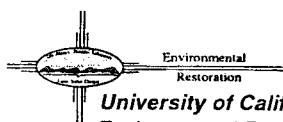


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Permit



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Date: September 22, 1998
Refer to: EM/ER:98-357

Mr. Benito Garcia
NMED-HRMB
P.O. Box 26110
Santa Fe, NM 87502

**SUBJECT: PROPOSED METHODOLOGY TO USE IN CALCULATING
SALS**

Dear Mr. Garcia:

Enclosed is a document describing the methodology that the Environmental Restoration (ER) Project proposes to use to calculate screening action levels (SALs) for conducting human health screening assessments on potential release sites (PRSSs). This SAL methodology was agreed on by the Laboratory and the Hazardous and Radioactive Materials Bureau (HRMB) personnel at a June 24, 1998, meeting. The document is submitted for HRMB review and will be finalized pending resolution of comments received back from your staff.

The ER Project requests that comments from HRMB be resolved at a meeting between appropriate personnel, rather than through a formal request for supplemental information or notice of deficiency. This would permit the timely resolution of concerns and permit the HRMB-approved methodology to be incorporated into the 1998 revision of the ER Project's Installation Work Plan (IWP) as agreed on at the June meeting. If possible, the ER Project requests that such a meeting be held at your earliest convenience, preferably by September 30, 1998, so that the IWP revision can be completed by November 1998. Please be advised that, due to end-of-fiscal-year resource constraints, the SAL methodology document has not been formally edited.

Please contact Joe Mose at (505) 667-5808 or Diana Hollis at (505) 665-8469 if you have any questions pertaining to this document.

Sincerely,

Julie A. Canepa, Program Manager
LANL/ER

Sincerely,

Theodore J. Taylor, Program Manager
DOE/LAAO

JC/TT/DH/el



15725

Mr. Benito Garcia
EM/ER:98-357

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September 21, 1998

Enclosure: Document Describing Methodology to Calculate SALs

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Summary

The document provides guidance to Environmental Restoration (ER) Project risk assessors for the calculation of screening action levels (SALs) for organic and inorganic chemicals in mesa-top soils and sediments. A residential exposure scenario that includes soil ingestion, inhalation, and dermal uptake exposure pathways is used as the basis of the SAL calculations. EPA guidance documents were used to identify appropriate model equations and parameter values consistent with 'reasonable maximum exposure' conditions.

1.0 Introduction

1.1 Purpose

The purpose of this document is to provide guidance to ER Project risk assessors for the calculation of SALs for organic and inorganic chemicals in mesa-top soils and sediments. Implementation of this guidance is intended to insure consistency in the calculation of SALs and in their application for evaluating specific media.

Sufficient discussion is provided in this document regarding assumptions and conditions of use to allow independent review of the methodology for calculating SALs by stakeholders and concerned citizens. This document is not intended to provide complete guidance for the application of SALs in ER Project assessments.

It is the intent of the ER Project to calculate SAL values such that responsibility for the accuracy of the SAL values resides completely with the ER Project rather than be dependent on an outside source. In addition, independent calculation of SAL values will allow incorporation of updated toxicity values in real time rather than depending on periodic updates from outside sources.

The equations and parameter values proposed in this document are consistent with those employed by EPA Region IX in the derivation of their preliminary remediation goals (PRGs) (EPA Region IX, 1998). The ER Project is adopting the approach of EPA Region IX for three reasons. The first is to use Region IX PRGs as a quality assessment tool, to check the values that the ER Project calculates. The second reason is to allow other risk assessors, who are familiar with Region IX PRGs, an easier understanding of the ER Project's guidelines and procedures. The third reason is to provide continuity within the ER Project by maintaining the same methodology for calculating SAL values that has and is currently being used.

Exceptions to the calculation of SALs described by this methodology are the values for lead and PCBs. Lead has been found to be a concern at several PRSs. However, EPA-approved toxicity values have not been published for this

chemical. A soil screening level of 400 mg/kg, from an EPA guidance document for screening soil lead concentrations (EPA 1994), will be used in lieu of an independently calculated SAL value. A PCB SAL of 1 ppm will be used for both residential and industrial land use. This SAL will be applied to the summed concentration of all PCB congeners and is based on guidance from the Toxic Substance Control Act (TSCA).

1.2 Applicable Regulations and Guidance

ER Project investigations and remedial actions are conducted in accordance with the Hazardous and Solid Wastes Amendments of 1984 (HSWA) and follow the regulatory requirements in Module VIII of the Laboratory's Hazardous Waste Facility Permit. For the derivation of SAL values, the Laboratory ER Project adheres to the guidelines of Risk Assessment Guidance for Superfund (RAGS) Human Health Evaluation Manual Part B, *Development of Preliminary Remediation Goals* (EPA 1991a) and EPA's *Soil Screening Guidance* (EPA 1996a), as well as the preamble to EPA Region IX PRG (EPA Region IX, 1998).

2.0 Identification of Target Risk Values

The excess incremental cancer risk (ICR) used in the calculation of SAL values will conform to the target risk range of 10^{-4} to 10^{-6} described in the National Contingency Plan [55 Federal Registry 8666 (March 8, 1990)], where risks less than 10^{-6} are considered negligible. A target ICR of 10^{-6} will be used when calculating SALs for EPA cancer class A, B1, and B2 carcinogens. A target ICR of 10^{-5} will be used when calculating SALs for EPA cancer class C carcinogens, which is consistent with guidelines from New Mexico Environment Department and EPA Region VI. The less restrictive target risk of 10^{-5} , which is within EPA's target risk range, is proposed for class C carcinogens because evidence for their carcinogenicity is not as compelling.

The screening values for noncarcinogens will be based upon a hazard quotient (HQ) of one. The HQ represents the ratio of the site concentration to the SAL concentration. Unlike an ICR, a HQ does not reflect the probability of an effect occurring, although larger values of HQ are generally associated with potentially increased severity of effects. For use in a screening assessment, SAL values for noncarcinogens will be divided by a safety margin of 10 when two or more noncarcinogen chemicals of potential concern (COPCs) are identified. The purpose of the additional safety margin of 10 is to address the potential that two or more COPCs may affect similar target organs or organ systems.

3.0 Identification and Use of Toxicity Values

Toxicity values (reference doses and cancer slope factors) associated with chronic exposure will be used for calculating SAL values. The preferred source of toxicity values is EPA's Integrated Risk Information System (IRIS) (EPA 1998). EPA's Health Effects Assessment Summary Tables (HEAST) will be used as a secondary source of toxicity values if they are not published in IRIS. Finally, provisional toxicity values may be obtained for some chemicals and routes of exposure from EPA's National Center for Environmental Assessment (NCEA). NCEA publishes issue papers on toxicity values for certain chemicals for use by EPA regional offices. These NCEA provisional values have not, however, been subjected to rigorous scientific review and therefore cannot be used with the confidence of values obtained from IRIS or HEAST. However, they are proposed for use in calculating SAL values for performing screening assessments because; 1) they generally reflect the state of knowledge of an EPA working group at the time of their publication and therefore, incorporate a level of review beyond peer review publications, and 2) SAL values are calculated incorporating several upper-bound exposure estimates and conservatively-biased submodels for dermal absorption and dust resuspension, such that the uncertainty associated with the provisional toxicity value is balanced by known biases for protecting the public. If provisional values are used in SAL calculations, consequences on the confidence of the screening decision will be discussed in the report.

Toxicity values are specified separately by EPA for the ingestion and inhalation intake routes. Route-to-route extrapolation of toxicity values when a value has been published for one route only will not be performed for metals due to the potential differences in absorption efficiencies between intake routes. Because absorption of organic chemicals more closely approximates 100% for both ingestion and inhalation, route-to-route extrapolations will be performed for organic chemicals.

The toxicity values for oral intake of a chemical will be used to evaluate risks associated with dermal uptake. Depending on the chemical and on the method of administration in the studies from which toxicity values are derived, these oral toxicity values may reflect varying absorption efficiencies from the gastrointestinal (GI) tract into the bloodstream. Oral toxicity values will not be adjusted to account for the chemical-specific oral absorption fraction associated with the toxicity value because information is generally unavailable to quantify a specific correction factor. This assumption may result in a slight underestimate of intake via the dermal pathway, but this is balanced by the conservative assumptions incorporated into the dermal uptake model, as discussed in Section 5.3, Dermal Uptake.

The relative bioavailability of a chemical in the GI tract will not be incorporated into the SAL calculations for the soil ingestion pathway. In general,

bioavailability of a chemical in soil is expected to be lower than from food or water due to the time required for a chemical to desorb from a soil particle and/or diffuse from within pores in the soil particle. Some fraction of a chemical adsorbed onto soil may be permanently adsorbed, or else desorb at so slow a rate as to be effectively irremovable. Factors such as chemical form, soil particle diameter, geochemical factors, and the nutritional status of an individual may affect the degree of bioavailability from soil. The assumption of equivalent bioavailability from soil and from the administration vehicle used in the toxicity studies on which many toxicity values are based should generally result in an overestimate of uptake from soil ingestion.

There are some chemicals that are routinely analyzed and detected at PRSs that do not have EPA-approved or provisional toxicity values. A general approach to this screening issue will be to identify a similar chemical for which toxicity values are available to incorporate as a surrogate. Identification of an appropriate surrogate value, and whether the evaluation should be performed within the context of a screening assessment or a risk assessment, is a chemical-specific and assessment-specific decision that is beyond the scope and purpose of this document. Surrogates and the assumptions affecting their choice and use will be documented in each report.

4.0 Exposure Scenario, Media, and Pathways

Three exposure scenarios have been generally identified for current and future land use at the Laboratory: residential, recreational, and commercial/industrial. The residential scenario is typically the most appropriate for town site properties; the recreational scenario for buffer areas or areas where development is topographically limited; and the commercial/industrial scenario for areas subject to continued Laboratory use or certain other locations where commercial development is foreseen. The SAL values described in this document are associated with residential land use because it is the most restrictive of these land use options. Therefore, sites screened and released on the basis of residential land use are also safe for recreational and commercial/industrial activities.

The SAL values described in this document are specifically for application at mesa-top potential release sites. Appropriate land use activities and exposure pathways may differ for some canyon-bottom settings. Therefore, SAL values developed using this guidance are not automatically applicable to non mesa-top sites. SAL values should also be applicable for screening exposures on mesa slopes, although due to the potential for erodability impacts in the canyon may need to be considered as well.

The SAL values calculated with this methodology are generally applicable to surface and near-surface soils and sediments. Below depths where construction activities may reasonably be expected to occur (approximately 12

ft), and in solid environmental media (e.g. tuff), application of SAL values is at the discretion of the assessor.

Exposure equations and parameter values for SAL calculations are documented in Attachment A. The primary source of exposure parameters used in the SAL calculations is EPA's *Standard Default Exposure Factors* (EPA 1991b). As described in EPA (1991b), these parameter values are intended to provide estimates of 'reasonable maximum exposure' for an exposure scenario that incorporates these pathways. The exposure parameters referenced in EPA (1991b) are generally those that describe the intensity, frequency, and duration of exposure. For the dermal uptake exposure route, parameter values for exposed body surface area, soil adherence factor, and skin absorption factors were obtained from EPA Region IX (1998). EPA Region IX referenced these values from a draft version of EPA's *Dermal Risk Assessment*. Although *Dermal Risk Assessment* is still in interim draft form and has not been released for general use, these parameter values reflect the current EPA guidance for evaluating this exposure route based on their review of relevant published research and are unlikely to change.

The 30-year exposure duration assumed in the SAL calculations includes time as both a child and an adult. Exposure to noncarcinogens is evaluated based on only a child's exposure primarily because children take in proportionally more contaminants per unit of body weight than adults. Hence, children experience proportionally greater hazard than adults and the SAL values are therefore based on children's exposure. For carcinogens, exposure to both children and adults over the entire exposure duration is considered, rather than just the intake over the period when exposure is highest. Cumulative intake over the entire exposure duration is relevant for carcinogens because carcinogenic effects are averaged over a lifetime, rather than just the period of exposure.

5.0 Modeling the Inhalation and Dermal Pathways

5.1 Inhalation - VOCs

The concentration of VOC vapors in the ambient air breathing zone associated with VOCs in site soils will be calculated using a steady-state volatilization model. The model used will be Hwang and Falco's volatilization factor (VF) model, originally described in RAGS, Part B, *Development of Risk-Based Preliminary Remediation Goals* (EPA 1991a).

The version of the VF model that will be used for calculating SAL values is presented in the User's Guide and Technical Background Document of EPA's *Soil Screening Guidance* (EPA 1996a and 1996b). The primary difference with the later version of the VF model is that the output of a separate air dispersion

model (based on one year of meteorological data) has now replaced the earlier box model component. From a table of dispersion model output ordered by area and regional location, users select a value most applicable to the site under consideration for use in their assessment.

The VF model assumes an effectively infinite depth of contaminated soil and no cover of clean soil. The first assumption in particular may contribute to significant overestimates of risk for sites with a relatively small volume of contamination because calculated VOC emissions over a chronic exposure period of many years can easily violate conservation of mass. However, the ambient air VF model is being used to screen sites for residential and commercial land use and situations where a building may be constructed over the affected soils. Indoor air VOC concentrations at a site may be considerably higher than local concentrations in ambient air. Thus, the significant conservative biases associated with applying the VF model to ambient air impacts are balanced by its potential application to sites where indoor air impacts may be of concern.

The VF model is valid for site conditions where a VOC is present at concentrations below which the soil particle, pore water, and pore air phases are saturated. For conditions where soil is saturated with one or more organic chemicals, the SAL value calculated using the VF model output is not reliable. Among the screening options available when saturated soil exists are 1) calculate SAL values using only soil ingestion and dermal uptake exposure routes, 2) use the VF model value in the SAL calculation, although model boundaries are violated, and 3) substitute the soil saturation concentration (C_{sat}) for the calculated VF value in the SAL calculation.

The ER Project proposes to use the first alternative for screening VOCs when saturated soil conditions exist. EPA has evaluated volatile inhalation risks at soil saturation concentrations for a number of common chemicals whose calculated VF value exceeds the soil saturation limit (EPA 1996a). Based on this evaluation, EPA concluded generally that organic chemicals present at concentrations above their saturation limit in soil would be unlikely to pose a significant inhalation risk. EPA therefore recommended that in cases where a calculated VF exceeds the soil saturation limit, the soil screening decision be made on the basis of the other exposure pathways evaluated.

Volatilization Factor model equations and parameter values for SAL calculations are documented in Attachment A. Parameter values for site-related factors such as soil porosities, density, and amount of organic carbon are default values recommended in EPA's *Soil Screening Guidance* (EPA 1996a). Chemical-specific parameter values are required for chemical diffusivity in air and water, Henry's Law constant, and organic carbon partition coefficient. The references that will be used for obtaining these values, in order of prioritization, are 1) EPA's *Soil Screening Guidance* (EPA 1996a and 1996b), and 2) EPA's

Superfund Chemical Data Matrix (EPA 1996c). Other references that may be employed if data are unavailable in the primary references include *Handbook of Environmental Fate and Exposure Data for Organic Chemicals* (Howard 1990), EPA's *Subsurface Contamination Reference Guide* (EPA 1990), and EPA's *Superfund Exposure Assessment Manual* (EPA 1988).

5.2 Inhalation - Fugitive Dust

The concentration of dust in the air above contaminated soils and sediment will be calculated using a screening-level soil resuspension model. The resuspension model used will be EPA's particulate emission factor (PEF) model. This model was originally described in *Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination Sites* (Cowherd et al, 1985). The version of the PEF model that will be used for calculating SAL values is presented in the User's Guide and Technical Background Document of EPA's *Soil Screening Guidance* (EPA 1996a and 1996b). The primary difference with the later version of the PEF model is that the output of a separate air dispersion model (based on one year of meteorological data) has now replaced the earlier box model component. From a table of dispersion model output ordered by area and regional location, users select a value most applicable to the site under consideration for use in their assessment.

The PEF model used for screening the dust inhalation pathway is based on the wind erosion of surfaces with an unlimited reservoir of particles. The model calculates the concentration of respirable particles in the air due to wind erosion. Depending on site soil conditions, there may not, in fact, be an unlimited supply of particles of this size available throughout the exposure period. This may result in a significant overestimation of intake via dust inhalation. A limitation of the model is that it does not address resuspension of particulates due to mechanical forces. Therefore, fugitive dust concentrations calculated using this model are not applicable for soil for activities such as construction.

Particulate Emission Factor model equations and parameter values for SAL calculations are documented in Appendix A. Parameter values for the PEF model, including the dispersion term Q/C , vegetative cover, and windspeeds are default values recommended in EPA's *Soil Screening Guidance* (EPA 1996a). No chemical-specific parameter values are required in the PEF model.

5.3 Dermal Uptake

Dermal uptake from soil will be evaluated using an absorption factor (ABS) to model desorption of a chemical from soil, absorption into skin, and transfer to the bloodstream. The amount of soil residing on a unit area of skin will be described using an adherence factor (AF). The literature on AFs recognizes that they are dependent upon body part, soil type, particle size, soil moisture content, and other variables. Because these variables are generally not well quantified, and because a focus of screening is to streamline the assessment process, single recommended default values will be used for the AFs when calculating SALs. Similarly, default values will be employed for the ABS unless there is readily available information for a specific chemical (see Appendix A).

Chemical-specific ABS values are used in SAL calculations for the following chemicals: arsenic (0.03), cadmium (0.01), chlordane (0.04), 2,4-D (0.05), DDT/DDD/DDE (0.03), hexachlorocyclohexane [lindane] (0.04), TCDD [dioxin] (0.03), polyaromatic hydrocarbons (0.13), PCBs (0.14), and pentachlorophenol (0.25). These chemical-specific ABS values are recommended for use in EPA Region IX (1998).

The approach used to model dermal uptake incorporates several assumptions that may result in an overestimation of actual uptake. The ABS value reflects an assumption that uptake is independent of concentration and also doesn't change with time. One hundred percent of a chemical is assumed to be available for uptake from adhered soil. Particularly, no loss of volatile or semivolatile chemicals is assumed to occur due to volatilization when soil is present on the skin. Finally, 100% of the specified surface area is assumed to be covered with a layer of soil of a depth corresponding to the AF. An additional assumption is that skin is presumed to be intact, abrasions or cuts on the skin surface that could result in greater uptake on an individual basis are not considered.

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Appendix A

SAL Equations and Parameter Values

Combined Exposures in Noncarcinogenic Contaminants in Residential Soil

$$C = \frac{THQ \leftrightarrow BW \leftrightarrow AT_n}{EF \leftrightarrow ED_c \leftrightarrow \frac{1}{RfD} \leftrightarrow \frac{IRS}{10^6 \text{ mg/kg}} \sqrt{+} \frac{1}{RfD} \leftrightarrow \frac{SA \leftrightarrow AF_c \leftrightarrow ABS}{10^6 \text{ mg/kg}} \sqrt{+} \frac{1}{RfD} \leftrightarrow \frac{IRa}{(VF \text{ or } PEF)^a} \sqrt{+}}$$

Combined Exposures in Carcinogenic Contaminants in Residential Soil

$$C = \frac{TR \leftrightarrow AT_c}{EF \leftrightarrow \frac{IFS_{adj} \leftrightarrow CSF_o}{10^6 \text{ mg/kg}} \sqrt{+} \frac{SFS_{adj} \leftrightarrow ABS \leftrightarrow CSF_o}{10^6 \text{ mg/kg}} \sqrt{+} \frac{InhF_{adj} \leftrightarrow CSF_i}{(VF \text{ or } PEF)^a} \sqrt{+}}$$

^aUse VFs for volatile chemicals (defined as having a Henry's Law Constant [atm-m³/mol] greater than 10⁻⁵ and a molecular weight less than 200 grams/mol) or PEF for non-volatile chemicals.

The parameter definitions for the SAL equations are provided below. References for these parameter values are described in Section 4.0.

C	=	chemical SAL in soil (mg/kg)	
THQ	=	target hazard quotient	1
TR	=	target cancer risk	10 ⁻⁶ for class A, B1, and B2 carcinogens 10 ⁻⁵ class C carcinogens
AT _c	=	averaging time (carcinogen)	70 yrs x 365 days
AT _n	=	averaging time (noncarcinogen)	30 yrs x 365 days
ABS	=	skin absorption factor (organics)	0.1 (inorganics : 0.01) ^b
AF _c	=	adherence factor (child)	0.3 mg/cm ²
BW _c	=	body weight - child	15 kg
CSF _o	=	cancer slope factor – oral	(mg/kg-d) ⁻¹ See Section 3
CSF _i	=	cancer slope factor – inhaled	(mg/kg-d) ⁻¹
EF	=	exposure frequency	350 d/yr
ED _c	=	exposure duration, child	6 yr
IFS _{adj}	=	age-adjusted ingestion factor	114 mg-yr/kg-d

InhF _{adj} =	age-adjusted inhalation factor	11 m ³ -yr/kg-d
IRA _c =	inhalation rate – child	10 m ³ /d
IRS _c =	soil ingestion rate – child	200 mg/d
PEF =	particulate emission factor	(m ³ /kg) See below
RfD _o =	reference dose, oral	(mg/kg-d) See Section 3
RfD _i =	reference dose, inhalation	(mg/kg-d) See Section 3
SA _c =	exposed surface area – child	2900 cm ² /day
SFS _{adj} =	age-adjusted skin contact factor for carcinogens	504 mg-yr/kg-d
VF _s =	volatilization factor for soil	(m ³ /kg) See below

^b See exceptions in Section 5.3

Because contact rates may be different for children and adults, carcinogenic risks during the first 30 years of life were calculated using age-adjusted factors (“adj”). Use of age-adjusted factors are especially important for soil ingestion exposures, which are higher during childhood and decrease with age. However, for purposes of combining exposures across pathways, additional age-adjusted factors are used for inhalation and dermal exposures.

For ingestion (mg-yr)/ (kg-d), the following equation is used:

$$IFS_{adj} = \frac{ED_c \leftrightarrow IRS_c}{BW_c} + \frac{(ED_r - ED_c) \leftrightarrow IRS_a}{BW_a}$$

For dermal contact (mg-yr)/ (kg-d), the following equation is used:

$$SFS_{adj} = \frac{ED_c \leftrightarrow AF \leftrightarrow SA_c}{BW_c} + \frac{(ED_r - ED_c) \leftrightarrow SA_a}{BW_a}$$

For inhalation (m³-yr)/ (kg-d), the following equation is used:

$$InhF_{adj} = \frac{ED_c \leftrightarrow IRA_c}{BW_c} + \frac{(ED_r - ED_c) \leftrightarrow IRA_a}{BW_a}$$

where:

BW _a =	body weight - adult	70 kg
ED _r =	exposure duration, residential	30 yr
IRS _a =	soil ingestion rate – adult	100 mg/d
SA _a =	exposed surface area – adult	5700 cm ² /day
IRA _a =	inhalation rate – adult	20 m ³ /d

Derivation of the Volatilization Factor

$$VF_s = \frac{-Q}{C_s} \frac{(314 \leftarrow D_A \leftarrow T)^{1/2}}{(2 \leftarrow \rho_b \leftarrow D_A)} \leftarrow 10^{-4} (m^2 / cm^2)$$

where:

$$D_A = \frac{(\Theta_a^{10/3} D_i H' + \Theta_w^{10/3} D_w) n^2}{\rho_b K_d + \Theta_w + \Theta_a H'}$$

where:

VF_s	=	volatilization factor	(m^3/kg)
D_A	=	apparent diffusivity	(cm^2/s)
Q/C	=	inverse of the mean conc. at the center of a 0.5-acre square source	$68.81 \text{ g/m}^2\text{-s per kg/m}^3$
T	=	exposure interval	$9.5 \times 10^8 \text{ s}$
ρ_b	=	dry soil bulk density	1.5 g/cm^3
Θ_a	=	air filled soil porosity (L_{air}/L_{soil})	0.28 or $n - \Theta_w$
Θ_w	=	water filled soil porosity (L_{water}/L_{soil})	0.15
D_i	=	diffusivity in air (cm^2/s)	chemical-specific
H'	=	dimensionless Henry's Law constant	chemical-specific
D_w	=	diffusivity in water (cm^2/s)	chemical-specific
n	=	total soil porosity (L_{pore}/L_{soil})	0.43 or $1 - (\rho_b/\rho_s)$
ρ_s	=	soil particle density	2.65 g/cm^3
K_d	=	soil-water partition coefficient (cm^3/g)	$= K_{oc} f_{oc}$
K_{oc}	=	soil organic carbon/water partition coefficient (L/kg)	chemical specific
F_{oc}	=	fraction organic carbon content of soil (g/g)	0.006 or site-specific

Derivation of the Particulate Emission Factor

$$PEF(m^3/kg) = \frac{Q}{C} \frac{3,600/h}{0.036(1-V)(U_m/U_t)^3 F(x)}$$

where:

PEF	=	particulate emission factor	(m ³ /kg)
Q/C	=	inverse of the mean conc. at the center of a 0.5-acre square source	90.8 g/m ² -s per kg/m ³
V	=	fraction of vegetative cover	(unitless)
U _m	=	mean annual windspeed	4.69 m/s
U _t	=	equivalent threshold value of windspeed at 7m	11.32 m/s
F(x)	=	function dependent on U _m /U _t derived using Cowherd et al. (1984)	0.194 (unitless)