APPENDIX P

Development of Risk-Based Concentrations

GeoSyntec Consultants

APPENDIX P
DEVELOPMENT OF RISK-BASED CONCENTRATIONS

Introduction

The results of the baseline human health risk assessment ("BHRA") indicate that onsite exposures to soil and waste may result in an unacceptable risk. Therefore, Risk-based Concentrations ("RBCs") for soil were developed for the Site for use in the remedial planning process. RBCs for each constituent of potential concern ("COPC") were developed assuming construction worker, residential development, commercial development, and recreational park scenarios. These scenarios are considered the most relevant for the Site considering surrounding land use and land use planning. RBCs are media-specific concentrations that are protective of human health under the designated land use. Soil RBCs developed for the Site express both a chemical concentration and an exposure route assumed in the derivation of the RBC; therefore, protectiveness may be achieved by reducing chemical concentrations or by reducing exposure by means other than chemical removal (such as capping an area, limiting access, or by waste stabilization).

Constituents of Potential Concern

As discussed in the Revised Feasibility Study ("RFS") Report, not all chemicals detected at the Ascon Landfill Site were included in the BHRA described in Chapter 4. A formal selection of COPCs was conducted to identify those chemicals that could be responsible for more than 95 percent of the health risks. A significant amount of additional Site data has been collected over the intervening years since the BHRA was published, including soil matrix and downhole flux data obtained during Pilot Study No. 3. These data, in conjunction with previous data collected at the Site, were evaluated to ensure that the appropriate chemicals were included for consideration in the RFS.

The updated dataset for the Site was compared to the USEPA Region IX (2004) residential soil preliminary remediation goals ("PRGs") as well as to the California Human Health Screening Levels (CHHSLs) for COPC identification. All chemicals detected in at least one sample in the data set were considered in the COPC selection process. Chemicals were selected as COPCs when the maximum detected concentration in soil exceeded either its respective residential soil PRG (mg/kg) or respective soil CHHSL (mg/kg). Additionally, chemicals were selected as COPCs when the maximum detected flux concentration exceeded either its respective Ambient Air PRG x 100 (ug/m3) or respective soil gas CHHSL (ug/m3).

The COPCs selected during the BHRA and additional chemicals selected based on the PRG and CHHSL comparison are presented in **Tables 4.4-1**. Soil RBCs were derived for each selected COPC.

Risk-Based Concentrations for Soil

This section presents the development of target RBCs for on-site soils for the Site. RBCs were developed for each COPC assuming construction worker, residential development, commercial development, and recreational park scenarios.

Soil RBCs were developed for the following potential receptor groups:

- Future On-Site Construction Worker
- Future On-Site Commercial Worker
- Future On-Site Resident
- Future On-Site Recreational User
- Future On-Site Recreational Worker

Soil RBCs were developed using human health risk assessment methodology in accordance with United States Environmental Protection Agency (USEPA) and California Environmental Protection Agency (Cal-EPA) guidance. The following exposure routes were evaluated for future on-site construction workers, commercial workers, residents, and recreation users:

- Incidental ingestion of soils,
- Dermal contact with soils; and
- Inhalation of dust/vapors in outdoor air

In addition, inhalation of indoor air vapors was evaluated for commercial workers, residents, and recreational users. Indoor air was evaluated for the recreational scenarios because it is assumed that either a recreation center and/or maintenance building may be placed within the park. The exposure parameters used to derive the RBCs for all the potential receptors are presented in Table P-1.

An important consideration in developing RBCs for the Site is the final disposition of contaminated media as described with respect to remedial alternative selection in Chapters 8 and 9 of this RFS. For the purpose of developing RBCs, two basic scenarios were evaluated: (1) a scenario in which COPCs may be present at the surface (0-ft Cover RBC) and (2) a remedial alternative scenario in which it was assumed a 4-foot cover of soils is placed over the waste material (4ft-Cover RBC). As a result, direct contact with COPCs in soil would not be possible, and the only potentially complete exposure pathways would be exposure to VOCs that have migrated from the subsurface into indoor and outdoor air. The 0-ft Cover RBC can be used to evaluate areas of the Site where a cover is not planned (ie the City parcel). The 4-ft Cover RBC can be used to evaluate areas where a cover is planned (ie the interior of the Site).

Development of Soil RBCs

Target soil RBCs can be calculated using the exposure algorithms in the Soil Screening Level Guidance (USEPA, 2002), as well as the Johnson and Ettinger (J&E, 1991 and USEPA, 2000) subsurface vapor intrusion model. The input parameters used in the J&E model to evaluate the indoor air pathway are presented in Table P-2. RBCs were developed for each COPC listed in Table 4.4-1. Current risk assessment toxicity values (cancer slope factors and noncancer reference doses) were selected from Cal-EPA's online OEHHA Toxicity Criteria Database (2007), USEPA's (2007) Integrated Risk Information System (IRIS), or from the Region IX PRG Table (USEPA, 2004). The toxicity criteria used to derive the RBCs are presented in Table P-3.

RBCs were developed for individual chemicals such that the risk posed by an individual chemical is at or below the one-in-one million (10^{-6}) cancer risk level, or was determined to have a Hazard Index (HI) of less than 1 for residential and recreational scenarios. For commercial and adult recreational worker scenarios, a target risk level of 1×10^{-5} and hazard index of 1 was used. For lead, the Cal-EPA Leadspread version 7.0 was used to derive soil lead RBCs.

RBCs for the Indoor Air Pathway

The indoor air pathway was evaluated using the J&E model to estimate potential migration of volatile chemicals from soil into indoor air. This computer spreadsheet model, which is public domain software that is freely available at the USEPA internet website, can also be used to estimate target RBCs. The model accounts for both the diffusion of chemicals through the subsurface as well as advection due to pressure differentials between the soil and buildings. It also incorporates two different types of building foundation construction: (1) slab on grade and (2) structures with basements. Default soil physical parameters (USEPA, 2002) and building characteristics were used in the derivation of RBCs for soil and are presented in Table P-2.

RBCs for the Direct Contact and Outdoor Air Pathways

In the risk assessment, the direct contact (incidental ingestion and dermal contact) and outdoor air inhalation pathways were evaluated using exposure algorithms following USEPA and Cal-EPA risk assessment guidance. These same algorithms were used, with slight modifications as outlined below, to develop target soil RBCs for a future on-site construction worker, on-site commercial worker, and on-site resident.

Chemical-specific soil RBCs were derived first by calculating cancer risk and noncancer hazard using a unitized soil concentration of 1 mg/kg for each COPC. In other words, cancer risks and noncancer hazards were estimated for a future on-site commercial worker and resident assuming exposures to soil concentrations of 1 mg/kg

for each COPC via incidental soil ingestion, dermal soil contact, and outdoor air inhalation of vapors/dust. To calculate cancer risk from exposure via incidental ingestion of soil, the following equation was used:

$$CR_{ingestion} \text{ or } HQ_{ingestion} = \frac{C_s \text{ x IngR x ABS x EF x ED x CF x } (CSF_o \text{ or } 1/RfD_o)}{BW \text{ x AT}}$$

Where:

$CR_{ingestion}$ = Chemical-specific cancer risk, incidental ingestion pathway
$HQ_{ingestion}$ = Chemical-specific noncancer hazard quotient
C_s = unitized chemical concentration in soil (1.0 mg/kg)
IngR = ingestion rate of soil (mg/day)
ABS = percent absorption (assumed to be 100 percent)
EF = exposure frequency (days/year)
ED = exposure duration (years)
CF = conversion factor for soil (10^{-6} kg/mg)
CSF_o = oral cancer slope factor $(mg/kg\text{-}day)^{-1}$
RfD_o = oral noncancer reference dose (mg/kg-day)
BW = body weight (kg)
AT = averaging time (days)
cancer effects: 70 years x 365 days = 25,550 days
noncancer effects: ED x 365 days

To estimate potential cancer risk from exposure via dermal contact with soil, the following equation was used:

$$CR_{dermal} \text{ or } HQ_{dermal} = \frac{C_s \text{ x SA x AF x EF x ED x CF x DAF x } (CSF_o \text{ or } 1/RfD_o)}{BW \text{ x AT}}$$

Where:

CR_{dermal} = Chemical-specific cancer risk, dermal contact pathway
HQ_{dermal} = Chemical-specific noncancer hazard quotient
C_s = unitized chemical concentration in soil (1.0 mg/kg)
SA = skin surface area exposed to soil per day (cm^2/day)
AF = soil-skin adherence factor (mg/cm^2)
CF = conversion factor (10^{-6} kg/mg)
DAF = dermal absorption factor (unitless, chemical-specific)

Evaluation of the outdoor air inhalation pathway followed the Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (USEPA, 2002) for

the on-site commercial worker and resident. For on-site construction workers and recreational users, a separate set of equations were used as discussed later in this section.

To estimate potential cancer risk from exposure via outdoor inhalation of vapors and fugitive dust from soil, the following equation was used:

$$CR_{inh} \text{ or } HQ_{inh} = \frac{C_s \text{ x InhR x ABS x EF x ED x } (CSF_i \text{ or } 1/RfD_i)}{BW \text{ x AT x } (PEF \text{ or } VF)}$$

Where:

CR_{inh} = Chemical-specific cancer risk, outdoor inhalation pathway
HQ_{inh} = Chemical-specific noncancer hazard quotient
C_s = unitized chemical concentration in soil (1.0 mg/kg)
InhR = inhalation rate (m^3/day)
ABS = percent absorption (assumed to be 100 percent)
CSF_i = inhalation cancer slope factor $(mg/kg\text{-}day)^{-1}$
RfD_i = inhalation noncancer reference dose (mg/kg-day)

Subsequently, the cancer risks and noncancer hazards are summed together across exposure routes to yield a cumulative risk per each COPC (e.g., $CR_{ingestion}$ + CR_{dermal} + $CR_{inhalation}$ = Cumulative Cancer Risk). Assuming a chemical-specific target cancer risk (10^{-5} for a commercial worker and 10^{-6} for a resident) and a target noncancer hazard quotient (HQ of 1.0), the RBC was estimated using the following equations:

$RBC_{carcinogen}$ = [1.0 / (Cumulative Cancer Risk)] x Target Risk

$RBC_{noncarcinogen}$ = [1.0 / Cumulative HQ] x Target HQ

The derivation of the chemical-specific volatilization factors ("VFs") for the outdoor vapor inhalation pathway and the particulate emission factor ("PEF") for the outdoor fugitive dust pathway are presented in Table P-4. Formulae for the VF and PEF derivations are listed at the bottom of Appendix Table P-4 and were taken from USEPA guidance (2002). Default soil physical properties from the USEPA guidance (2002) were used to derive the VFs and PEFs for the outdoor air inhalation pathway (Table P-4). An exposure area of approximately 20 acres was assumed for the recreational park scenario, while approximately 16 acres was assumed for the proposed commercial and residential areas. The exposure parameters used to derive the RBCs

for all the potential receptors are presented in Table P-1. Detailed calculations for the soil RBCs are presented at the end of this Appendix (Tables P-5 through P-10).

A different algorithm was used for chemical-specific volatilization factors that are calculated assuming the contaminated soils are covered by 4 feet of clean fill. Methods described in the USEPA Supplemental Soil Screening Level Guidance (USEPA, 2002) were used as described below to calculate emissions due to subsurface contamination.

The emission flux per unit soil concentration from subsurface soils at a selected time is determined by:

$$J_{sub} = \left(\frac{\rho_b D_A}{\pi t}\right)^{1/2}\left[Exp\left(-\frac{d^2}{4D_A t}\right) - Exp\left(-\frac{(d+W)^2}{4D_A t}\right)\right] x10^4\, cm^2/m^2 \qquad (1)$$

Where

J_{sub} = Unit emission flux from subsurface soils at each time step ($g/m^2/s$)

$_b$ = Soil dry bulk density (g/cm^3)

D_A = Apparent diffusivity (cm^2/s)

t = Elapsed time at the end of each time-step (s)

d = Depth to top of soil contamination (cm)

W = Thickness of subsurface contaminated soil (cm).

The cumulative mass emitted is calculated by integrating Equation (1) over the exposure time.

$$M_{sub} = \mathrm{A}_{\mathrm{sub}} \int J_{sub}\, dt \qquad (2)$$

Where

M_{sub} = Cumulative unit mass emitted from undisturbed subsurface soils (g)

A_{sub} = Areal extent of undisturbed subsurface soil contamination (m^2)

To ensure that the estimated total mass emitted does not exceed the total initial mass in soil, the mass emitted is limited to the following maximum value:

$$M_{Sub}^{T} = \rho_b \text{ x } \mathrm{A}_{\mathrm{Sub}} \text{ x W x } 10^{-2}\,\mathrm{m/cm} \text{ x } 10^{6}\,\mathrm{cm^3/m^3} \qquad (3)$$

The time average unit emission flux is the total mass emitted divided by the area and time. Therefore, the volatilization factor can be estimated by:

$$VF = (Q/C) \Big/ \left(\frac{M_{Sub}}{A_{Sub}\tau} \right)$$

Where
VF = volatilization factor (m^3/kg)
Q/C = inverse of mean concentration at the center of a square source (g/m^2-s per kg/m^3)

For the construction worker volatilization factor, VOC emissions into a trench and subsequent mixing in air were estimated using the volatilization factor for transport of chemicals from soil to outdoor air from Table X.3.4 of the American Society for Testing and Materials (ASTM) Standard Guide For Provisional Risk-Based Corrective Action (ASTM, 1998). A conservative wind speed of 0.255 meters per second was assumed based on 1/10 of the average wind speed for the Los Angeles area (NCDC, 2004). This speed represents the reduced airflow expected in a trench. Conservative assumptions regarding the size of the trench were also used (assumed area of two side-walls and bottom area of trench was approximately 7.2 x 10^{+5} cm^2, length, width and depth of trench of 9.14 meters (30 feet), 3.04 meters (10 feet) and 2.44 meters (8 feet), respectively). The chemical-specific VFss,amb for construction worker exposures was derived using the following equation (ASTM, 1998):

$$VF_{ss,amb} = (Pb/DF_{amb}) \times [(4 \times D_{eff} \times H_{eff})/ (3.14 \times T \times K_{sw} \times Pb)]^{1/2}$$

Where:

$VF_{ss,amb}$	=	volatilization factor, surficial soils to ambient air (g-soil/cm^3-air)
D_{eff}	=	effective diffusion coefficient for vadose-zone soils (cm^2/s)
DF_{amb}	=	dispersion factor for ambient air (cm/s)
H_{eff}	=	effective Henry's law coefficient (cm^3-water/cm^3-air)
K_{sw}	=	soil to water partition coefficient (cm^3-water/g-soil)
Pb	=	dry soil bulk density (g/cm^3)
T	=	averaging time for surface emission vapor flux (s)

And where:

$$K_{sw} = \frac{\theta_w + \theta_a H_{eff} + Pb\,Kd}{Pb}$$

$$D_{eff} = [((D_{air} \times (\theta_{air}^{3.33} / \theta_T^2)) + ((D_{water} / H_{eff}) \times (\theta_{water}^{3.33} / \theta_T^2))]$$

$$DF_{amb} = \frac{U_{air} \times W \times H}{A}$$

Where:

U_{air} = ambient air velocity in mixing zone (cm/s)
W = width of source-zone area (cm)
H = mixing zone height (cm)
A = source-zone area (cm^2)

The soil RBCs for an on-site future construction worker, commercial worker, resident, recreational user, and recreational worker are summarized in Table 4.5-1 of the RFS, as well as in Table P-11.

Table P-12 presents a statistical summary of data for each COPC. This summary is developed assuming future residual concentrations under a remedial alternative scenario consistent with the proposed alternative that would include removal of soil associated with Pits A through G, including soils impacted from migration of materials away from Pit F, and the removal of oily/tarry wastes in Lagoons 1, 2, and 3.

Summary and Limitations

Risk-based Concentrations for soil were developed for the Site for use in the remedial planning process. RBCs for each COPC were developed assuming construction worker, residential development, commercial development, and recreational park scenarios. These scenarios are considered the most relevant for the Site considering surrounding land use and land use planning. Table P-11 presents the RBCs for each scenario.

Because some inorganic compounds are naturally occurring in the environment, the presence of these chemicals in Site soils must be evaluated with respect to what would be expected to be naturally occurring. This is especially important for chemicals such as arsenic where the commercial and residential RBC is below levels typically found in southern California soils. Furthermore, because of the unpredictable mixture of COPCs at the Site in any given area, a determination of the risk posed by chemicals remaining at the Site following completion of remedial actions can only be accurately determined using final soil confirmation data obtained following the remedial action in a post-remediation risk assessment. Finally, Soil RBCs developed for the Site express both a chemical concentration and an exposure route assumed in the derivation of the RBC. Therefore protectiveness may be achieved by reducing chemical concentrations or by reducing exposure by means other than chemical removal (such as capping an area, limiting access, or by waste stabilization). Therefore, the final risk determination conducted for the Site should take into account these other considerations.

References

American Society for Testing and Materials (ASTM) Standard Guide For Provisional Risk-Based Corrective Action (ASTM, 1998).

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Table P-1
Exposure Parameters
Ascon Landfill Site

Exposure Route	Parameter		Units	Construction		Commercial		Residential		Recreational	
				Value	Reference	Value	Reference	Value	Reference	Value	Reference
General	Csoil	Unitized Chemical Concentration in Soil	mg/kg	1	--	1	--	1	--	1	--
	EF	Exposure Frequency	days/year	30	prof judgment	250	USEPA 1991	350	USEPA 1991	31.25	prof judgment
	EDa	Exposure Duration, adult	years	1	prof judgment	25	USEPA 1991	24	USEPA 1991	24	USEPA 1991
	EDc	Exposure Duration, child	years	--	--	--	--	6	USEPA 1991	6	USEPA 1991
	BWa	Body Weight, adult	kilograms	70	USEPA 1989	70	USEPA 1989	70	USEPA 1989	70	USEPA 1989
	BWc	Body Weight, child	kilograms	--	--	--	--	15	USEPA 1989	15	USEPA 1989
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA 1989	25,550	USEPA 1989	25,550	USEPA 1989	25,550	USEPA 1989
	AT-N	Averaging Time (Noncancer)	days	ED x 365	USEPA 1989	ED x 365	USEPA 1989	ED x 365	USEPA 1989	ED x 365	USEPA 1989
Ingestion	IngRa	Ingestion Rate of Soil, adult	mg/day	330	USEPA 2002	100	USEPA 1991	100	USEPA 1991	--	--
	IngRc	Ingestion Rate of Soil, child	mg/day	--	--	--	--	200	USEPA 1991	--	--
	CF	Conversion Factor	kg/mg	1.0E-06	--	1.0E-06	--	1.0E-06	--	--	--
Dermal	SAa	Surface Area Available for Contact, adult	cm^2/day	3,300	USEPA 2002	3,300	USEPA 2004	5,700	USEPA 2004	--	--
Contact	SAc	Surface Area Available for Contact, child	cm^2/day	--	--	--	--	2,800	USEPA 2004	--	--
	AFa	Adherence Factor, adult	mg/cm^2	0.3	USEPA 2002	0.2	USEPA 2004	0.07	USEPA 2004	--	--
	AFc	Adherence Factor, child	mg/cm^2	--	--	--	--	0.2	USEPA 2004	--	--
	AbsD	Dermal Absorption	unitless	chemical-specific	USEPA 2004	chemical-specific	USEPA 2004	chemical-specific	USEPA 2004	--	--
	CF	Conversion Factor	kg/mg	1.0E-06	--	1.0E-06	--	1.0E-06	--	--	--
Inhalation	Cair	Chemical Concentration in Workplace Air	mg/m^3	Csoil/PEF or VF	--	Csoil/PEF or VF	--	Csoil/PEF or VF	--	Csoil/PEF or VF	--
(Outdoor and	InhRa	Inhalation Rate, adult	m^3/day	20	USEPA 2002	15	OSWER 1991	20	USEPA 1991	20	USEPA 1991
Indoor Air)	InhRc	Inhalation Rate, child	m^3/day	--	--	--	--	10	USEPA 1997	10	USEPA 1997
	PEF	Particulate Emission Factor	m^3/kg	chemical-specific	USEPA 2002	chemical-specific	USEPA 2002	chemical-specific	USEPA 2002	--	--
	VF	Volatilization Factor	m^3/kg	chemical-specific	USEPA 2002	chemical-specific	USEPA 2002	chemical-specific	USEPA 2002	chemical-specific	USEPA 2002

Notes: na: not applicable; -- not available

Sources: USEPA 1989. Risk Assessment Guidance for Superfund (RAGS). Volume I: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

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Equations: Ingestion: Chronic Daily Intake (CDI) (mg/kg/day) = Csoil x IngR x EF x ED x CF x 1/BW x 1/AT-N

Dermal Contact: CDI (mg/kg/day) = Csoil x SA x EF x ED x AF x AbsD x CF x 1/BW x [1/AT-C or AT-N]

Outdoor Inhalation: CDI (mg/kg/day) = Csoil x InhR x EF x ED x [1/PEF or VF] x 1/BW x [1/AT-C or AT-N]

Indoor Inhalation: CDI (mg/kg/day) = Cair x InhR x EF x ED x 1/BW x [1/AT-C or AT-N]

Table P-2
Model Input Parameters
Ascon Landfill Site

Model Input Parameter	Value Used	Rationale
Soil Properties		
Average Soil / Groundwater Temperature (Ts), °C	19	Area-Specific Value
Depth below grade to bottom of enclosed space floor (L_F), cm	15	Slab construction
Depth below grade to top of shallow contamination (Lt), cm	122	Assumes 4-foot clean cover of soil
Depth below grade to bottom of contamination (Lb), cm	229	Average depth to groundwater, 7.5 feet bgs
Thickness of soil stratum A (h_A), cm	122	Assumes 4-foot clean cover of soil
Thickness of soil stratum B (h_B), cm	--	
Thickness of soil stratum C (h_C), cm	--	
Soil stratum A SCS soil type	S	default
Stratum A soil dry bulk density, gm/cm^3	1.5	Default Assumption
Stratum A soil total porosity, unitless	0.43	Default Assumption
Stratum A soil water-filled porosity, cm^3/cm^3	0.15	Default Assumption
Startum A soil organic carbon fraction (f_{oc}^A), unitless	0.006	Default Assumption
Commercial and Recreational Building Parameters		
Enclosed space floor thickness (L_{crack}), cm	10	Default assumption
Soil-building pressure differential, $g/cm\text{-}sec^2$	40	Default assumption
Enclosed space floor length (L_B), cm	1000	Default building dimension
Enclosed space floor width (W_B), cm	1000	Default building dimension
Enclosed space height (H_B), cm	305	Assume commercial building ceiling height = 10 feet
Floor-wall seam crack width (w), cm	0.1	Default assumption
Indoor air exchange rate (ER), $hour^{-1}$	1	Professional judgment
Average vapor flow rate into building (Qsoil), L/m	5	Default assumption
Residential Building Parameters		
Enclosed space floor thickness (L_{crack}), cm	10	Default assumption
Soil-building pressure differential, $g/cm\text{-}sec^2$	40	Default assumption
Enclosed space floor length (L_B), cm	1000	Default residential building dimension
Enclosed space floor width (W_B), cm	1000	Default residential building dimension
Enclosed space height (H_B), cm	244	Default residential building dimension for slab-on-grade, 8 feet
Floor-wall seam crack width (w), cm	0.1	Default assumption
Indoor air exchange rate (ER), $hour^{-1}$	0.5	50th percentile from a comprehensive US study (USPEA 2003)
Average vapor flow rate into building (Qsoil), L/m	5	Default residential assumption

Table P-3
Toxicity Criteria
Ascon Landfill Site

Chemical of Potential Concern	Dermal ABS	Cancer Toxicity Criteria						Noncancer Toxicity Criteria					
		Oral Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$		Inhalation Unit Risk $(ug/m^3)^{-1}$		Inhalation Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$		Oral RfD mg/kg-d		Inhalation RfC or REL mg/m^3		Inhalation RfD mg/kg-d	
VOCs													
1,1,1-Trichloroethane	0.10	--		--		--		2.8E-01	n	1.0E+00	c	2.9E-01	c
1,2,4-Trimethylbenzene	0.10	--		--		--		5.0E-02	n	6.0E-03	n	1.7E-03	n
1,2-Dichloroethane	0.10	4.7E-02	c	2.1E-05	c	7.2E-02	c	2.0E-02	n	4.0E-01	c	1.1E-01	c
1,3-Butadiene	0.10	3.4E+00	c	1.7E-04	c	6.0E-01	c	5.7E-03	cr	2.0E-02	c	5.7E-03	c
Acetone	0.10	--		--		--		9.0E-01	i	3.2E+00	ir	9.0E-01	ir
Benzene	0.10	1.0E-01	c	2.9E-05	c	1.0E-01	c	4.0E-03	i	6.0E-02	c	1.7E-02	c
Chlorobenzene	0.10	--		--		--		2.0E-02	i	1.0E+00	c	2.9E-01	c
Chloroform	0.10	3.1E-02	c	5.3E-06	c	1.9E-02	c	1.0E-02	i	3.0E-01	c	8.6E-02	c
Ethylbenzene	0.10	--		--		--		1.0E-01	i	2.0E+00	c	5.7E-01	c
Freon 11 (TCFM)	0.10	--		--		--		3.0E-01	i	7.0E-01	h	2.0E-01	h
n-Hexane	0.10	--		--		--		1.1E+01	n	7.0E-01	i	2.0E-01	i
Methylene Chloride	0.10	1.4E-02	c	1.0E-06	c	3.5E-03	c	6.0E-02	i	4.0E-01	c	1.1E-01	c
Naphthalene	0.10	--		3.4E-05	c*	1.2E-01	c*	2.0E-02	i	9.0E-03	c	2.6E-03	c
Styrene	0.10	--		--		--		2.0E-01	i	9.0E-01	c	2.6E-01	c
Toluene	0.10	--		--		--		8.0E-02	i	3.0E-01	c	8.6E-02	c
Inorganics													
Antimony	0.01	--		--		--		4.0E-04	i	--		--	
Arsenic	0.03	9.5E+00	c	3.3E-03	c	1.2E+01	c	3.0E-04	i	3.0E-05	c	8.6E-06	c
Barium	0.01	--		--		--		2.0E-01	i	4.9E-04	h	1.4E-04	h
Cadmium	0.001	--		4.2E-03	c	1.5E+01	c	1.0E-03	i	2.0E-05	c	5.7E-06	c
Copper	0.01	--		--		--		4.0E-02	h	--		--	
Mercury	0.01	--		--		--		3.0E-04	i	9.0E-05	c	2.6E-05	c
Nickel	0.01	--		2.6E-04	c	9.1E-01	c	2.0E-02	i	5.0E-05	c	1.4E-05	c
Silver	0.01	--		--		--		5.0E-03	i	--		--	
Thallium	0.01	--		--		--		8.0E-05	i	--		--	
Vanadium	0.01	--		--		--		1.0E-03	n	--		--	
Zinc	0.01	--		--		--		3.0E-01	i	--		--	
Pesticides/PCBs													
Aldrin	0.1	1.7E+01	c	4.9E-03	c	1.7E+01	c	3.0E-05	i	1.1E-04	ir	3.0E-05	ir
Aroclor 1248	0.14	5.0E+00	c	5.7E-04	c	2.0E+00	c	2.0E-05	i	7.0E-05	ir	2.0E-05	ir
Aroclor 1260	0.14	5.0E+00	c	5.7E-04	c	2.0E+00	c	2.0E-05	i	7.0E-05	ir	2.0E-05	ir
Endosulfan II	0.1	--		--		--		6.0E-03	i	2.1E-02	ir	6.0E-03	ir

Table P-3
Toxicity Criteria
Ascon Landfill Site

Chemical of Potential Concern	Dermal ABS	Cancer Toxicity Criteria			Noncancer Toxicity Criteria		
		Oral Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Inhalation Unit Risk $(ug/m^3)^{-1}$	Inhalation Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Oral RfD mg/kg-d	Inhalation RfC or REL mg/m^3	Inhalation RfD mg/kg-d
SVOCs							
1-Methylnaphthalene	0.13	--	--	--	4.0E-03 i	1.4E-02 i	4.0E-03 ir
2-Methylnaphthalene	0.13	--	--	--	4.0E-03 i	1.4E-02 i	4.0E-03 ir
2,4-Dichlorophenol	0.1	--	--	--	3.0E-03 i	1.1E-02 ir	3.0E-03 ir
2,4-Dimethylphenol	0.1	--	--	--	2.0E-02 i	7.0E-02 ir	2.0E-02 ir
2,4,6-Trichlorophenol	0.1	7.0E-02 c	2.0E-05 c	7.0E-02 c	1.0E-04 n	3.5E-04 nr	1.0E-04 nr
Benzidine	0.1	5.0E+02 c	1.4E-01 c	5.0E+02 c	3.0E-03 i	1.1E-02 ir	3.0E-03 ir
Benzo(a)pyrene	0.13	1.2E+01 c	1.1E-03 c	3.9E+00 c	--	--	--
Bis 2-ethylhexylphthalate	0.1	3.0E-03 c	2.4E-06 c	8.4E-03 c	2.0E-02 i	7.0E-02 ir	2.0E-02 ir
Di-n-butyl phthalate	0.1	--	--	--	1.0E-01 i	3.5E-01 ir	1.0E-01 ir
Dibenzofuran	0.1	--	--	--	2.0E-03 n	7.0E-03 nr	2.0E-03 nr
Fluoranthene	0.13	--	--	--	4.0E-02 i	1.4E-01 ir	4.0E-02 ir
Indeno(1,2,3-cd)pyrene	0.13	1.2E+00 c	1.1E-04 c	3.9E-01 c	--	--	--
Phenanthrene**	0.13	--	--	--	6.0E-02 i	2.1E-01 ir	6.0E-02 ir
Phenol	0.1	--	--	--	3.0E-01 i	2.0E-01 c	5.7E-02 c
Pyrene	0.13	--	--	--	3.0E-02 i	1.1E-01 ir	3.0E-02 ir

Notes:

** Toxicity criteria for acenaphthene used as a surrogate

c: CalEPA OEHHA Toxicity Criteria Database. URL: http://www.oehha.org/risk/ChemicalDB/index.asp (CalEPA 2007). Table of noncancer chronic reference exposure levels at http://www.oehha.org/air/chronic_rels/AllChrels.html (CalEPA 2007).

c*: Draft naphthalene cancer slope factor is found in Long-term Health Effects of Exposure to Naphthalene, Background and Status of Napthalene as a Toxic Air Contaminant and Potential Carcinogen. DRAFT, January 2004.

i: Integrated Risk Information System Database. URL: http://www.epa.gov/iris/index.html (USEPA 2007)

n: National Center for Environmental Assessment (NCEA), from Region IX PRG table (USEPA 2004)

h: Health Effects Assessment Summary Tables (HEAST). FY 1997 Update (USEPA 1997)

r: route extrapolated

Table P-4
Volatilization and Particulate Emission Factors
Ascon Landfill Site

Parameter	Value	Units	Reference
Water-filled soil porosity (θw)	1.5E-01	(Lwater-Lsoil)	Default (USEPA 2002)
Total soil porosity (θ_T)	4.3E-01	(Lpore-Lsoil)	Default (USEPA 2002)
Air-filled soil porosity (θa)	2.8E-01	(Lair-Lsoil)	Default (USEPA 2002)
Soil bulk density (Pb)	1.5	g/cm^3	Default (USEPA 2002)
Fraction organic carbon in soil (foc)	0.006	unitless	Default (USEPA 2002)
Exposure interval (T), construction worker	3.2E+07	sec	one year exposure duration
$T_{resident}$	9.5E+08	sec	Resident for 30 years
$T_{commercial\ worker}$	7.9E+08	sec	Worker for 25 years
$T_{recreational}$	9.5E+08	sec	Recreational Resident for 30 years
Inverse of mean conc (Q/C_{sa}), volatiles $_{constW}$	14.31	(g/m^2-s per kg/m^3)	Calculated for a 0.5-acre site, subchronic (eqn E-15, USEPA 2002)
Q/C_{sr}, particulates $_{constW}$	23.02	(g/m^2-s per kg/m^3)	Calculated for a 0.5-acre site (eqn E-19, USEPA 2002)
$Q/C_{commercial/resident}$	38.37	(g/m^2-s per kg/m^3)	Calculated for a 16-acre site in Los Angeles (USEPA 2002)
$Q/C_{recreator}$	37.12	(g/m^2-s per kg/m^3)	Calculated for a 20-acre site in Los Angeles (USEPA 2002)
Fraction of vegetative cover (G), constW	0	unitless	Professional Judgment
$G_{resident/commercial/recreator}$	0.5	unitless	Default (USEPA 2002)
Ambient air velocity in mixing zone (Uair)	0.469	m/s	1/10th mean annual windspeed (Default, USEPA 2002)
Width of source-zone area (W)	914	cm	Assume length of trench = 30 feet
Mixing zone height (H)	244	cm	Assume depth of trench = 8 feet
Width of trench (Wt)	305	cm	Assume width of trench = 10 feet
Source-zone area (A)	7.2E+05	cm2	2 sidewalls and bottom area of trench
Dispersion factor for ambient air (DFamb)	14.43	cm/s	Calculated (ASTM 1998)
Mean annual windspeed (Um)	4.69	m/s	Default (USEPA 2002)
Equivalent threshold value of windspeed at 7m (Ut)	11.32	m/s	Default (USEPA 2002)
Function dependent on Um/Ut (Fx)	1.9E-01	unitless	Default (USEPA 2002)
Particulate Emission Factor (PEF), $_{constW}$	1.7E+08	(m^3/kg)	calculated for a 0.5-acre area
$PEF_{commercial/resident}$	5.6E+08	(m^3/kg)	calculated for a 5-acre area
$PEF_{recreator}$	5.4E+08	(m^3/kg)	calculated for a 20-acre area

Note:

Particulate Emission Factor (USEPA 2002): $PEF = [(Q/C * 3600) / (0.036 * (1-G) * (Um/Ut)^3 * Fx)]$

Table P-4
Volatilization and Particulate Emission Factors
Ascon Landfill Site

Compound	Diffusivity in Air (Dair)	Henry's Law Constant (H')	Diffusivity in Water (Dw)	Soil organic carbon partition coeff (Koc)	Soil-water partition coefficient (Kd)	(Ksw)	Apparent Diffusivity (Da)	Effective Diffusion Coefficient (Deff)	0-foot Cover			4-foot Cover		
									Construction VF (m^3/kg)	Commercial VF (m3/kg)	Resident VF (m^3/kg)	Commercial VF (m^3/kg)	Resident VF (m^3/kg)	Recreational VF (m^3/kg)
VOCs														
1,1,1-Trichloroethane	7.8E-02	7.1E-01	8.8E-06	1.1E+02	6.6E-01	8.9E-01	3.2E-03	6.1E-03	8.5E+02	1.1E+03	1.2E+03	1.5E+04	1.9E+04	1.9E+04
1,2,4-Trimethylbenzene	7.5E-02	2.3E-01	7.1E-06	3.7E+03	2.2E+01	2.2E+01	4.0E-05	5.9E-03	7.5E+03	1.0E+04	1.1E+04	3.0E+04	3.2E+04	3.1E+04
1,2-Dichloroethane	1.0E-01	4.0E-02	9.9E-06	1.7E+01	1.0E-01	2.1E-01	1.0E-03	8.1E-03	1.5E+03	2.0E+03	2.2E+03	1.4E+04	1.6E+04	1.6E+04
1,3-Butadiene	9.8E-02	7.3E+00	1.1E-05	1.2E+02	7.2E-01	2.2E+00	1.7E-02	7.6E-03	3.7E+02	4.9E+02	5.4E+02	2.7E+04	3.5E+04	3.4E+04
Acetone	1.2E-01	1.6E-03	1.1E-05	5.8E-01	3.5E-03	1.0E-01	9.9E-05	9.7E-03	4.8E+03	6.4E+03	7.0E+03	1.9E+04	2.2E+04	2.1E+04
Benzene	8.8E-02	2.3E-01	9.8E-06	5.9E+01	3.5E-01	5.0E-01	2.1E-03	6.9E-03	1.0E+03	1.4E+03	1.5E+03	1.4E+04	1.8E+04	1.7E+04
Chlorobenzene	7.3E-02	1.5E-01	8.7E-06	2.2E+02	1.3E+00	1.4E+00	4.0E-04	5.7E-03	2.4E+03	3.2E+03	3.5E+03	1.4E+04	1.7E+04	1.6E+04
Chloroform	1.0E-01	1.5E-01	1.0E-05	4.0E+01	2.4E-01	3.7E-01	2.2E-03	8.1E-03	1.0E+03	1.4E+03	1.5E+03	1.4E+04	1.8E+04	1.7E+04
Ethylbenzene	7.5E-02	3.2E-01	7.8E-06	3.6E+02	2.2E+00	2.3E+00	5.4E-04	5.9E-03	2.1E+03	2.7E+03	3.0E+03	1.4E+04	1.6E+04	1.6E+04
Trichlorofluoromethane	8.7E-02	4.0E+00	1.3E-05	1.6E+02	9.6E-01	1.8E+00	9.9E-03	6.8E-03	4.8E+02	6.4E+02	7.0E+02	2.2E+04	2.8E+04	2.7E+04
n-Hexane	2.0E-01	5.0E+00	7.8E-06	8.9E+02	5.3E+00	6.4E+00	8.1E-03	1.6E-02	5.3E+02	7.1E+02	7.7E+02	2.0E+04	2.6E+04	2.5E+04
Methylene chloride	1.0E-01	9.0E-02	1.2E-05	1.2E+01	7.0E-02	1.9E-01	2.5E-03	7.9E-03	9.5E+02	1.3E+03	1.4E+03	1.5E+04	1.8E+04	1.8E+04
Naphthalene	5.9E-02	2.0E-02	7.5E-06	1.2E+03	7.1E+00	7.2E+00	8.4E-06	4.6E-03	1.7E+04	2.2E+04	2.4E+04	1.5E+05	1.4E+05	1.3E+05
Styrene	7.1E-02	1.1E-01	8.0E-06	7.8E+02	4.7E+00	4.8E+00	8.7E-05	5.5E-03	5.1E+03	6.8E+03	7.5E+03	2.0E+04	2.3E+04	2.2E+04
Toluene	8.7E-02	2.7E-01	8.6E-06	1.8E+02	1.1E+00	1.2E+00	9.9E-04	6.8E-03	1.5E+03	2.0E+03	2.2E+03	1.4E+04	1.6E+04	1.6E+04

Notes:

0-foot cover Volatilization Factor; resident, commercial (USEPA 2002): $VF = Q/C * ((3.14 * Da * T)^{1/2} * 10^{-4})/(2 * Pb * Da))$

Effective Diffusion Coefficient (ASTM 1998): $Deff = [((Dair * \theta a^{3.33}) / \theta_T^2) + ((Dw * \theta w^{3.33}) / (H' * \theta_T^2))]$

VF_{constW} (ASTM 1998): $VF = (Pb / DFamb) * [(4 * Deff * H') / (3.14 * T * 3.2E07 * Ksw * Pb)]^{1/2}$

where: Effective Diffusion Coefficient (ASTM 1998): $Deff = [((Dair * \theta a^{3.33}) / \theta_T^2) + ((Dw * \theta w^{3.33}) / (H' * \theta_T^2))]$

Table P-5
RBCs for Soil - 0 foot Cover
Construction Worker Exposure Scenario
Ascon Landfill Site

Chemical	Unitized Cancer Risk				Soil RBC Target Risk $=10^{-5}$ (mg/kg)	Unitized Noncancer Hazard				Soil RBC Target HI = 1.0 (mg/kg)
	Ingestion	Inhalation	Dermal	Exposure Routes Total		Ingestion	Inhalation	Dermal	Exposure Routes Total	
VOCs										
1,1,1-Trichloroethane	--	--	--	--	**--**	1.4E-06	9.7E-05	4.2E-07	9.9E-05	**1.0E+04**
1,2,4-Trimethylbenzene	--	--	--	--	**--**	7.7E-06	1.8E-03	2.3E-06	1.8E-03	**5.5E+02**
1,2-Dichloroethane	2.6E-10	1.6E-08	7.8E-11	1.6E-08	**6.1E+02**	1.9E-05	1.4E-04	5.8E-06	1.6E-04	**6.2E+03**
1,3-Butadiene	1.9E-08	5.5E-07	5.6E-09	5.7E-07	**1.7E+01**	6.8E-05	1.1E-02	2.0E-05	1.1E-02	**8.9E+01**
Acetone	--	--	--	--	**--**	4.3E-07	5.4E-06	1.3E-07	6.0E-06	**1.7E+05**
Benzene	5.5E-10	3.2E-08	1.7E-10	3.3E-08	**3.0E+02**	9.7E-05	1.3E-03	2.9E-05	1.4E-03	**7.0E+02**
Chlorobenzene	--	--	--	--	**--**	1.9E-05	3.4E-05	5.8E-06	5.9E-05	**1.7E+04**
Chloroform	1.7E-10	6.3E-09	5.1E-11	6.5E-09	**1.5E+03**	3.9E-05	2.7E-04	1.2E-05	3.2E-04	**3.1E+03**
Ethylbenzene	--	--	--	--	**--**	3.9E-06	2.0E-05	1.2E-06	2.5E-05	**4.0E+04**
Freon 11 (TCFM)	--	--	--	--	**--**	1.3E-06	2.5E-04	3.9E-07	2.5E-04	**4.1E+03**
n-Hexane	--	--	--	--	**--**	3.5E-08	2.2E-04	1.1E-08	2.2E-04	**4.5E+03**
Methylene Chloride	7.7E-11	1.2E-09	2.3E-11	1.3E-09	**7.5E+03**	6.5E-06	2.2E-04	1.9E-06	2.2E-04	**4.5E+03**
Naphthalene	--	2.4E-09	--	2.4E-09	**4.1E+03**	1.9E-05	5.5E-04	5.8E-06	5.8E-04	**1.7E+03**
Styrene	--	--	--	--	**--**	1.9E-06	1.8E-05	5.8E-07	2.0E-05	**4.9E+04**
Toluene	--	--	--	--	**--**	4.8E-06	1.8E-04	1.5E-06	1.9E-04	**5.4E+03**
Inorganics										
Arsenic	5.2E-08	2.4E-11	4.7E-09	5.7E-08	**1.8E+02**	1.3E-03	1.6E-05	1.2E-04	1.4E-03	**7.0E+02**
Antimony	--	--	--	--	**--**	9.7E-04	--	2.9E-05	1.0E-03	**1.0E+03**
Barium	--	--	--	--	**--**	1.9E-06	1.0E-06	5.8E-08	3.0E-06	**3.3E+05**
Cadmium	--	3.0E-11	--	3.0E-11	**3.3E+05**	3.9E-04	2.5E-05	1.2E-06	4.1E-04	**2.4E+03**
Copper	--	--	--	--	**--**	9.7E-06	--	2.9E-07	1.0E-05	**1.0E+05**
Mercury	--	--	--	--	**--**	1.3E-03	5.5E-06	3.9E-05	1.3E-03	**7.5E+02**
Nickel	--	1.8E-12	--	1.8E-12	**5.5E+06**	1.9E-05	9.9E-06	5.8E-07	3.0E-05	**3.4E+04**
Silver	--	--	--	--	**--**	7.7E-05	--	2.3E-06	8.0E-05	**1.3E+04**
Thallium	--	--	--	--	**--**	4.8E-03	--	1.5E-04	5.0E-03	**2.0E+02**
Vanadium	--	--	--	--	**--**	3.9E-04	--	1.2E-05	4.0E-04	**2.5E+03**
Zinc	--	--	--	--	**--**	1.3E-06	--	3.9E-08	1.3E-06	**7.5E+05**
Pesticides/PCBs										
Aldrin	9.4E-08	3.4E-11	2.8E-08	1.2E-07	**8.2E+01**	1.3E-02	4.7E-06	3.9E-03	1.7E-02	**6.0E+01**
Aroclor 1248	2.8E-08	4.0E-12	1.2E-08	3.9E-08	**2.5E+02**	1.9E-02	7.0E-06	8.1E-03	2.8E-02	**3.6E+01**
Aroclor 1260	2.8E-08	4.0E-12	1.2E-08	3.9E-08	**2.5E+02**	1.9E-02	7.0E-06	8.1E-03	2.8E-02	**3.6E+01**
Endosulfan II	--	--	--	--	**--**	6.5E-05	2.3E-08	1.9E-05	8.4E-05	**1.2E+04**
SVOCs										
1-Methylnaphthalene	--	--	--	--	**--**	9.7E-05	3.5E-08	3.8E-05	1.3E-04	**7.4E+03**
2-Methylnaphthalene	--	--	--	--	**--**	9.7E-05	3.5E-08	3.8E-05	1.3E-04	**7.4E+03**
2,4-Dichlorophenol	--	--	--	--	**--**	1.3E-04	4.7E-08	3.9E-05	1.7E-04	**6.0E+03**
2,4-Dimethylphenol	--	--	--	--	**--**	1.9E-05	7.0E-09	5.8E-06	2.5E-05	**4.0E+04**
2,4,6-Trichlorophenol	3.9E-10	1.4E-13	1.2E-10	5.0E-10	**2.0E+04**	3.9E-03	1.4E-06	1.2E-03	5.0E-03	**2.0E+02**
Benzidine	2.8E-06	1.0E-09	8.3E-07	3.6E-06	**2.8E+00**	1.3E-04	4.7E-08	3.9E-05	1.7E-04	**6.0E+03**
Benzo(a)pyrene	6.6E-08	7.8E-12	2.6E-08	9.2E-08	**1.1E+02**	--	--	--	--	**--**
Bis 2-ethylhexylphthalate	1.7E-11	1.7E-14	5.0E-12	2.2E-11	**4.6E+05**	1.9E-05	7.0E-09	5.8E-06	2.5E-05	**4.0E+04**
Di-n-butyl phthalate	--	--	--	--	**--**	3.9E-06	1.4E-09	1.2E-06	5.0E-06	**2.0E+05**
Dibenzofuran	--	--	--	--	**--**	1.9E-04	7.0E-08	5.8E-05	2.5E-04	**4.0E+03**
Fluoranthene	--	--	--	--	**--**	9.7E-06	3.5E-09	3.8E-06	1.3E-05	**7.4E+04**
Indeno(1,2,3-cd)pyrene	6.6E-09	7.8E-13	2.6E-09	9.2E-09	**1.1E+03**	--	--	--	--	**--**
Phenanthrene	--	--	--	--	**--**	6.5E-06	2.3E-09	2.5E-06	9.0E-06	**1.1E+05**
Phenol	--	--	--	--	**--**	1.3E-06	2.5E-09	3.9E-07	1.7E-06	**5.9E+05**
Pyrene	--	--	--	--	**--**	1.3E-05	4.7E-09	5.0E-06	1.8E-05	**5.6E+04**

Table P-6
RBCs for Soil - 0 foot Cover
Commercial Worker Exposure Scenario
Ascon Landfill Site

Chemical	Unitized Cancer Risk				Soil RBC Target Risk $=10^{-5}$ (mg/kg)	Unitized Noncancer Hazard				Soil RBC Target HI = 1.0 (mg/kg)
	Ingestion	Inhalation	Dermal	Exposure Routes Total		Ingestion	Inhalation	Dermal	Exposure Routes Total	
VOCs										
1,1,1-Trichloroethane	--	--	--	--	**--**	3.5E-06	4.6E-04	2.3E-06	4.6E-04	**2.2E+03**
1,2,4-Trimethylbenzene	--	--	--	--	**--**	2.0E-05	8.6E-03	1.3E-05	8.6E-03	**1.2E+02**
1,2-Dichloroethane	1.6E-08	1.9E-06	1.1E-08	1.9E-06	**5.2E+00**	4.9E-05	6.4E-04	3.2E-05	7.3E-04	**1.4E+03**
1,3-Butadiene	1.2E-06	6.4E-05	7.8E-07	6.6E-05	**1.5E-01**	1.7E-04	5.3E-02	1.1E-04	5.3E-02	**1.9E+01**
Acetone	--	--	--	--	**--**	1.1E-06	2.6E-05	7.2E-07	2.7E-05	**3.7E+04**
Benzene	3.5E-08	3.8E-06	2.3E-08	3.8E-06	**2.6E+00**	2.4E-04	6.2E-03	1.6E-04	6.6E-03	**1.5E+02**
Chlorobenzene	--	--	--	--	**--**	4.9E-05	1.6E-04	3.2E-05	2.4E-04	**4.1E+03**
Chloroform	1.1E-08	7.4E-07	7.1E-09	7.5E-07	**1.3E+01**	9.8E-05	1.3E-03	6.5E-05	1.4E-03	**7.0E+02**
Ethylbenzene	--	--	--	--	**--**	9.8E-06	9.3E-05	6.5E-06	1.1E-04	**9.1E+03**
Freon 11 (TCFM)	--	--	--	--	**--**	3.3E-06	1.1E-03	2.2E-06	1.2E-03	**8.7E+02**
n-Hexane	--	--	--	--	**--**	8.9E-08	1.0E-03	5.9E-08	1.0E-03	**9.6E+02**
Methylene Chloride	4.9E-09	1.4E-07	3.2E-09	1.5E-07	**6.6E+01**	1.6E-05	1.0E-03	1.1E-05	1.0E-03	**9.6E+02**
Naphthalene	--	2.8E-07	--	2.8E-07	**3.5E+01**	4.9E-05	2.6E-03	3.2E-05	2.7E-03	**3.7E+02**
Styrene	--	--	--	--	**--**	4.9E-06	8.4E-05	3.2E-06	9.2E-05	**1.1E+04**
Toluene	--	--	--	--	**--**	1.2E-05	8.5E-04	8.1E-06	8.7E-04	**1.2E+03**
Inorganics										
Arsenic	3.3E-06	1.1E-09	6.5E-07	4.0E-06	**2.5E+00**	3.3E-03	3.1E-05	6.5E-04	3.9E-03	**2.5E+02**
Antimony	--	--	--	--	**--**	2.4E-03	--	1.6E-04	2.6E-03	**3.8E+02**
Barium	--	--	--	--	**--**	4.9E-06	1.9E-06	3.2E-07	7.1E-06	**1.4E+05**
Cadmium	--	1.4E-09	--	1.4E-09	**7.1E+03**	9.8E-04	4.6E-05	6.5E-06	1.0E-03	**9.7E+02**
Copper	--	--	--	--	**--**	2.4E-05	--	1.6E-06	2.6E-05	**3.8E+04**
Mercury	--	--	--	--	**--**	3.3E-03	1.0E-05	2.2E-04	3.5E-03	**2.9E+02**
Nickel	--	8.6E-11	--	8.6E-11	**1.2E+05**	4.9E-05	1.8E-05	3.2E-06	7.1E-05	**1.4E+04**
Silver	--	--	--	--	**--**	2.0E-04	--	1.3E-05	2.1E-04	**4.8E+03**
Thallium	--	--	--	--	**--**	1.2E-02	--	8.1E-04	1.3E-02	**7.7E+01**
Vanadium	--	--	--	--	**--**	9.8E-04	--	6.5E-05	1.0E-03	**9.6E+02**
Zinc	--	--	--	--	**--**	3.3E-06	--	2.2E-07	3.5E-06	**2.9E+05**
Pesticides/PCBs										
Aldrin	5.9E-06	1.6E-09	3.9E-06	9.9E-06	**1.0E+00**	3.3E-02	8.8E-06	2.2E-02	5.4E-02	**1.8E+01**
Aroclor 1248	1.7E-06	1.9E-10	1.6E-06	3.4E-06	**3.0E+00**	4.9E-02	1.3E-05	4.5E-02	9.4E-02	**1.1E+01**
Aroclor 1260	1.7E-06	1.9E-10	1.6E-06	3.4E-06	**3.0E+00**	4.9E-02	1.3E-05	4.5E-02	9.4E-02	**1.1E+01**
Endosulfan II	--	--	--	--	**--**	1.6E-04	4.4E-08	1.1E-04	2.7E-04	**3.7E+03**
SVOCs										
1-Methylnaphthalene	--	--	--	--	**--**	2.4E-04	6.6E-08	2.1E-04	4.5E-04	**2.2E+03**
2-Methylnaphthalene	--	--	--	--	**--**	2.4E-04	6.6E-08	2.1E-04	4.5E-04	**2.2E+03**
2,4-Dichlorophenol	--	--	--	--	**--**	3.3E-04	8.8E-08	2.2E-04	5.4E-04	**1.8E+03**
2,4-Dimethylphenol	--	--	--	--	**--**	4.9E-05	1.3E-08	3.2E-05	8.1E-05	**1.2E+04**
2,4,6-Trichlorophenol	2.4E-08	6.6E-12	1.6E-08	4.1E-08	**2.5E+02**	9.8E-03	2.6E-06	6.5E-03	1.6E-02	**6.2E+01**
Benzidine	1.7E-04	4.7E-08	1.2E-04	2.9E-04	**3.4E-02**	3.3E-04	8.8E-08	2.2E-04	5.4E-04	**1.8E+03**
Benzo(a)pyrene	4.2E-06	3.7E-10	3.6E-06	7.8E-06	**1.3E+00**	--	--	--	--	**--**
Bis 2-ethylhexylphthalate	1.0E-09	7.9E-13	6.9E-10	1.7E-09	**5.7E+03**	4.9E-05	1.3E-08	3.2E-05	8.1E-05	**1.2E+04**
Di-n-butyl phthalate	--	--	--	--	**--**	9.8E-06	2.6E-09	6.5E-06	1.6E-05	**6.2E+04**
Dibenzofuran	--	--	--	--	**--**	4.9E-04	1.3E-07	3.2E-04	8.1E-04	**1.2E+03**
Fluoranthene	--	--	--	--	**--**	2.4E-05	6.6E-09	2.1E-05	4.5E-05	**2.2E+04**
Indeno(1,2,3-cd)pyrene	4.2E-07	3.7E-11	3.6E-07	7.8E-07	**1.3E+01**	--	--	--	--	**--**
Phenanthrene	--	--	--	--	**--**	1.6E-05	4.4E-09	1.4E-05	3.0E-05	**3.3E+04**
Phenol	--	--	--	--	**--**	3.3E-06	4.6E-09	2.2E-06	5.4E-06	**1.8E+05**
Pyrene	--	--	--	--	**--**	3.3E-05	8.8E-09	2.8E-05	6.1E-05	**1.6E+04**

Table P-7
RBCs for Soil - 0 foot Cover
Residential Exposure Scenario
Ascon Landfill Site

Chemical	Unitized Cancer Risk				Soil RBC Target Risk $=10^{-6}$ (mg/kg)	Unitized Noncancer Hazard				Soil RBC Target HI = 1.0 (mg/kg)
	Ingestion	Inhalation	Dermal	Exposure Routes Total		Ingestion	Inhalation	Dermal	Exposure Routes Total	
VOCs										
1,1,1-Trichloroethane	--	--	--	--	**--**	4.6E-05	1.8E-03	1.3E-05	1.9E-03	**5.3E+02**
1,2,4-Trimethylbenzene	--	--	--	--	**--**	2.6E-04	3.4E-02	7.2E-05	3.4E-02	**2.9E+01**
1,2-Dichloroethane	7.4E-08	4.9E-06	2.3E-08	5.0E-06	**2.0E-01**	6.4E-04	2.6E-03	1.8E-04	3.4E-03	**3.0E+02**
1,3-Butadiene	5.3E-06	1.7E-04	1.7E-06	1.7E-04	**5.8E-03**	2.2E-03	2.1E-01	6.3E-04	2.1E-01	**4.7E+00**
Acetone	--	--	--	--	**--**	1.4E-05	1.0E-04	4.0E-06	1.2E-04	**8.4E+03**
Benzene	1.6E-07	9.8E-06	4.9E-08	1.0E-05	**1.0E-01**	3.2E-03	2.4E-02	8.9E-04	2.9E-02	**3.5E+01**
Chlorobenzene	--	--	--	--	**--**	6.4E-04	6.4E-04	1.8E-04	1.5E-03	**6.9E+02**
Chloroform	4.9E-08	1.9E-06	1.5E-08	2.0E-06	**5.1E-01**	1.3E-03	5.0E-03	3.6E-04	6.7E-03	**1.5E+02**
Ethylbenzene	--	--	--	--	**--**	1.3E-04	3.7E-04	3.6E-05	5.4E-04	**1.9E+03**
Freon 11 (TCFM)	--	--	--	--	**--**	4.3E-05	4.6E-03	1.2E-05	4.6E-03	**2.2E+02**
n-Hexane	--	--	--	--	**--**	1.2E-06	4.1E-03	3.3E-07	4.1E-03	**2.4E+02**
Methylene Chloride	2.2E-08	3.7E-07	6.9E-09	4.0E-07	**2.5E+00**	2.1E-04	4.0E-03	6.0E-05	4.3E-03	**2.3E+02**
Naphthalene	--	7.3E-07	--	7.3E-07	**1.4E+00**	6.4E-04	1.0E-02	1.8E-04	1.1E-02	**9.0E+01**
Styrene	--	--	--	--	**--**	6.4E-05	3.3E-04	1.8E-05	4.1E-04	**2.4E+03**
Toluene	--	--	--	--	**--**	1.6E-04	3.4E-03	4.5E-05	3.6E-03	**2.8E+02**
Inorganics										
Arsenic	1.5E-05	3.2E-09	1.4E-06	1.6E-05	**6.2E-02**	4.3E-02	1.3E-04	3.6E-03	4.6E-02	**2.2E+01**
Antimony	--	--	--	--	**--**	3.2E-02	--	8.9E-04	3.3E-02	**3.0E+01**
Barium	--	--	--	--	**--**	6.4E-05	8.2E-06	1.8E-06	7.4E-05	**1.4E+04**
Cadmium	--	4.0E-09	--	4.0E-09	**2.5E+02**	1.3E-02	2.0E-04	3.6E-05	1.3E-02	**7.7E+01**
Copper	--	--	--	--	**--**	3.2E-04	--	8.9E-06	3.3E-04	**3.0E+03**
Mercury	--	--	--	--	**--**	4.3E-02	4.5E-05	1.2E-03	4.4E-02	**2.3E+01**
Nickel	--	2.4E-10	--	2.4E-10	**4.1E+03**	6.4E-04	8.0E-05	1.8E-05	7.4E-04	**1.4E+03**
Silver	--	--	--	--	**--**	2.6E-03	--	7.2E-05	2.6E-03	**3.8E+02**
Thallium	--	--	--	--	**--**	1.6E-01	--	4.5E-03	1.6E-01	**6.1E+00**
Vanadium	--	--	--	--	**--**	1.3E-02	--	3.6E-04	1.3E-02	**7.6E+01**
Zinc	--	--	--	--	**--**	4.3E-05	--	1.2E-06	4.4E-05	**2.3E+04**
Pesticides/PCBs										
Aldrin	2.7E-05	4.6E-09	8.4E-06	3.5E-05	**2.9E-02**	4.3E-01	3.8E-05	1.2E-01	5.5E-01	**1.8E+00**
Aroclor 1248	7.8E-06	5.3E-10	3.5E-06	1.1E-05	**8.9E-02**	6.4E-01	5.7E-05	2.5E-01	8.9E-01	**1.1E+00**
Aroclor 1260	7.8E-06	5.3E-10	3.5E-06	1.1E-05	**8.9E-02**	6.4E-01	5.7E-05	2.5E-01	8.9E-01	**1.1E+00**
Endosulfan II	--	--	--	--	**--**	2.1E-03	1.9E-07	6.0E-04	2.7E-03	**3.7E+02**
SVOCs										
1-Methylnaphthalene	--	--	--	--	**--**	3.2E-03	2.9E-07	1.2E-03	4.4E-03	**2.3E+02**
2-Methylnaphthalene	--	--	--	--	**--**	3.2E-03	2.9E-07	1.2E-03	4.4E-03	**2.3E+02**
2,4-Dichlorophenol	--	--	--	--	**--**	4.3E-03	3.8E-07	1.2E-03	5.5E-03	**1.8E+02**
2,4-Dimethylphenol	--	--	--	--	**--**	6.4E-04	5.7E-08	1.8E-04	8.2E-04	**1.2E+03**
2,4,6-Trichlorophenol	1.1E-07	1.9E-11	3.5E-08	1.4E-07	**6.9E+00**	1.3E-01	1.1E-05	3.6E-02	1.6E-01	**6.1E+00**
Benzidine	7.8E-04	1.3E-07	2.5E-04	1.0E-03	**9.7E-04**	4.3E-03	3.8E-07	1.2E-03	5.5E-03	**1.8E+02**
Benzo(a)pyrene	1.9E-05	1.0E-09	7.7E-06	2.6E-05	**3.8E-02**	--	--	--	--	**--**
Bis 2-ethylhexylphthalate	4.7E-09	2.2E-12	1.5E-09	6.2E-09	**1.6E+02**	6.4E-04	5.7E-08	1.8E-04	8.2E-04	**1.2E+03**
Di-n-butyl phthalate	--	--	--	--	**--**	1.3E-04	1.1E-08	3.6E-05	1.6E-04	**6.1E+03**
Dibenzofuran	--	--	--	--	**--**	6.4E-03	5.7E-07	1.8E-03	8.2E-03	**1.2E+02**
Fluoranthene	--	--	--	--	**--**	3.2E-04	2.9E-08	1.2E-04	4.4E-04	**2.3E+03**
Indeno(1,2,3-cd)pyrene	1.9E-06	1.0E-10	7.7E-07	2.6E-06	**3.8E-01**	--	--	--	--	**--**
Phenanthrene	--	--	--	--	**--**	2.1E-04	1.9E-08	7.8E-05	2.9E-04	**3.4E+03**
Phenol	--	--	--	--	**--**	4.3E-05	2.0E-08	1.2E-05	5.5E-05	**1.8E+04**
Pyrene	--	--	--	--	**--**	4.3E-04	3.8E-08	1.6E-04	5.8E-04	**1.7E+03**

Table P-8
RBCs for Soil - 4 foot Cover
Commercial Worker Exposure Scenario
Ascon Landfill Site

Chemical	Unitized Cancer Risk				**Soil RBC Target Risk $=10^{-5}$ (mg/kg)**	Unitized Noncancer Hazard				**Soil RBC Target HI = 1.0 (mg/kg)**
	Ingestion	Inhalation	Dermal	Exposure Routes Total		Ingestion	Inhalation	Dermal	Exposure Routes Total	
VOCs										
1,1,1-Trichloroethane	--	--	--	--	**--**	3.5E-06	3.3E-05	2.3E-06	3.9E-05	**2.6E+04**
1,2,4-Trimethylbenzene	--	--	--	--	**--**	2.0E-05	2.9E-03	1.3E-05	2.9E-03	**3.4E+02**
1,2-Dichloroethane	1.6E-08	2.8E-07	1.1E-08	3.1E-07	**3.3E+01**	4.9E-05	9.5E-05	3.2E-05	1.8E-04	**5.7E+03**
1,3-Butadiene	1.2E-06	1.2E-06	7.8E-07	3.1E-06	**3.2E+00**	1.7E-04	9.6E-04	1.1E-04	1.2E-03	**8.1E+02**
Acetone	--	--	--	--	**--**	1.1E-06	8.4E-06	7.2E-07	1.0E-05	**9.8E+04**
Benzene	3.5E-08	3.7E-07	2.3E-08	4.3E-07	**2.4E+01**	2.4E-04	6.0E-04	1.6E-04	1.0E-03	**9.9E+02**
Chlorobenzene	--	--	--	--	**--**	4.9E-05	3.6E-05	3.2E-05	1.2E-04	**8.5E+03**
Chloroform	1.1E-08	6.9E-08	7.1E-09	8.7E-08	**1.1E+02**	9.8E-05	1.2E-04	6.5E-05	2.8E-04	**3.6E+03**
Ethylbenzene	--	--	--	--	**--**	9.8E-06	1.9E-05	6.5E-06	3.5E-05	**2.9E+04**
Freon 11 (TCFM)	--	--	--	--	**--**	3.3E-06	3.4E-05	2.2E-06	3.9E-05	**2.5E+04**
n-Hexane	--	--	--	--	**--**	8.9E-08	3.6E-05	5.9E-08	3.7E-05	**2.7E+04**
Methylene Chloride	4.9E-09	1.2E-08	3.2E-09	2.1E-08	**4.9E+02**	1.6E-05	8.7E-05	1.1E-05	1.1E-04	**8.7E+03**
Naphthalene	--	4.3E-08	--	4.3E-08	**2.3E+02**	4.9E-05	3.9E-04	3.2E-05	4.7E-04	**2.1E+03**
Styrene	--	--	--	--	**--**	4.9E-06	2.8E-05	3.2E-06	3.6E-05	**2.8E+04**
Toluene	--	--	--	--	**--**	1.2E-05	1.3E-04	8.1E-06	1.5E-04	**6.8E+03**

Table P-9
RBCs for Soil - 4 foot Cover
Residential Exposure Scenario
Ascon Landfill Site

Chemical	Unitized Cancer Risk				**Soil RBC Target Risk $=10^{-6}$ (mg/kg)**	Unitized Noncancer Hazard				**Soil RBC Target HI = 1.0 (mg/kg)**
	Ingestion	Inhalation	Dermal	Exposure Routes Total		Ingestion	Inhalation	Dermal	Exposure Routes Total	
VOCs										
1,1,1-Trichloroethane	--	--	--	--	**--**	4.6E-05	1.2E-04	1.3E-05	1.7E-04	**5.7E+03**
1,2,4-Trimethylbenzene	--	--	--	--	**--**	2.6E-04	1.2E-02	7.2E-05	1.2E-02	**8.3E+01**
1,2-Dichloroethane	7.4E-08	6.6E-07	2.3E-08	7.5E-07	**1.3E+00**	6.4E-04	3.4E-04	1.8E-04	1.2E-03	**8.6E+02**
1,3-Butadiene	5.3E-06	2.6E-06	1.7E-06	9.6E-06	**1.0E-01**	2.2E-03	3.2E-03	6.3E-04	6.1E-03	**1.6E+02**
Acetone	--	--	--	--	**--**	1.4E-05	3.2E-05	4.0E-06	5.0E-05	**2.0E+04**
Benzene	1.6E-07	8.4E-07	4.9E-08	1.1E-06	**9.5E-01**	3.2E-03	2.1E-03	8.9E-04	6.2E-03	**1.6E+02**
Chlorobenzene	--	--	--	--	**--**	6.4E-04	1.3E-04	1.8E-04	9.5E-04	**1.1E+03**
Chloroform	4.9E-08	1.6E-07	1.5E-08	2.2E-07	**4.5E+00**	1.3E-03	4.2E-04	3.6E-04	2.1E-03	**4.9E+02**
Ethylbenzene	--	--	--	--	**--**	1.3E-04	6.8E-05	3.6E-05	2.3E-04	**4.3E+03**
Freon 11 (TCFM)	--	--	--	--	**--**	4.3E-05	1.1E-04	1.2E-05	1.7E-04	**5.9E+03**
n-Hexane	--	--	--	--	**--**	1.2E-06	1.2E-04	3.3E-07	1.3E-04	**8.0E+03**
Methylene Chloride	2.2E-08	2.9E-08	6.9E-09	5.7E-08	**1.7E+01**	2.1E-04	3.1E-04	6.0E-05	5.8E-04	**1.7E+03**
Naphthalene	--	1.3E-07	--	1.3E-07	**7.6E+00**	6.4E-04	1.8E-03	1.8E-04	2.7E-03	**3.8E+02**
Styrene	--	--	--	--	**--**	6.4E-05	1.1E-04	1.8E-05	1.9E-04	**5.3E+03**
Toluene	--	--	--	--	**--**	1.6E-04	4.6E-04	4.5E-05	6.6E-04	**1.5E+03**

Table P-10
RBCs for Soil - 4 foot Cover
Recreational Exposure Scenario
Ascon Landfill Site

Chemical	Unitized Cancer Risk				**Soil RBC Target Risk =10^{-6} (mg/kg)**	Unitized Noncancer Hazard				**Soil RBC Target HI = 1.0 (mg/kg)**
	Ingestion	Inhalation	Dermal	Exposure Routes Total		Ingestion	Inhalation	Dermal	Exposure Routes Total	
VOCs										
1,1,1-Trichloroethane	--	--	--	--	**--**	--	1.1E-05	--	1.1E-05	**9.3E+04**
1,2,4-Trimethylbenzene	--	--	--	--	**--**	--	1.1E-03	--	1.1E-03	**9.3E+02**
1,2-Dichloroethane	--	6.1E-08	--	6.1E-08	**1.7E+01**	--	3.2E-05	--	3.2E-05	**3.2E+04**
1,3-Butadiene	--	2.4E-07	--	2.4E-07	**4.2E+00**	--	3.0E-04	--	3.0E-04	**3.4E+03**
Acetone	--	--	--	--	**--**	--	3.0E-06	--	3.0E-06	**3.4E+05**
Benzene	--	7.8E-08	--	7.8E-08	**1.3E+01**	--	2.0E-04	--	2.0E-04	**5.1E+03**
Chlorobenzene	--	--	--	--	**--**	--	1.2E-05	--	1.2E-05	**8.1E+04**
Chloroform	--	1.5E-08	--	1.5E-08	**6.8E+01**	--	3.9E-05	--	3.9E-05	**2.6E+04**
Ethylbenzene	--	--	--	--	**--**	--	6.3E-06	--	6.3E-06	**1.6E+05**
Freon 11 (TCFM)	--	--	--	--	**--**	--	1.1E-05	--	1.1E-05	**9.5E+04**
n-Hexane	--	--	--	--	**--**	--	1.1E-05	--	1.1E-05	**8.8E+04**
Methylene Chloride	--	2.6E-09	--	2.6E-09	**3.8E+02**	--	2.8E-05	--	2.8E-05	**3.5E+04**
Naphthalene	--	1.2E-08	--	1.2E-08	**8.3E+01**	--	1.7E-04	--	1.7E-04	**5.9E+03**
Styrene	--	--	--	--	**--**	--	1.0E-05	--	1.0E-05	**1.0E+05**
Toluene	--	--	--	--	**--**	--	4.2E-05	--	4.2E-05	**2.4E+04**

Table P-11
Summary of Risk-Based Concentrations for Soil
Ascon Landfill Site

Chemical	Construction		Commercial				Residential				Recreational			
											Adult/Child			Adult Concession
	Ingestion, Dermal, Outdoor Air Inhalation		Ingestion, Dermal, Outdoor Air Inhalation			Indoor Air Pathway	Ingestion, Dermal, Outdoor Air Inhalation			Indoor Air Pathway	Outdoor Air Inhalation		Indoor Air Pathway	Indoor Air Pathway
	Risk or Hazard	0 ft Cover RBC	Risk or Hazard	0 ft Cover RBC	4 ft Cover RBC	4 ft Cover RBC	Risk or Hazard	0 ft Cover RBC	4 ft Cover RBC	4 ft Cover RBC	Risk or Hazard	4 ft Cover RBC	4 ft Cover RBC	4 ft Cover RBC
VOCs														
1,1,1-Trichloroethane	1.0	**10,000**	1.0	**2,200**	**26,000**	**570**	1.0	**530**	**5,700**	**17**	1.0	**93,000**	**1,800**	**1,100**
1,2,4-Trimethylbenzene	1.0	**550**	1.0	**120**	**340**	**3.4**	1.0	**29**	**83**	**0.17**	1.0	**930**	**18**	**6.6**
1,2-Dichloroethane	1E-05	**610**	1E-05	**5.2**	**33**	**0.77**	1E-06	**0.20**	**1.3**	**0.009**	1E-06	**17**	**0.99**	**1.5**
1,3-Butadiene	1E-05	**17**	1E-05	**0.15**	**3.2**	**0.10**	1E-06	**0.01**	**0.10**	**0.001**	1E-06	**4.2**	**0.12**	**0.18**
Acetone	1.0	**170,000**	1.0	**37,000**	**98,000**	**1,800**	1.0	**8,400**	**20,000**	**100**	1.0	**340,000**	**10,000**	**3,500**
Benzene	1E-05	**300**	1E-05	**2.6**	**24**	**0.55**	1E-06	**0.10**	**0.95**	**0.007**	1E-06	**13**	**0.72**	**1.1**
Chlorobenzene	1.0	**17,000**	1.0	**4,100**	**8,500**	**570**	1.0	**690**	**1,100**	**17**	1.0	**81,000**	**1,800**	**1,100**
Chloroform	1E-05	**1,500**	1E-05	**13**	**110**	**3.0**	1E-06	**0.51**	**4.5**	**0.037**	1E-06	**68**	**3.9**	**5.8**
Ethylbenzene	1.0	**40,000**	1.0	**9,100**	**29,000**	**1,100**	1.0	**1,900**	**4,300**	**34**	1.0	**160,000**	**3,600**	**2,200**
Freon 11 (TCFM)	1.0	**4,100**	1.0	**870**	**25,000**	**400**	1.0	**220**	**5,900**	**12**	1.0	**95,000**	**1,200**	**770**
n-Hexane	1.0	**4,500**	1.0	**960**	**27,000**	**400**	1.0	**240**	**8,000**	**12**	1.0	**88,000**	**1,200**	**770**
Methylene Chloride	1.0	**4,500**	1E-05	**66**	**490**	**16**	1E-06	**2.5**	**17**	**0.20**	1E-06	**380**	**21**	**31**
Naphthalene	1.0	**1,700**	1E-05	**35**	**230**	**3.4**	1E-06	**1.4**	**7.6**	**0.064**	1E-06	**83**	**6.7**	**6.5**
Styrene	1.0	**49,000**	1.0	**11,000**	**28,000**	**520**	1.0	**2,400**	**5,300**	**29**	1.0	**100,000**	**3,000**	**990**
Toluene	1.0	**5,400**	1.0	**1,200**	**6,800**	**170**	1.0	**280**	**1,500**	**5.1**	1.0	**24,000**	**530**	**330**
Inorganics														
Arsenic	1E-05	**180**	1E-05	**2.5**	--	**--**	1E-06	**0.06**	--	**--**	--	--	**--**	**--**
Antimony	1.0	**1,000**	1.0	**380**	--	**--**	1.0	**30**	--	**--**	--	--	**--**	**--**
Barium	1.0	**330,000**	1.0	**140,000**	--	**--**	1.0	**14,000**	--	**--**	--	--	**--**	**--**
Cadmium	1.0	**2,400**	1.0	**970**	--	**--**	1.0	**77**	--	**--**	--	--	**--**	**--**
Copper	1.0	**100,000**	1.0	**38,000**	--	**--**	1.0	**3,000**	--	**--**	--	--	**--**	**--**
Lead	NA	**580**	NA	**800**	--		NA	**150**	--	**--**	--	--	**--**	**--**
Mercury	1.0	**750**	1.0	**290**	--	**--**	1.0	**23**	--	**--**	--	--	**--**	**--**
Nickel	1.0	**34,000**	1.0	**14,000**	--	**--**	1.0	**1,400**	--	**--**	--	--	**--**	**--**
Silver	1.0	**13,000**	1.0	**4,800**	--	**--**	1.0	**380**	--	**--**	--	--	**--**	**--**
Thallium	1.0	**200**	1.0	**77**	--	**--**	1.0	**6.1**	--	**--**	--	--	**--**	**--**
Vanadium	1.0	**2,500**	1.0	**960**	--	**--**	1.0	**76**	--	**--**	--	--	**--**	**--**
Zinc	1.0	**750,000**	1.0	**290,000**	--	**--**	1.0	**23,000**	--	**--**	--	--	**--**	**--**

Table P-11
Summary of Risk-Based Concentrations for Soil
Ascon Landfill Site

Chemical	Construction		Commercial				Residential				Recreational			
											Adult/Child			Adult Concession
	Ingestion, Dermal, Outdoor Air Inhalation		Ingestion, Dermal, Outdoor Air Inhalation			Indoor Air Pathway	Ingestion, Dermal, Outdoor Air Inhalation			Indoor Air Pathway	Outdoor Air Inhalation		Indoor Air Pathway	Indoor Air Pathway
	Risk or Hazard	0 ft Cover RBC	Risk or Hazard	0 ft Cover RBC	4 ft Cover RBC	4 ft Cover RBC	Risk or Hazard	0 ft Cover RBC	4 ft Cover RBC	4 ft Cover RBC	Risk or Hazard	4 ft Cover RBC	4 ft Cover RBC	4 ft Cover RBC
Pesticides/PCBs														
Aldrin	1.0	**60**	1E-05	**1.0**	--	**--**	1E-06	**0.03**	--	**--**	--	--	**--**	**--**
Aroclor 1248	1.0	**36**	1E-05	**3.0**	--	**--**	1E-06	**0.09**	--	**--**	--	--	**--**	**--**
Aroclor 1260	1.0	**36**	1E-05	**3.0**	--	**--**	1E-06	**0.09**	--	**--**	--	--	**--**	**--**
Endosulfan II	1.0	**12,000**	1.0	**3,700**	--	**--**	1.0	**370**	--	**--**	--	--	**--**	**--**
SVOCs														
1-Methylnaphthalene	1.0	**7,400**	1.0	**2,200**	--	**--**	1.0	**230**	--	**--**	--	--	**--**	**--**
2-Methylnaphthalene	1.0	**7,400**	1.0	**2,200**	--	**--**	1.0	**230**	--	**--**	--	--	**--**	**--**
2,4-Dichlorophenol	1.0	**6,000**	1.0	**1,800**	--	**--**	1.0	**180**	--	**--**	--	--	**--**	**--**
2,4-Dimethylphenol	1.0	**40,000**	1.0	**12,000**	--	**--**	1.0	**1,200**	--	**--**	--	--	**--**	**--**
2,4,6-Trichlorophenol	1.0	**200**	1.0	**62**	--	**--**	1.0	**6.1**	--	**--**	--	--	**--**	**--**
Benzidine	1E-05	**2.8**	1E-05	**0.03**	--	**--**	1E-06	**0.001**	--	**--**	--	--	**--**	**--**
Benzo(a)pyrene	1E-05	**110**	1E-05	**1.3**	--	**--**	1E-06	**0.04**	--	**--**	--	--	**--**	**--**
Bis 2-ethylhexylphthalate	1.0	**40,000**	1E-05	**5,700**	--	**--**	1E-06	**160**	--	**--**	--	--	**--**	**--**
Di-n-butyl phthalate	1.0	**200,000**	1.0	**62,000**	--	**--**	1.0	**6,100**	--	**--**	--	--	**--**	**--**
Dibenzofuran - SVOC	1.0	**4,000**	1.0	**1,200**	--	**--**	1.0	**120**	--	**--**	--	--	**--**	**--**
Fluoranthene	1.0	**74,000**	1.0	**22,000**	--	**--**	1.0	**2,300**	--	**--**	--	--	**--**	**--**
Indeno(1,2,3-cd)pyrene	1E-05	**1,100**	1E-05	**13**	--	**--**	1E-06	**0.38**	--	**--**	--	--	**--**	**--**
Phenanthrene	1.0	**110,000**	1.0	**33,000**	--	**--**	1.0	**3,400**	--	**--**	--	--	**--**	**--**
Phenol	1.0	**590,000**	1.0	**180,000**	--	**--**	1.0	**18,000**	--	**--**	--	--	**--**	**--**
Pyrene	1.0	**56,000**	1.0	**16,000**	--	**--**	1.0	**1,700**	--	**--**	--	--	**--**	**--**

Notes:

All Concentrations are in mg/kg; ND: not detected above detection limit (DL); NA: not applicable

0 foot cover assumes residual chemicals are present in surface soils, exposure pathways include soil ingestion, dermal contact, inhalation of fugitive dust/vapors in outdoor air

4 foot cover assumes a 4 foot clean soil cover over residual chemicals, exposure pathways include inhalation of vapors in outdoor air and indoor air

95% UCL estimated using ProUCL version 3.0; nondetects were assigned 1/2 the DL as a surrogate concentration

Table P-12
Statistical Summary of Soil Data
Ascon Landfill Site

COPCs	Number of Detects	Number of Samples	Detection Frequency	NonDetects		Detects		Mean	Median	Std Deviation	CV	Skewness	Variance	Distribution	Statistical Method	UCL
				Minimum DL	Maximum DL	Minimum	Maximum									
VOCs																
1,1,1-Trichloroethane	1	146	0.7	0.00039	0.76	0.2	0.2	0.25	0.38	0.17	0.70	-0.57	0.03	neither	99% Chebyshev (Mean, Sd)	0.39
1,2,4-Trimethylbenzene	71	92	77	0.00078	0.033	0.0075	80	6.50	3.4	11.43	1.76	4.50	131	neither	99% Chebyshev (Mean, Sd)	18.36
1,2-Dichloroethane	1	175	0.6	0.00058	0.82	10	10	0.35	0.41	0.76	2.17	12.11	0.57	neither	97.5% Chebyshev (Mean, Sd)	0.70
1,3-Butadiene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	12	38	32	0.1	0.1	0.01	26	0.73	0.05	4.21	5.76	6.16	17.72	neither	99% Chebyshev (Mean, Sd)	7.53
Benzene	75	150	50	0.0005	0.68	0.0015	3.1	0.44	0.34	0.48	1.08	2.58	0.23	neither	97.5% Chebyshev (Mean, Sd)	0.68
Chlorobenzene	3	166	1.8	0.00052	0.6	0.002	6.6	0.25	0.3	0.51	2.09	11.58	0.26	neither	97.5% Chebyshev (Mean, Sd)	0.49
Chloroform	2	147	1.4	0.0004	0.88	9.6	25	0.52	0.44	2.18	4.20	10.30	4.76	neither	99% Chebyshev (Mean, Sd)	2.31
Ethylbenzene	98	153	64	0.00051	0.0051	0.0018	11	1.79	0.61	2.44	1.37	1.61	5.97	neither	99% Chebyshev (Mean, Sd)	3.75
Freon 11 (TCFM)	2	139	1.4	0.00054	1.2	0.057	15	0.48	0.6	1.27	2.63	10.94	1.62	neither	99% Chebyshev (Mean, Sd)	1.56
n-Hexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	8	149	5.4	0.0065	8.6	0.0014	34	3.11	4.3	3.95	1.27	5.30	15.61	neither	99% Chebyshev (Mean, Sd)	6.33
Naphthalene	107	218	49	0.0011	69	0.01	300	18.45	7.8	28.07	1.52	5.90	787.97	neither	99% Chebyshev (Mean, Sd)	37.36
Styrene	4	123	3.3	0.00058	0.11	0.69	3.3	0.11	0.055	0.41	3.86	6.46	0.17	neither	97.5% Chebyshev (Mean, Sd)	0.34
Toluene	85	156	54	0.00091	0.12	0.0011	9.9	0.91	0.06	1.78	1.95	2.56	3.17	neither	99% Chebyshev (Mean, Sd)	2.33
Inorganics																
Arsenic	70	119	59	0.48	0.96	1.2	140	11.65	4.2	21.34	1.83	3.42	455	neither	97.5% Chebyshev (Mean, Sd)	23.87
Antimony	29	106	27	0.52	1	0.08	8.5	1.44	0.5	2.13	1.48	1.81	4.53	neither	97.5% Chebyshev (Mean, Sd)	2.73
Barium	116	119	97	0.35	3.5	11	3100	518.82	300	634.96	1.22	2.24	403177	gamma	Approx gamma	618.07
Cadmium	49	121	40	0.043	0.086	0.32	23	0.94	0.043	2.72	2.90	5.75	7.38	neither	97.5% Chebyshev (Mean, Sd)	2.48
Copper	104	107	97	0.22	0.44	2.7	92	27.84	26	15.55	0.56	1.40	242	neither	95% Chebyshev (Mean, Sd)	34.39
Lead	99	123	80	0.27	0.54	1.7	2560	142.89	28	339.03	2.37	4.63	114939	neither	99% Chebyshev (Mean, Sd)	447.05
Mercury	57	94	61	0.0063	0.0063	0.015	37	0.53	0.0535	3.81	7.12	9.63	14.51	neither	99% Chebyshev (Mean, Sd)	4.44
Nickel	104	107	97	0.25	0.5	2.2	140	23.72	20	19.76	0.83	3.62	390	neither	95% Chebyshev (Mean, Sd)	32.05
Silver	2	119	1.7	0.16	0.32	0.3	7.6	0.20	0.16	0.68	3.34	10.86	0.47	normal	Student's-t	0.31
Thallium	3	104	2.9	0.39	0.78	8.7	72	1.38	0.39	7.58	5.49	8.50	57.42	neither	95% Chebyshev (Mean, Sd)	4.62
Vanadium	97	102	95	0.17	0.34	2.9	75	30.90	30	15.30	0.50	0.43	234	neither	97.5% Chebyshev (Mean, Sd)	40.36
Zinc	105	108	97	0.46	0.92	11	1740	130.72	94	182.14	1.39	6.88	33175	neither	97.5% Chebyshev (Mean, Sd)	240.17

Table P-12
Statistical Summary of Soil Data
Ascon Landfill Site

COPCs	Number of Detects	Number of Samples	Detection Frequency	NonDetects		Detects		Mean	Median	Std Deviation	CV	Skewness	Variance	Distribution	Statistical Method	UCL
				Minimum DL	Maximum DL	Minimum	Maximum									
Pesticides/PCBs																
Aldrin	1	76	1.3	0.001	0.036	0.05	0.05	0.01	0.018	0.01	0.66	0.57	0.00	neither	97.5% Chebyshev (Mean, Sd)	0.02
Aroclor 1248	1	5	20	0.019	0.95	0.14	0.14	0.13	0.0095	0.20	1.57	1.85	0.04	gamma	Adjusted gamma	2.38
Aroclor 1260	2	5	40	0.024	1.2	0.39	9	1.89	0.012	3.98	2.11	2.23	15.85	gamma	Adjusted gamma	52.90
Endosulfan II	3	152	2.0	0.002	0.058	0.0026	0.071	0.02	0.029	0.01	0.60	-0.05	0.00	neither	95% Chebyshev (Mean, Sd)	0.02
SVOCs																
1-Methylnaphthalene	2	2	100	--	--	5	65	35.00	35	42.43	1.21	N/A	1800	--	sample size <5	--
2-Methylnaphthalene	39	113	35	0.23	69	0.3	100	24.12	34.5	16.08	0.67	0.66	259	neither	97.5% Chebyshev (Mean, Sd)	33.56
2,4-Dichlorophenol	1	109	0.9	0.2	60	0.59	0.59	22.85	30	11.82	0.52	-1.10	140	neither	97.5% Chebyshev (Mean, Sd)	29.92
2,4-Dimethylphenol	1	108	0.9	0.2	60	39	39	23.14	30	11.76	0.51	-1.11	138	neither	97.5% Chebyshev (Mean, Sd)	30.20
2,4,6-Trichlorophenol	1	109	0.9	0.2	60	0.16	0.16	22.84	30	11.83	0.52	-1.10	140	neither	97.5% Chebyshev (Mean, Sd)	29.92
Benzidine	2	101	2.0	0.37	110	17	260	43.04	55	30.91	0.72	3.07	955	neither	97.5% Chebyshev (Mean, Sd)	62.25
Benzo(a)pyrene	1	44	2.3	75	75	0.068	0.068	36.65	37.5	5.64	0.15	-6.63	31.84	neither	95% Chebyshev (Mean, Sd)	40.36
Bis 2-ethylhexylphthalate	8	109	7.3	0.25	75	0.13	460	30.39	37.5	44.47	1.46	8.43	1977	neither	97.5% Chebyshev (Mean, Sd)	56.99
Di-n-butyl phthalate	8	110	7.3	0.19	57	0.16	3.7	20.01	28.5	12.15	0.61	-0.77	148	neither	97.5% Chebyshev (Mean, Sd)	27.24
Dibenzofuran	1	108	0.9	0.19	57	0.54	0.54	21.64	28.5	11.27	0.52	-1.08	127	neither	97.5% Chebyshev (Mean, Sd)	28.41
Fluoranthene	6	109	5.5	0.18	54	0.1	3.2	19.37	27	11.31	0.58	-0.85	128	neither	97.5% Chebyshev (Mean, Sd)	26.13
Indeno(1,2,3-cd)pyrene	1	108	0.9	0.25	75	23	23	28.97	37.5	14.44	0.50	-1.17	209	neither	97.5% Chebyshev (Mean, Sd)	37.65
Phenanthrene	28	117	24	0.17	51	0.078	55	16.65	25.5	11.35	0.68	-0.10	129	neither	97.5% Chebyshev (Mean, Sd)	23.21
Phenol	2	108	1.9	0.21	63	0.087	0.098	23.63	31.5	12.64	0.53	-1.03	160	neither	97.5% Chebyshev (Mean, Sd)	31.22
Pyrene	11	110	10	0.15	45	0.09	17	16.04	22.5	9.31	0.58	-0.84	86.65	neither	97.5% Chebyshev (Mean, Sd)	21.58

Notes:

Units in **mg/kg**

"DL" = method detection limit; "--" not applicable; "UCL": upper confidence limit

If the UCL > maximum detection then use the maximum concentration

(normal) normal distribution = 95% UCL calculated using the Student's t

(gamma) Gamma distribution = adjusted or approximate gamma UCL estimated

(neither) Neither normal nor lognormal = 95%, 97.5%, or 99% UCL calculated using non-parametric Chebyshev Inequality method