

June 24, 2010

RESPONSE TO ADDITIONAL COMMENTS
ILLINOIS EPA REVIEW
June 9, 2010
SITE 19 REMEDIAL INVESTIGATION & RISK ASSESSMENT REPORT—SMALL ARMS
RANGE 910
NAVAL STATION GREAT LAKES

- 2) **Response to Comment No. 7** - Revised screening levels based on the generic USEPA Supplemental SSL guidance for migration from soil to air for residential and industrial receptors were checked and are acceptable.

The calculated criteria for the construction worker, however, could not be confirmed. We employed the input parameters presented in the “Response to Comment Number 7” table and equation 5-3 from the USEPA Supplemental SSL guidance when attempting to regenerate these objectives. The discrepancies include; 57.8 v. 5.3 mg/kg for arsenic, 20.7 v. 3.0 mg/kg for chromium, and 955 v. 32 mg/kg for nickel. Please double-check the calculations to ensure they are correct.

Response: SSLs for Inhalation Construction Worker Scenario were calculated by Tetra Tech using methodology and equations presented in the Supplemental Guidance For Developing Soil Screening Levels for Superfund Sites, OSWER 93355.4-24, December 2002 using the following parameters and the equations from the guidance (see below).

Calculations were made for both carcinogenic and noncarcinogenic values and then the lower value was selected as the screening level. It appears Illinois EPA was only looking at carcinogenic toxicity criteria. For arsenic, Illinois EPA’s value of 57.8 mg/kg is the carcinogenic value. However, the noncarcinogenic value of 5.3 mg/kg was chosen since it was the lower of the two values. The same applies for nickel – Illinois EPA’s value of 955 mg/kg is the carcinogenic value, however the noncarcinogenic value of 32 mg/kg was also chosen, since it was the lower of the two values. For chromium, it appears that Illinois EPA is using an IUR of 0.012 (ug/m³)-1 whereas we used a value of 0.084 (ug/m³)-1. The value Illinois EPA used is appropriate for total chromium whereas the value we used is appropriate for hexavalent chromium. The calculations for arsenic, chromium, and nickel, and the other values in the spreadsheet were double checked, and found to be correct.

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<i>INPUT PARAMETERS</i>		
<i>Parameter</i>	<i>Value</i>	<i>Definition</i>
$Q/C_{sr} = :$	23.02	<i>inverse of 1-h average air concentration along a straight road segment bisecting a 0.5-acre square site (g/m²-s)/(kg/m³)</i>
$F_D = :$	0.185	<i>dispersion correction factor (unitless)</i>
$T = :$	7.20E+06	<i>total time over which construction occurs</i>
$A_R = :$	274.231	<i>surface area of contaminated road segment (m²)</i>
$W = :$	8	<i>mean vehicle weight (tons)</i>
$p = :$	110	<i>number of days with at least 0.01 inches of precipitation (days/year)</i>
$\square VKT$	175.5	<i>sum of fleet vehicle kilometers traveled during the exposure duration (km)</i>
$PEF_{sc} = :$	2.43E+06	<i>subchronic road particulate emission factor (m³/kg)</i>
$SSL_{carc} = :$		<i>Soil Screening Level for carcinogenic chemicals (mg/kg)</i>
$SSL_{ncarc} = :$		<i>Soil Screening Level for noncarcinogenic chemicals (mg/kg)</i>
$TR = :$	1E-06	<i>Target cancer risk (unitless)</i>
$THQ = :$	1	<i>Target hazard index (unitless)</i>
$AT_c = :$	70	<i>averaging time for carcinogenic exposures (70 years)</i>
$AT_n = :$	1	<i>averaging time for noncarcinogenic exposures (years)</i>
$EF = :$	250	<i>exposure frequency (days/year)</i>
$ED = :$	1	<i>exposure duration (years)</i>
URF	<i>Chemical-specific</i>	<i>inhalation unit risk factor (ug/m³)-1</i>
HBL_{sc}	<i>Chemical-specific</i>	<i>subchronic health based limit (mg/m³)</i>

$$SSL_{carc} = \frac{TR \times AT_c \times 365 \text{ days/year}}{URF \times 1,000 \text{ ug/mg} \times EF \times ED \times 1/PEF_{sc}}$$

$$SSL_{ncarc} = \frac{THQ \times AT_n \times 365 \text{ days/year}}{EF \times ED \times [1/HBL_{sc} \times 1/PEF_{sc}]}$$

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- 4) **Response to Comment No. 13** - The PEF inputs and calculation are acceptable. Tables 6-6 and 6-7 should be revised to reflect this value. Additionally, please provide assurance that the site-specific PEF was used in the risk and hazard calculations for this receptor.

Response: The site-specific PEF was used in the calculations. Tables 6-6 and 6-7 have been corrected and are attached.

TABLE 6-6

**SUMMARY OF EXPOSURE INPUT PARAMETERS
REASONABLE MAXIMUM EXPOSURES
SITE 19 - SMALL ARMS RANGE 910
NAVAL STATION GREAT LAKES, ILLINOIS
PAGE 1 OF 3**

Exposure Parameter	Maintenance Worker	Adolescent Trespasser	Construction Worker	Occupational Worker	On-Site Adult Resident	On-Site Child Resident
All Exposures						
C _{soil} (mg/kg)	Maximum or 95% UCL ⁽¹⁾	Maximum or 95% UCL ⁽¹⁾				
C _{gw} (µg/L)	NA	NA	Maximum	Maximum	Maximum	Maximum
EF (days/year)	250 ⁽³⁾	26 ⁽⁴⁾	30 ⁽²⁾	250 ⁽⁴⁾	350 ⁽⁵⁾	350 ⁽⁵⁾
ED (years)	25 ⁽³⁾	10 ⁽⁶⁾	1 ⁽⁴⁾	25 ⁽³⁾	24 ⁽⁵⁾	6 ⁽⁵⁾
BW (kg)	70 ⁽⁵⁾	42 ⁽⁷⁾	70 ⁽⁵⁾	70 ⁽⁵⁾	70 ⁽⁵⁾	15 ⁽⁵⁾
AT _n (days)	9,125 ⁽⁹⁾	3,650 ⁽⁹⁾	42 ⁽⁸⁾	9,125 ⁽⁹⁾	8,760 ⁽⁹⁾	2,190 ⁽⁹⁾
AT _c (days)	25,550 ⁽⁹⁾	25,550 ⁽⁹⁾				
Incidental Ingestion/Dermal Contact with Soil						
IR (mg/day)	100 ⁽⁵⁾	100 ⁽⁵⁾	330 ⁽¹⁰⁾	100 ⁽⁵⁾	100 ⁽⁵⁾	200 ⁽⁵⁾
FI (unitless)	1 ⁽⁵⁾	1 ⁽⁵⁾				
SA (cm ² /day)	3,300 ⁽¹¹⁾	3,280 ⁽⁷⁾	3,300 ⁽¹¹⁾	3,300 ⁽¹¹⁾	5,700 ⁽¹¹⁾	2,800 ⁽¹¹⁾
AF (mg/cm ²)	0.2 ⁽¹¹⁾	0.2 ⁽¹¹⁾	0.3 ⁽¹¹⁾	0.2 ⁽¹¹⁾	0.07 ⁽¹¹⁾	0.2 ⁽¹¹⁾
ABS (unitless)	chemical-specific ⁽¹¹⁾	chemical-specific ⁽¹¹⁾				
CF (kg/mg)	1E-06	1E-06	1E-06	1E-06	1E-06	1E-06
Inhalation Fugitive Dust/Volatile Emissions from Soil						
C _{air} (mg/m ³)	calculated ⁽¹⁰⁾	calculated ⁽¹⁰⁾				
InhR (m ³ /hour)	2.5 ⁽¹⁰⁾	1.9 ⁽⁷⁾	2.5 ⁽⁷⁾	2.5 ⁽¹⁰⁾	20 m ³ /day ⁽¹⁰⁾	10 m ³ /day ⁽⁷⁾
ET (hours/day)	8 ⁽¹⁰⁾	2 ⁽⁴⁾	8 ⁽¹²⁾	8 ⁽¹⁰⁾	24 ⁽¹⁰⁾	24 ⁽⁷⁾
PEF (m ³ /kg)	1.36E+9 ⁽¹⁰⁾	1.36E+9 ⁽¹⁰⁾	1.27 x 10 ⁶⁽¹⁰⁾	1.36E+9 ⁽¹⁰⁾	1.36E+9 ⁽¹⁰⁾	1.36E+9 ⁽¹⁰⁾
VF (m ³ /kg)	chemical-specific ⁽¹⁰⁾	chemical-specific ⁽¹⁰⁾				
Ingestion/Dermal Contact with Groundwater						
IR _{gw} (L/day)	NA	NA	NA	NA	2 ⁽⁵⁾	1.5 ⁽⁷⁾
ET (hours/day) and t _{event} (hours/event)	NA	NA	4 ⁽⁴⁾	NA	0.33 ⁽⁴⁾	0.33 ⁽⁴⁾
EV (events/day)	NA	NA	1 ⁽⁴⁾	NA	1 ⁽⁴⁾	1 ⁽⁴⁾
A (cm ² /day)	NA	NA	3,300 ⁽¹¹⁾	NA	18,000 ⁽¹¹⁾	6,600 ⁽¹¹⁾
K _p (cm/hour)	NA	NA	chemical-specific ⁽¹¹⁾	NA	chemical-specific ⁽¹¹⁾	chemical-specific ⁽¹¹⁾

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PAGE 2 OF 3**

Exposure Parameter	Maintenance Worker	Adolescent Trespasser	Construction Worker	Occupational Worker	On-Site Adult Resident	On-Site Child Resident
t* (hours), τ (hour), and B (unitless)	NA	NA	chemical-specific ⁽¹¹⁾	NA	chemical-specific ⁽¹¹⁾	chemical-specific ⁽¹¹⁾
Inhalation of Volatile Emissions while Showering						
C _{air} (mg/m ³)	NA	NA	NA	NA	Calculated ⁽¹³⁾	Calculated ⁽¹³⁾
InhR (m ³ /hour)	NA	NA	NA	NA	0.6 ⁽⁹⁾	0.6 ⁽⁹⁾
ET (hours/day)	NA	NA	NA	NA	0.33 ⁽⁴⁾	0.33 ⁽⁴⁾
Inhalation of Volatile Emissions from Groundwater by Vapor Intrusion and in a Trench (Construction Workers)						
C _{air} (mg/m ³)	NA	NA	calculated ⁽¹⁴⁾	calculated ⁽¹⁵⁾	calculated ⁽¹⁵⁾	calculated ⁽¹⁵⁾
InhR (m ³ /hour)	NA	NA	2.5 ⁽⁷⁾	2.5 ⁽¹⁰⁾	0.833 ⁽¹⁰⁾	0.42 ⁽⁷⁾
ET (hours/day)	NA	NA	4 ⁽⁴⁾	8 ⁽¹⁰⁾	24 ⁽¹⁰⁾	24 ⁽⁷⁾

A	Skin surface area available for contact	EF	Exposure frequency
ABS	Absorption factor	ET	Exposure time
AF	Soil-to-skin adherence factor	EV	Event frequency
AT _c	Averaging time for carcinogenic effects	FI	Fraction ingested from contaminated source
AT _n	Averaging time for non-carcinogenic effects	InhR	Inhalation rate
B	Bunge Model partitioning coefficient	IR	Ingestion rate (soil or groundwater)
BW	Body weight	K _p	Permeability coefficient from water through skin
CF	Conversion factor	SA	Skin surface area available for contact
IR	Ingestion rate	PEF	Particulate emission factor
C _{soil}	Exposure concentration for soil	τ	Lag time
C _{gw}	Exposure concentration for groundwater	t*	Time it takes to reach steady-state conditions
C _{air}	Exposure concentration for air	t _{event}	Duration of event
ED	Exposure duration		

1 - USEPA, 2002.

2 - Illinois EPA, 2004.

3 - USEPA, 1991

4 - Professional judgment.

5 - USEPA, 1993

6 - Adolescents ages 7 to 16 years old.

8 - Illinois EPA, 2003.

9 - USEPA, 1989

10 - USEPA, 2002

11 - USEPA, 2004

12 - Assume an 8-hour work shift.

13 - Foster, S.A. and P.C. Chrostowski, 1987

15 - USEPA, 2004

Note: The exposure factors for future civilian and military residents are the same, except for exposure duration (ED) for adult military residents. Exposure duration for adult military residents was assumed to be the typical enlistment times of 6

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PAGE 3 OF 3**

Exposure Parameter	Maintenance Worker	Adolescent Trespasser	Construction Worker	Occupational Worker	On-Site Adult Resident	On-Site Child Resident
7 - USEPA, 1997		14 - VDEQ, 2004				years for the RME and CTE.