors incorporate the concept of the uncertainty associated with (1) toxicity data; laboratory tests versus field test and measured versus estimated that and (2) species sensitivity. For example, if only a single LC_{50} value for a single species, is available, but there several uncertainties to consider. First, how good is the value itself? If the test were to be done again by the same laboratory or a different laboratory, with the value defer? Second, there are differences and sensitivity, and between species that have been considered. Is the species tested the most or the least sensitive? In general, if only a single toxicity value is available, there is a large uncertainty about the applicability of is valued to other organisms in the firm in and large assessment factor, that is, 1000, is applied to cover the breath of sensitivity known to exist among and between organisms in the garment. The mercy, the more information than is available results in more certainty concerning the toxicity values and requires the use of a smaller assessment factor. For example, if toxicity values are derived from field tests, then an assessment factor on one is used.

Four AsFs are used by OPPT to set a CC for chronic rest: 1, 10, 100, and 1000. The AsFs rule use is dependent on the amount and type of toxicity data

contained in the hazard profile and reflects the amount of uncertainty about the potential effects associated with a toxicity value. In general, the more complete the hazard profile and the greater the quality of the toxicity data, is smaller factor is used. Following discussion describes the use application of the assessment factors:

1. If the hazard profile only contains one or two acute toxicity values, the concern concentration is set at 1/1000 of the acute value.
2. If the hazard profile contains three acute values (base set), the concern concentration is set at 1/100 of the lowest acute value.
3. If that has a profile contains one chronic value, but concerned concentration is set at 1/10 of the cup chronic value of the value is for the most sensitive species. Otherwise, it is 1/100 of the acute value for the most sensitive species.
4. If the hazard profile contains three chronic values, the concern concentration is set at 1/10 of the lowest chronic value.
5. If the hazard profile contains a measure chronic value from the field study, then an assessment factor of 1 is used.

Hazard Ranking

Chemicals can also be ranked aCCording to hazard concern levels for the aquatic environment. This ranking can be based upon the acute toxicity values expressed in milligrams per liter (MG/L). The generally aCCepted scoring is as follows:

High concern (H)	□ 1
Moderate concern (M)	> 1 and < 100
Low concern (L)	> 100

The ranking can also be expressed in terms of chronic values as follows:

High concern (H)	□ 0.1
Moderate concern (M)	> 0.1 and < 10.0
Low concern (L)	□ 10.0

Chronic toxicity ranking takes precedence over the acute ranking.