



PAT MCCRORY
Governor

DONALD R. VAN DER VAART
Secretary

MICHAEL E. SCOTT
Acting Director

May 2, 2016

Mr. Lance Norris, Public Works Director
Town of Chapel Hill
405 Martin Luther King Jr Blvd
Chapel Hill NC 27514

Re: Chapel Hill Police Department Property
828 Martin Luther King Jr Blvd
Chapel Hill, Orange County
NONCD0001486

Dear Mr. Norris

This letter is written regarding the soil sample results from the requested testing in and around the proposed greenway construction that will cross onto the Chapel Hill Police Department Property Site (Site). The sample results were evaluated by our industrial hygienist to determine if they exceed safe levels for park/recreational use and worker exposure. The complete results of the evaluation are attached for your review. In summary, the risk of adverse health effects to park visitors and construction workers is below the US EPA and NC DEQ maximum acceptable limits.

If you have any questions, please contact me at (919) 707-8371.

Sincerely,

Amy Axon, Hydrogeologist
Inactive Hazardous Sites Branch

Enclosures
CC: Curtis Brooks

Axon, Amy

From: Assefa, Hanna
Sent: Tuesday, March 22, 2016 5:13 PM
To: Axon, Amy
Subject: Risk Assessment for the Chapel Hill Police Department soil contamination-828 Martin Luther King Jr Blvd. Chapel Hill, Orange County, NONCDD0001486
Attachments: recreator risk calc chapel hil pd property 03 21 2016.pdf; Construction_Worker_chem_22MAR2016_prg6491 Chapel Hill Police Department Soil.pdf

Amy, I have evaluated the maximum contaminant concentrations you provided for the subject site, for risk posed for a recreational/park scenario and a construction worker scenario. I used the USEPA risk calculator for this calculation. For the recreational/park scenario I assumed several age groups including infants going to the park twice a week 110 days a year for 1 hr. This is likely very conservative. Under these assumptions the risk of adverse health effects to the park visitor is below the USEPA and NCDEQ acceptable limits. Similarly, I assumed that construction workers would be exposed to the contaminants when they are grading the land when converting to a park. I ultra-conservatively assumed that they would work in the same area for 1 year.

The risk of adverse health effects calculated for the construction worker was also below the USEPA and NCDEQ maximum acceptable limits.

The USEPA and the NCDEQ maximum acceptable limits are a cumulative $1.0E-04$ cancer risk a hazard index of 1.0 for non-cancer adverse health effects.

I have attached the calculations for your records.

Chapel Hill Police Department Property, 828 Martin Luther King Jr Blvd
Chapel Hill, Orange County
Incident #NONCD0001486

Site-specific

Construction Worker Equation Inputs for Soil - Other Construction Activities

Variable	Value
TR (target cancer risk) unitless	1.0E-6
THQ (target hazard quotient) unitless	1
EF _{rw} (exposure frequency - construction worker) day/yr	250
ED _{rw} (exposure duration - construction worker) yr	1
ET _{rw} (exposure time - construction worker) hr/day	8
LT (lifetime) yr	70
BW _{rw} (body weight - construction worker) kg	80
IR _{rw} (soil ingestion rate - construction worker) mg/day	330
SA _{CW} (surface area - construction worker) cm ² /day	3527
AF _{CW} (skin adherence factor - construction worker) mg/cm ²	0.3
AT _{rw} (averaging time - construction worker)	365
EW _{rw} (overall duration of construction) weeks/year	50
DW _{rw} (days worked - construction worker) days/week	5
A _r (acres)	0.13
A _{hill} (areal extent of tilling) acres	0.13
A _{excav} (area of excavation site) m ²	0.13
A _{r,grade} (areal extent of grading) acres	0.13
A _{r,doz} (areal extent of dozing) acres	0.13
M _{m,doz} (Gravimetric soil moisture content) %	7.9
M _{m,excav} (Gravimetric soil moisture content) %	12
ρ _{soil} (density) g/cm ³ - chemical-specific	1.68
N _{A,dump} (number of times soil is dumped)	2
N _{A,hill} (number of times soil is tilled)	2
s _{hill} (soil silt content) %	18
s _{doz} (soil silt content) %	6.9
B _i (dozing blade length) m	1
B _i (grading blade length) m	1
N _{A,doz} (number of times site was dozed)	2
N _{A,grade} (number of times site was graded)	4
S _{doz} (dozing speed) kph	11.4
S _{grade} (dozing speed) kph	11.4
d _{excav} (average depth of excavation site) m	.6
V (fraction of vegetative cover)	0

Site-specific

Construction Worker Equation Inputs for Soil - Other Construction Activities

Variable	Value
U_m (mean annual wind speed) m/s	4.69
U_t (equivalent threshold value) m/s	11.32
t_c (overall duration of construction) hours	8400
F_n Unitless Dispersion Correction Factor	0.185837208
T (time over which traffic occurs) s	7200000
J_T (g/m ² s)	0.0000010282552
F(x) (function dependant on U_m/U_t , derived using Cowherd et al. (1985))	0.194
M_{wind} (dust emitted by wind erosion) g	2289.0175219211
M_{doz} (dust emitted from dozing operations) g	31.265918140303
M_{till} (dust emitted from tilling operations) g	655.63592234891
M_{grade} (dust emitted from grading operations) g	918.93655526399
M_{excav} (dust emitted from excavation soil dumping) g	0.0319584249322
ΣVKT _{trav} (sum of fleet vehicle km traveled) km	1.05222
ΣVKT _{grade} (sum of fleet vehicle km traveled) km	2.10444
Q/C _{ca} (inverse of the ratio of the geometric mean air concentration to the emission flu	18.747540287861
PEF _{sc} (particulate emission factor) m ³ /kg	98109416.470716
A (PEF Dispersion Constant)	2.4538
B (PEF Dispersion Constant)	17.5660
C (PEF Dispersion Constant)	189.0426
A_{surf} (areal extent of site) m ²	526.0918
A_e (VF _{mlim-sc} acres)	0.5
T (temperature) °C	25
foc (fraction organic carbon in soil) g/g	0.006
ρ _b (dry soil bulk density) g/cm ³	1.5
ρ _s (soil particle density) g/cm ³	2.65
θ _w (water-filled soil porosity) L _{water} /L _{cnil}	0.15
A (VF Dispersion Constant)	2.4538
B (VF Dispersion Constant)	17.5660
C (VF Dispersion Constant)	189.0426
Q/C _{ca} (inverse of the ratio of the geometric mean air concentration to the emission flu	14.31407
n (total soil porosity) L _{nonp} /L _{cnil}	0.43396
θ _a (air-filled soil porosity) L _{air} /L _{cnil}	0.28396
A_s (VF _{mlim-sc} acres)	0.5

Site-specific

Construction Worker Equation Inputs for Soil - Other Construction Activities

Variable	Value
ρ_b (dry soil bulk density) g/cm^3	1.5
d_s (average source depth) m	.
Q/C_{env} (inverse of the ratio of the geometric mean air concentration to the emission fl	14.31407
$VF_{\text{mim-sc}}$ (volitization factor) $\text{m}^3_{\text{air}}/\text{kg}_{\text{soil}}$.

Site-specific

Construction Worker Screening Levels (RSL) for Soil - Other Construction Activities

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
 ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
 Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
 Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF (mg/kg-day) ⁻¹	SFO Ref	Inhalation Unit Risk (ug/m ³) ⁻¹	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m ³)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m ³ /kg)
Arsenic, Inorganic	7440-38-2	No	No	1.50E+00	I	4.30E-03	I	3.00E-04	I	1.50E-05	C	1	0.03	0.6	-
Barium	7440-39-3	No	No	-		-		2.00E-01	A	5.00E-03	H	0.07	-	1	-
Beryllium and compounds	7440-41-7	No	No	-		2.40E-03	I	5.00E-03	H	2.00E-05	I	0.007	-	1	-
Chromium(III), Insoluble Salts	16065-83-1	No	No	-		-		1.50E+00	H	5.00E-03	A	0.013	-	1	-
Cobalt	7440-48-4	No	No	-		9.00E-03	P	3.00E-03	P	2.00E-05	P	1	-	1	-
Copper	7440-50-8	No	No	-		-		1.00E-02	A	-		1	-	1	-
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		3.00E-04	H	1	-	1	7.53E+03
Molybdenum	7439-98-7	No	No	-		-		5.00E-03	H	-		1	-	1	-
Nickel Soluble Salts	7440-02-0	No	No	-		2.60E-04	C	2.00E-02	H	2.00E-04	A	0.04	-	1	-
Selenium	7782-49-2	No	No	-		-		5.00E-03	H	2.00E-02	C	1	-	1	-
Strontium, Stable	7440-24-6	No	No	-		-		2.00E+00	A	-		1	-	1	-
Thallium (Soluble Salts)	7440-28-0	No	No	-		-		4.00E-05	S	-		1	-	1	-
Vanadium and Compounds	7440-62-2	No	No	-		-		1.00E-02	A	1.00E-04	A	0.026	-	1	-
Zinc and Compounds	7440-66-6	No	No	-		-		3.00E-01	A	-		1	-	1	-

Site-specific

Construction Worker Screening Levels (RSL) for Soil - Other Construction Activities

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
 ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
 Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
 Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat

Chemical	Soil Saturation Concentration (mg/kg)	Particulate Emission Factor (m ³ /kg)	Ingestion SL TR=1.0E-6 (mg/kg)	Dermal SL TR=1.0E-6 (mg/kg)	Inhalation SL TR=1.0E-6 (mg/kg)	Carcinogenic SL TR=1.0E-6 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)	Screening Level (mg/kg)
Arsenic, Inorganic	-	9.81E+07	2.75E+01	1.72E+02	7.00E+03	2.36E+01	1.70E+02	1.06E+03	6.18E+03	1.43E+02	2.36E+01 ca**
Barium	-	9.81E+07	-	-	-	-	6.79E+04	-	2.06E+06	6.57E+04	6.57E+04 nc
Beryllium and compounds	-	9.81E+07	-	-	1.25E+04	1.25E+04	1.70E+03	-	8.24E+03	1.41E+03	1.41E+03 nc
Chromium(III), Insoluble Salts	-	9.81E+07	-	-	-	-	5.09E+05	-	2.06E+06	4.08E+05	4.08E+05 max
Cobalt	-	9.81E+07	-	-	3.34E+03	3.34E+03	1.02E+03	-	8.24E+03	9.06E+02	9.06E+02 nc
Copper	-	9.81E+07	-	-	-	-	3.39E+03	-	-	3.39E+03	3.39E+03 nc
Mercury (elemental)	3.13E+00	9.81E+07	-	-	-	-	-	-	9.49E+00	9.49E+00	9.49E+00 sat
Molybdenum	-	9.81E+07	-	-	-	-	1.70E+03	-	-	1.70E+03	1.70E+03 nc
Nickel Soluble Salts	-	9.81E+07	-	-	1.16E+05	1.16E+05	6.79E+03	-	8.24E+04	6.27E+03	6.27E+03 nc
Selenium	-	9.81E+07	-	-	-	-	1.70E+03	-	8.24E+06	1.70E+03	1.70E+03 nc
Strontium, Stable	-	9.81E+07	-	-	-	-	6.79E+05	-	-	6.79E+05	6.79E+05 max
Thallium (Soluble Salts)	-	9.81E+07	-	-	-	-	1.36E+01	-	-	1.36E+01	1.36E+01 nc
Vanadium and Compounds	-	9.81E+07	-	-	-	-	3.39E+03	-	4.12E+04	3.14E+03	3.14E+03 nc
Zinc and Compounds	-	9.81E+07	-	-	-	-	1.02E+05	-	-	1.02E+05	1.02E+05 max

Site-specific

Construction Worker Risk for Soil - Other Construction Activities

Chemical	Ingestion SF (mg/kg-day) ⁻¹	SFO Ref	Inhalation Unit Risk (ug/m ³) ⁻¹	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m ³)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m ³ /kg)	Soil Saturation Concentration (mg/kg)
Arsenic, Inorganic	1.50E+00	I	4.30E-03	I	3.00E-04	I	1.50E-05	C	1	0.03	0.6	-	-
Barium	-		-		2.00E-01	A	5.00E-03	H	0.07	-	1	-	-
Beryllium and compounds	-		2.40E-03	I	5.00E-03	H	2.00E-05	I	0.007	-	1	-	-
Chromium(III), Insoluble Salts	-		-		1.50E+00	H	5.00E-03	A	0.013	-	1	-	-
Cobalt	-		9.00E-03	P	3.00E-03	P	2.00E-05	P	1	-	1	-	-
Copper	-		-		1.00E-02	A	-		1	-	1	-	-
Mercury (elemental)	-		-		-		3.00E-04	H	1	-	1	7.53E+03	3.13E+00
Molybdenum	-		-		5.00E-03	H	-		1	-	1	-	-
Nickel Soluble Salts	-		2.60E-04	C	2.00E-02	H	2.00E-04	A	0.04	-	1	-	-
Selenium	-		-		5.00E-03	H	2.00E-02	C	1	-	1	-	-
Strontium, Stable	-		-		2.00E+00	A	-		1	-	1	-	-
Thallium (Soluble Salts)	-		-		4.00E-05	S	-		1	-	1	-	-
Vanadium and Compounds	-		-		1.00E-02	A	1.00E-04	A	0.026	-	1	-	-
Zinc and Compounds	-		-		3.00E-01	A	-		1	-	1	-	-
<i>*Total Risk/HI</i>	-		-		-		-		-	-	-	-	-

Site-specific

Construction Worker Risk for Soil - Other Construction Activities

Chemical	Particulate Emission Factor (m ³ /kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
Arsenic, Inorganic	9.81E+07	2.40E+01	8.72E-07	1.40E-07	3.43E-09	1.02E-06	0.1414286	0.0226736	0.0038829	0.1679851
Barium	9.81E+07	8.30E+02	-	-	-	-	0.0122277	-	0.0004029	0.0126305
Beryllium and compounds	9.81E+07	3.50E+00	-	-	2.79E-10	2.79E-10	0.0020625	-	0.0004247	0.0024872
Chromium(III), Insoluble Salts	9.81E+07	3.50E+01	-	-	-	-	0.0000688	-	0.000017	0.0000857
Cobalt	9.81E+07	2.80E+01	-	-	8.38E-09	8.38E-09	0.0275	-	0.0033976	0.0308976
Copper	9.81E+07	5.70E+01	-	-	-	-	0.0167946	-	-	0.0167946
Mercury (elemental)	9.81E+07	2.10E+00	-	-	-	-	-	-	0.2213331	0.2213331
Molybdenum	9.81E+07	1.70E+00	-	-	-	-	0.0010018	-	-	0.0010018
Nickel Soluble Salts	9.81E+07	1.90E+01	-	-	1.64E-10	1.64E-10	0.0027991	-	0.0002305	0.0030297
Selenium	9.81E+07	2.40E+00	-	-	-	-	0.0014143	-	2.9122E-7	0.0014146
Strontium, Stable	9.81E+07	1.90E+02	-	-	-	-	0.0002799	-	-	0.0002799
Thallium (Soluble Salts)	9.81E+07	1.70E+00	-	-	-	-	0.1252232	-	-	0.1252232
Vanadium and Compounds	9.81E+07	9.50E+01	-	-	-	-	0.0279911	-	0.0023055	0.0302966
Zinc and Compounds	9.81E+07	1.10E+02	-	-	-	-	0.0010804	-	-	0.0010804
<i>*Total Risk/HI</i>	-	-	<i>8.72E-07</i>	<i>1.40E-07</i>	<i>1.23E-08</i>	<i>1.02E-06</i>	<i>0.3598719</i>	<i>0.0226736</i>	<i>0.2319945</i>	<i>0.61454</i>

Site-specific

Recreator Equation Inputs for Soil

Variable	Value
TR (target cancer risk) unitless	1.0E-6
THQ (target hazard quotient) unitless	1
SA _{rec-c} (skin surface area - child) cm ² /day	2373
SA _{rec-a} (skin surface area - adult) cm ² /day	6032
SA ₀₋₂ (skin surface area - mutagenic) cm ² /day	2373
SA ₂₋₆ (skin surface area - mutagenic) cm ² /day	2373
SA ₆₋₁₆ (skin surface area - mutagenic) cm ² /day	6032
SA ₁₆₋₃₀ (skin surface area - mutagenic) cm ² /day	6032
SA _{rec-a} (skin surface area - adult) cm ² /day	6032
LT (lifetime - recreator) year	70
IFS _{rec-adj} (age-adjusted soil ingestion factor) mg/kg	11550
DFS _{rec-adj} (age-adjusted soil dermal factor) mg/kg	32494
IFSM _{rec-adj} (mutagenic age-adjusted soil ingestion factor) mg/kg	52433.333
DFSM _{rec-adj} (mutagenic age-adjusted soil dermal factor) mg/kg	134596
EF ₀₋₂ (exposure frequency) day/year	110
EF ₂₋₆ (exposure frequency) day/year	110
EF ₆₋₁₆ (exposure frequency) day/year	110
EF ₁₆₋₃₀ (exposure frequency) day/year	110
EF _{rec-c} (exposure frequency - child) day/year	110
EF _{rec-a} (exposure frequency - adult) day/year	110
EF _{rec-a} (exposure frequency - adult) day/year	110
EF _{rec-r} (exposure frequency - recreator) day/year	110
IRS ₀₋₂ (soil intake rate) mg/day	200
IRS ₂₋₆ (soil intake rate) mg/day	200
IRS ₆₋₁₆ (soil intake rate) mg/day	100
IRS ₁₆₋₃₀ (soil intake rate) mg/day	100
IRS _{rec-c} (soil intake rate - child) mg/day	200
IRS _{rec-a} (soil intake rate - adult) mg/day	100
IRS _{rec-a} (soil intake rate - adult) mg/day	100
ED ₀₋₂ (exposure duration) year	2
ED ₂₋₆ (exposure duration) year	4
ED ₆₋₁₆ (exposure duration) year	10
ED ₁₆₋₃₀ (exposure duration) year	10

Site-specific

Recreator Equation Inputs for Soil

Variable	Value
ED _{rec-r} (exposure duration - child) year	6
ED _{rec-a} (exposure duration - adult) year	20
ED _{rec-a} (exposure duration - adult) year	20
ED _{rec} (exposure duration - recreator) year	26
ET _{n-7} (exposure time) hr/day	1
ET ₂₋₆ (exposure time) hr/day	1
ET ₆₋₁₆ (exposure time) hr/day	1
ET ₁₆₋₃₀ (exposure time) hr/day	1
ET _{rec-r} (exposure time - child) hr/day	1
ET _{rec-a} (exposure time - adult) hr/day	1
ET _{rec-a} (exposure time - adult) hr/day	1
ET _{rec} (exposure time - recreator) hr/day	1
BW _{n-7} (body weight) kg	15
BW ₂₋₆ (body weight) kg	15
BW ₆₋₁₆ (body weight) kg	80
BW ₁₆₋₃₀ (body weight) kg	80
BW _{rec-r} (body weight - child) kg	15
BW _{rec-a} (body weight - adult) kg	80
BW _{rec-a} (body weight - adult) kg	80
AF ₀₋₂ (skin adherence factor) mg/cm ²	0.2
AF ₂₋₆ (skin adherence factor) mg/cm ²	0.2
AF ₆₋₁₆ (skin adherence factor) mg/cm ²	0.07
AF ₁₆₋₃₀ (skin adherence factor) mg/cm ²	0.07
AF _{rec-c} (skin adherence factor - child) mg/cm ²	0.2
AF _{rec-a} (skin adherence factor - adult) mg/cm ²	0.07
AF _{rec-a} (skin adherence factor - adult) mg/cm ²	0.07
City (Climate Zone) PEF Selection	Default
A _e (acres)	.5
Q/C _{wp} (g/m ² -s per kg/m ³)	93.77
PEF (particulate emission factor) m ³ /kg	1359344438
A (PEF Dispersion Constant)	16.2302
B (PEF Dispersion Constant)	18.7762
C (PEF Dispersion Constant)	216.108

Site-specific

Recreator Equation Inputs for Soil

Variable	Value
V (fraction of vegetative cover) unitless	0.5
U_m (mean annual wind speed) m/s	4.69
U_t (equivalent threshold value)	11.32
F(x) (function dependant on U_m/U_t) unitless	0.194
City (Climate Zone) VF Selection	Default
A_e (acres)	.5
Q/C_{vol} (g/m ² -s per kg/m ³)	68.18
foc (fraction organic carbon in soil) g/g	0.006
ρ_b (dry soil bulk density) g/cm ³	1.5
ρ_s (soil particle density) g/cm ³	2.65
n (total soil porosity) L_{pore}/L_{cnl}	0.43396
θ_a (air-filled soil porosity) L_{air}/L_{cnl}	0.28396
θ_w (water-filled soil porosity) L_{water}/L_{cnl}	0.15
T (exposure interval) s	819936000
A (VF Dispersion Constant)	11.911
B (VF Dispersion Constant)	18.4385
C (VF Dispersion Constant)	209.7845
City (Climate Zone) VF _m Selection	Default
VF _s (volitization factor) m ³ /kg	.
Q/C_{vol} (g/m ² -s per kg/m ³)	68.18365
A_e (acres)	.5
T (exposure interval) yr	26
d_e (depth of source) m	.
ρ_b (dry soil bulk density) g/cm ³	1.5
A (VF Dispersion Constant - Mass Limit)	11.911
B (VF Dispersion Constant - Mass Limit)	18.4385
C (VF Dispersion Constant - Mass Limit)	209.7845

Site-specific

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 ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
 Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
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Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF (mg/kg-day) ⁻¹	SFO Ref	Inhalation Unit Risk (ug/m ³) ⁻¹	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m ³)	Subchronic RfC Ref
Arsenic, Inorganic	7440-38-2	No	No	1.50E+00	I	4.30E-03	I	3.00E-04	I	1.50E-05	C
Barium	7440-39-3	No	No	-		-		2.00E-01	A	5.00E-03	H
Beryllium and compounds	7440-41-7	No	No	-		2.40E-03	I	5.00E-03	H	2.00E-05	I
Chromium(III), Insoluble Salts	16065-83-1	No	No	-		-		1.50E+00	H	5.00E-03	A
Cobalt	7440-48-4	No	No	-		9.00E-03	P	3.00E-03	P	2.00E-05	P
Copper	7440-50-8	No	No	-		-		1.00E-02	A	-	
Manganese (Non-diet)	7439-96-5	No	No	-		-		2.40E-02	S	5.00E-05	I
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		3.00E-04	H
Molybdenum	7439-98-7	No	No	-		-		5.00E-03	H	-	
Nickel Soluble Salts	7440-02-0	No	No	-		2.60E-04	C	2.00E-02	H	2.00E-04	A
Selenium	7782-49-2	No	No	-		-		5.00E-03	H	2.00E-02	C
Strontium, Stable	7440-24-6	No	No	-		-		2.00E+00	A	-	
Thallium (Soluble Salts)	7440-28-0	No	No	-		-		4.00E-05	S	-	
Vanadium and Compounds	7440-62-2	No	No	-		-		1.00E-02	A	1.00E-04	A
Zinc and Compounds	7440-66-6	No	No	-		-		3.00E-01	A	-	

Site-specific

Recreator Screening Levels (RSL) for Soil

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),

ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,

Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),

Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat

Chemical	GIABS	ABS	RBA	Volatilization Factor (m ³ /kg)	Soil Saturation Concentration (mg/kg)	Particulate Emission Factor (m ³ /kg)	Ingestion SL TR=1.0E-6 (mg/kg)	Dermal SL TR=1.0E-6 (mg/kg)	Inhalation SL TR=1.0E-6 (mg/kg)	Carcinogenic SL TR=1.0E-6 (mg/kg)
Arsenic, Inorganic	1	0.03	0.6	-	-	1.36E+09	2.46E+00	1.75E+01	6.78E+04	2.15E+00
Barium	0.07	-	1	-	-	1.36E+09	-	-	-	-
Beryllium and compounds	0.007	-	1	-	-	1.36E+09	-	-	1.21E+05	1.21E+05
Chromium(III), Insoluble Salts	0.013	-	1	-	-	1.36E+09	-	-	-	-
Cobalt	1	-	1	-	-	1.36E+09	-	-	3.24E+04	3.24E+04
Copper	1	-	1	-	-	1.36E+09	-	-	-	-
Manganese (Non-diet)	0.04	-	1	-	-	1.36E+09	-	-	-	-
Mercury (elemental)	1	-	1	3.47E+04	3.13E+00	1.36E+09	-	-	-	-
Molybdenum	1	-	1	-	-	1.36E+09	-	-	-	-
Nickel Soluble Salts	0.04	-	1	-	-	1.36E+09	-	-	1.12E+06	1.12E+06
Selenium	1	-	1	-	-	1.36E+09	-	-	-	-
Strontium, Stable	1	-	1	-	-	1.36E+09	-	-	-	-
Thallium (Soluble Salts)	1	-	1	-	-	1.36E+09	-	-	-	-
Vanadium and Compounds	0.026	-	1	-	-	1.36E+09	-	-	-	-
Zinc and Compounds	1	-	1	-	-	1.36E+09	-	-	-	-

Site-specific

Recreator Screening Levels (RSL) for Soil

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),

ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,

Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),

Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat

Chemical	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)	Ingestion SL Adult THQ=1 (mg/kg)	Dermal SL Adult THQ=1 (mg/kg)	Inhalation SL Adult THQ=1 (mg/kg)	Noncarcinogenic SL Adult THI=1 (mg/kg)	Screening Level (mg/kg)
Arsenic, Inorganic	1.24E+02	1.05E+03	1.62E+06	1.11E+02	1.33E+03	6.29E+03	1.62E+06	1.10E+03	2.15E+00 ca*
Barium	4.98E+04	-	5.41E+08	4.98E+04	5.31E+05	-	5.41E+08	5.30E+05	4.98E+04 nc
Beryllium and compounds	1.24E+03	-	2.17E+06	1.24E+03	1.33E+04	-	2.17E+06	1.32E+04	1.24E+03 nc
Chromium(III), Insoluble Salts	3.73E+05	-	5.41E+08	3.73E+05	3.98E+06	-	5.41E+08	3.95E+06	3.73E+05 max
Cobalt	7.47E+02	-	2.17E+06	7.46E+02	7.96E+03	-	2.17E+06	7.93E+03	7.46E+02 nc
Copper	2.49E+03	-	-	2.49E+03	2.65E+04	-	-	2.65E+04	2.49E+03 nc
Manganese (Non-diet)	5.97E+03	-	5.41E+06	5.97E+03	6.37E+04	-	5.41E+06	6.30E+04	5.97E+03 nc
Mercury (elemental)	-	-	8.29E+02	8.29E+02	-	-	8.29E+02	8.29E+02	8.29E+02 sat
Molybdenum	1.24E+03	-	-	1.24E+03	1.33E+04	-	-	1.33E+04	1.24E+03 nc
Nickel Soluble Salts	4.98E+03	-	2.17E+07	4.98E+03	5.31E+04	-	2.17E+07	5.30E+04	4.98E+03 nc
Selenium	1.24E+03	-	2.17E+09	1.24E+03	1.33E+04	-	2.17E+09	1.33E+04	1.24E+03 nc
Strontium, Stable	4.98E+05	-	-	4.98E+05	5.31E+06	-	-	5.31E+06	4.98E+05 max
Thallium (Soluble Salts)	9.95E+00	-	-	9.95E+00	1.06E+02	-	-	1.06E+02	9.95E+00 nc
Vanadium and Compounds	2.49E+03	-	1.08E+07	2.49E+03	2.65E+04	-	1.08E+07	2.65E+04	2.49E+03 nc
Zinc and Compounds	7.47E+04	-	-	7.47E+04	7.96E+05	-	-	7.96E+05	7.47E+04 nc

Site-specific

Recreator Risk for Soil

Chemical	Ingestion SF (mg/kg-day) ⁻¹	SFO Ref	Inhalation Unit Risk (ug/m ³) ⁻¹	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m ³)	Subchronic RfC Ref	GIABS	ABS	RBA
Arsenic, Inorganic	1.50E+00	I	4.30E-03	I	3.00E-04	I	1.50E-05	C	1	0.03	0.6
Barium	-		-		2.00E-01	A	5.00E-03	H	0.07	-	1
Beryllium and compounds	-		2.40E-03	I	5.00E-03	H	2.00E-05	I	0.007	-	1
Chromium(III), Insoluble Salts	-		-		1.50E+00	H	5.00E-03	A	0.013	-	1
Cobalt	-		9.00E-03	P	3.00E-03	P	2.00E-05	P	1	-	1
Copper	-		-		1.00E-02	A	-		1	-	1
Manganese (Non-diet)	-		-		2.40E-02	S	5.00E-05	I	0.04	-	1
Mercury (elemental)	-		-		-		3.00E-04	H	1	-	1
Molybdenum	-		-		5.00E-03	H	-		1	-	1
Nickel Soluble Salts	-		2.60E-04	C	2.00E-02	H	2.00E-04	A	0.04	-	1
Selenium	-		-		5.00E-03	H	2.00E-02	C	1	-	1
Strontium, Stable	-		-		2.00E+00	A	-		1	-	1
Thallium (Soluble Salts)	-		-		4.00E-05	S	-		1	-	1
Vanadium and Compounds	-		-		1.00E-02	A	1.00E-04	A	0.026	-	1
Zinc and Compounds	-		-		3.00E-01	A	-		1	-	1
<i>*Total Risk/HI</i>	-		-		-		-		-	-	-

Site-specific

Recreator Risk for Soil

Chemical	Volatilization Factor (m ³ /kg)	Soil Saturation Concentration (mg/kg)	Particulate Emission Factor (m ³ /kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk
Arsenic, Inorganic	-	-	1.36E+09	2.40E+01	9.76E-06	1.37E-06	3.54E-10	1.11E-05
Barium	-	-	1.36E+09	8.30E+02	-	-	-	-
Beryllium and compounds	-	-	1.36E+09	3.50E+00	-	-	2.88E-11	2.88E-11
Chromium(III), Insoluble Salts	-	-	1.36E+09	3.50E+01	-	-	-	-
Cobalt	-	-	1.36E+09	2.80E+01	-	-	8.65E-10	8.65E-10
Copper	-	-	1.36E+09	5.70E+01	-	-	-	-
Manganese (Non-diet)	-	-	1.36E+09	3.90E+01	-	-	-	-
Mercury (elemental)	3.47E+04	3.13E+00	1.36E+09	2.10E+00	-	-	-	-
Molybdenum	-	-	1.36E+09	1.70E+00	-	-	-	-
Nickel Soluble Salts	-	-	1.36E+09	1.90E+01	-	-	1.69E-11	1.69E-11
Selenium	-	-	1.36E+09	2.40E+00	-	-	-	-
Strontium, Stable	-	-	1.36E+09	1.90E+02	-	-	-	-
Thallium (Soluble Salts)	-	-	1.36E+09	1.70E+00	-	-	-	-
Vanadium and Compounds	-	-	1.36E+09	9.50E+01	-	-	-	-
Zinc and Compounds	-	-	1.36E+09	1.10E+02	-	-	-	-
*Total Risk/HI	-	-	-	-	9.76E-06	1.37E-06	1.26E-09	1.11E-05

Site-specific

Recreator Risk for Soil

Chemical	Ingestion Child HQ	Dermal Child HQ	Inhalation Child HQ	Noncarcinogenic Child HI	Ingestion Adult HQ	Dermal Adult HQ	Inhalation Adult HQ	Noncarcinogenic Adult HI
Arsenic, Inorganic	1.93E-01	2.29E-02	1.48E-05	2.16E-01	1.81E-02	3.82E-03	1.48E-05	2.19E-02
Barium	1.67E-02	-	1.53E-06	1.67E-02	1.56E-03	-	1.53E-06	1.56E-03
Beryllium and compounds	2.81E-03	-	1.62E-06	2.81E-03	2.64E-04	-	1.62E-06	2.65E-04
Chromium(III), Insoluble Salts	9.38E-05	-	6.47E-08	9.38E-05	8.79E-06	-	6.47E-08	8.85E-06
Cobalt	3.75E-02	-	1.29E-05	3.75E-02	3.52E-03	-	1.29E-05	3.53E-03
Copper	2.29E-02	-	-	2.29E-02	2.15E-03	-	-	2.15E-03
Manganese (Non-diet)	6.53E-03	-	7.21E-06	6.54E-03	6.12E-04	-	7.21E-06	6.19E-04
Mercury (elemental)	-	-	2.53E-03	2.53E-03	-	-	2.53E-03	2.53E-03
Molybdenum	1.37E-03	-	-	1.37E-03	1.28E-04	-	-	1.28E-04
Nickel Soluble Salts	3.82E-03	-	8.78E-07	3.82E-03	3.58E-04	-	8.78E-07	3.59E-04
Selenium	1.93E-03	-	1.11E-09	1.93E-03	1.81E-04	-	1.11E-09	1.81E-04
Strontium, Stable	3.82E-04	-	-	3.82E-04	3.58E-05	-	-	3.58E-05
Thallium (Soluble Salts)	1.71E-01	-	-	1.71E-01	1.60E-02	-	-	1.60E-02
Vanadium and Compounds	3.82E-02	-	8.78E-06	3.82E-02	3.58E-03	-	8.78E-06	3.59E-03
Zinc and Compounds	1.47E-03	-	-	1.47E-03	1.38E-04	-	-	1.38E-04
*Total Risk/HI	4.97E-01	2.29E-02	2.58E-03	5.23E-01	4.66E-02	3.82E-03	2.58E-03	5.30E-02