APPENDIX I

Applicable SSTL's

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: Former Fire Fighting Training Facility
Site Location: Stead, Nevada

Completed By: P. S. Hackenberry
Date Completed: 16-Apr-02

Job ID: US T2.Ind

Exposure Parameters		Residential			Commercial/Industrial	
		Adult	(1-6yrs)	(1-16 yrs)	Chronic	Construc.
AT_c	Averaging time for carcinogens (yr)	70				
AT_n	Averaging time for non-carcinogens (yr)	30			25	1
BW	Body weight (kg)	70	15	35	70	
ED	Exposure duration (yr)	30	6	16	25	1
τ	Averaging time for vapor flux (yr)	30			25	1
EF	Exposure frequency (days/yr)	350			250	180
EF_D	Exposure frequency for dermal exposure	350			250	
IR_w	Ingestion rate of water (L/day)	2			1	
IR_s	Ingestion rate of soil (mg/day)	100	200		50	100
SA	Skin surface area (dermal) (cm^2)	5800		2023	5800	5800
M	Soil to skin adherence factor	1				
ET_{swim}	Swimming exposure time (hr/event)	3				
EV_{swim}	Swimming event frequency (events/yr)	12	12	12		
IR_{swim}	Water ingestion while swimming (L/hr)	0.05	0.5			
SA_{swim}	Skin surface area for swimming (cm^2)	23000		8100		
IR_{fish}	Ingestion rate of fish (kg/yr)	0.025				
FI_{fish}	Contaminated fish fraction (unitless)	1				

Complete Exposure Pathways and Receptors	On-site	Off-site 1	Off-site 2
Groundwater:			
Groundwater Ingestion	Residential	MCL	None
Soil Leaching to Groundwater Ingestion	Residential	MCL	None
Applicable Surface Water Exposure Routes:			
Swimming			NA
Fish Consumption			NA
Aquatic Life Protection			NA
Soil:			
Direct Ingestion and Dermal Contact	Com./Constr.		
Outdoor Air:			
Particulates from Surface Soils	None	None	None
Volatilization from Soils	Com./Constr.	Commercial	None
Volatilization from Groundwater	Commercial	Commercial	None
Indoor Air:			
Volatilization from Subsurface Soils	Commercial	NA	NA
Volatilization from Groundwater	Commercial	NA	NA

Receptor Distance from Source Media	On-site	Off-site 1	Off-site 2	(Units)
Groundwater receptor	0	2000	NA	(ft)
Soil leaching to groundwater receptor	0	2000	NA	(ft)
Outdoor air inhalation receptor	0	75	NA	(ft)

Target Health Risk Values		Individual	Cumulative
TR_{ab}	Target Risk (class A&B carcinogens)	1.0E-6	1.0E-5
TR_c	Target Risk (class C carcinogens)	1.0E-5	
THQ	Target Hazard Quotient (non-carcinogenic risk)	1.0E+0	1.0E+0

Modeling Options	
RBCA tier	Tier 2
Outdoor air volatilization model	Surface & subsurface models
Indoor air volatilization model	Johnson & Ettinger model
Soil leaching model	ASTM leaching model
Use soil attenuation model (SAM) for leachate?	No
Air dilution factor	3-D Gaussian dispersion
Groundwater dilution-attenuation factor	Domenico model

NOTE: NA = Not applicable

Surface Parameters		General	Construction	(Units)
A	Source zone area	3.5E+5	3.5E+5	(ft^2)
W	Length of source-zone area parallel to wind	6.0E+2	6.0E+2	(ft)
W_{gw}	Length of source-zone area parallel to GW flow	6.0E+2		(ft)
U_{air}	Ambient air velocity in mixing zone	1.1E+6		(ft/d)
δ_{air}	Air mixing zone height	6.6E+0		(ft)
P_a	Areal particulate emission rate	NA		(g/cm^2/s)
L_{ss}	Thickness of affected surface soils	4.8E+1		(ft)

Surface Soil Column Parameters		Value			(Units)
h_{cap}	Capillary zone thickness	3.0E-1			(ft)
h_v	Vadose zone thickness	4.8E+1			(ft)
ρ_s	Soil bulk density	1.7E+0			(g/cm^3)
f_{oc}	Fraction organic carbon	2.5E-3			(-)
θ_T	Soil total porosity	4.1E-1			(-)
K_{vs}	Vertical hydraulic conductivity	2.8E+0			(ft/d)
k_v	Vapor permeability	1.1E-12			(ft^2)
L_{gw}	Depth to groundwater	4.8E+1			(ft)
L_s	Depth to top of affected soils	0.0E+0			(ft)
L_{base}	Depth to base of affected soils	4.8E+1			(ft)
L_{subs}	Thickness of affected soils	4.8E+1			(ft)
pH	Soil/groundwater pH	7.6E+0			(-)
		capillary	vadose	foundation	
θ_w	Volumetric water content	0.369	0.12	0.12	(-)
θ_a	Volumetric air content	0.041	0.29	0.26	(-)

Building Parameters		Residential	Commercial	(Units)
L_b	Building volume/area ratio	NA	9.84E+0	(ft)
A_b	Foundation area	NA	7.53E+2	(ft^2)
X_{crk}	Foundation perimeter	NA	1.12E+2	(ft)
ER	Building air exchange rate	NA	1.99E+1	(1/d)
L_{crk}	Foundation thickness	NA	4.92E-1	(ft)
Z_{crk}	Depth to bottom of foundation slab	NA	4.92E-1	(ft)
η	Foundation crack fraction	NA	1.00E-2	(-)
dP	Indoor/outdoor differential pressure	NA	0.00E+0	(psi)
Q_s	Convective air flow through slab	NA	0.00E+0	(ft^3/d)

Groundwater Parameters		Value	(Units)
δ_{gw}	Groundwater mixing zone depth	6.4E+1	(ft)
I_f	Net groundwater infiltration rate	2.2E-1	(in/yr)
U_{gw}	Groundwater Darcy velocity	2.2E-1	(ft/d)
V_{gw}	Groundwater seepage velocity	7.3E-1	(ft/d)
K_s	Saturated hydraulic conductivity	2.2E+1	(ft/d)
i	Groundwater gradient	9.7E-3	(-)
S_w	Width of groundwater source zone	6.0E+2	(ft)
S_d	Depth of groundwater source zone	6.4E+1	(ft)
θ_{eff}	Effective porosity in water-bearing unit	3.0E-1	(-)
$f_{oc\text{-}sat}$	Fraction organic carbon in water-bearing unit	1.0E-3	(-)
pH_{sat}	Groundwater pH	7.0E+0	(-)
	Biodegradation considered?	No	

Transport Parameters		Off-site 1	Off-site 2	Off-site 1	Off-site 2	(Units)
Lateral Groundwater Transport		Groundwater Ingestion		Soil Leaching to GW		
α_x	Longitudinal dispersivity	3.2E+1	NA	3.2E+1	NA	(ft)
α_y	Transverse dispersivity	3.2E+0	NA	3.2E+0	NA	(ft)
α_z	Vertical dispersivity	3.2E-1	NA	3.2E-1	NA	(ft)
Lateral Outdoor Air Transport		Soil to Outdoor Air Inhal.		GW to Outdoor Air Inhal.		
σ_y	Transverse dispersion coefficient	8.6E+0	NA	8.6E+0	NA	(ft)
σ_z	Vertical dispersion coefficient	5.8E+0	NA	5.8E+0	NA	(ft)
ADF	Air dispersion factor	1.0E+0	NA	1.0E+0	NA	(-)

Surface Water Parameters		Off-site 2	(Units)
Q_{sw}	Surface water flowrate	NA	(ft^3/d)
W_{pi}	Width of GW plume at SW discharge	NA	(ft)
δ_{pi}	Thickness of GW plume at SW discharge	NA	(ft)
DF_{sw}	Groundwater-to-surface water dilution factor	NA	(-)

RBCA SITE ASSESSMENT

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Completed By: P. S. Hackenberry
Date Completed: 16-Apr-02

Job ID: US T2.Ind

SOIL (0 - 48 ft) SSTL VALUES

Target Risk (Class A & B) 1.0E-6
Target Risk (Class C) 1.0E-5
Target Hazard Quotient 1.0E+0

Groundwater DAF Option: Domenico - No Decay
(One-directional vert. dispersion)

SSTL Results For Complete Exposure Pathways ("X" if Complete)

CONSTITUENTS OF CONCERN		Representative Concentration	X Soil Leaching to Groundwater Ingestion			X Soil Vol. to Indoor Air	X Soil Volatilization to Outdoor Air				X Surface Soil Inhalation, Ingestion,Dermal Contact		Applicable SSTL	SSTL Exceeded ?	Required CRF
			On-site (0 ft)	Off-site 1 (2000 ft)	Off-site 2 (2000 ft)	On-site (0 ft)	On-site (0 ft)		Off-site 1 (75 ft)	Off-site 2 (0 ft)	On-site (0 ft)				Only if "yes" left
CAS No.	Name	(mg/kg)	Residential	MCL	None	Commercial	Commercial	Construction Worker	Commercial	None	Commercial	Construction Worker	(mg/kg)	"■" if yes	
71-43-2	Benzene		3.4E-1	6.4E-1	NA	1.1E-2	6.4E-1	2.2E+0	6.4E-1	NA	5.4E-1	2.1E+0	1.1E-2	☐	NA
108-88-3	Toluene		>2.3E+2	2.2E+2	NA	1.6E+1	>2.3E+2	1.9E+2	>2.3E+2	NA	6.7E+2	1.8E+2	1.6E+1	☐	NA
100-41-4	Ethylbenzene		>1.7E+2	>1.7E+2	NA	8.3E+1	>1.7E+2	>1.7E+2	>1.7E+2	NA	1.4E+3	5.6E+2	8.3E+1	☐	NA
1330-20-7	Xylene (mixed isomers)		>1.4E+2	>1.4E+2	NA	>1.4E+2	>1.4E+2	>1.4E+2	>1.4E+2	NA	1.2E+4	4.0E+3	4.0E+3	☐	NA
91-20-3	Naphthalene		>1.6E+2	noMCL	NA	>1.6E+2	>1.6E+2	>1.6E+2	>1.6E+2	NA	2.6E+4	8.6E+3	8.6E+3	☐	NA
86-73-7	Fluorene		>3.1E+1	noMCL	NA	NC	NC	NC	NC	NA	NC	NC	>3.1E+1	☐	NA
120-12-7	Anthracene		>1.6E+0	noMCL	NA	NC	NC	NC	NC	NA	NC	NC	>1.6E+0	☐	NA
206-44-0	Fluoranthene		>2.0E+1	noMCL	NA	NC	NC	NC	NC	NA	NC	NC	>2.0E+1	☐	NA
129-00-0	Pyrene		>1.5E+1	noMCL	NA	NC	NC	NC	NC	NA	NC	NC	>1.5E+1	☐	NA

">" indicates risk-based target concentration greater than constituent residual saturation value. NA = Not applicable. NC = Not calculated.

RBCA SITE ASSESSMENT

Site Name: Former Fire Fighting Training Facility
Site Location: Stead, Nevada

Completed By: P. S. Hackenberry
Date Completed: 16-Apr-02

Job ID: US TPH T2.IndR2

SOIL (0 - 48 ft) SSTL VALUES

Target Risk (Class A & B) 1.0E-6
Target Risk (Class C) 1.0E-5
Target Hazard Quotient 1.0E+0

Groundwater DAF Option: Domenico - No Decay
(One-directional vert. dispersion)

SSTL Results For Complete Exposure Pathways ("X" if Complete)

CONSTITUENTS OF CONCERN		Representative Concentration	X Soil Leaching to Groundwater Ingestion			X Soil Vol. to Indoor Air	X Soil Volatilization to Outdoor Air				X Surface Soil Inhalation, Ingestion,Dermal Contact		Applicable SSTL	SSTL Exceeded ?	Required CRF
			On-site (0 ft)	Off-site 1 (2000 ft)	Off-site 2 (0 ft)	On-site (0 ft)	On-site (0 ft)		Off-site 1 (75 ft)	Off-site 2 (0 ft)	On-site (0 ft)				Only if "yes" left
CAS No.	Name	(mg/kg)	Residential	MCL	None	Commercial	Commercial	Construction Worker	Commercial	#VALUE!	Commercial	Construction Worker	(mg/kg)	"■" if yes	
0-00-0	TPH - Aliph >C08-C10		>4.0E+1	noMCL	NA	3.2E+1	>4.0E+1	>4.0E+1	>4.0E+1	NA	1.2E+3	3.2E+2	3.2E+1	☐	NA
0-00-0	TPH - Aliph >C10-C12		>2.2E+1	noMCL	NA	>2.2E+1	>2.2E+1	>2.2E+1	>2.2E+1	NA	1.5E+3	6.1E+2	6.1E+2	☐	NA
0-00-0	TPH - Aliph >C12-C16		>9.6E+0	noMCL	NA	>9.6E+0	>9.6E+0	>9.6E+0	>9.6E+0	NA	2.2E+3	1.1E+3	1.1E+3	☐	NA
0-00-0	TPH - Aliph >C16-C21		>3.9E+0	noMCL	NA	NC	NC	NC	NC	NA	NC	NC	>3.9E+0	☐	NA
0-00-0	TPH - Aliph >C21-C34		>3.9E+0	noMCL	NA	NC	NC	NC	NC	NA	NC	NC	>3.9E+0	☐	NA
0-00-0	TPH - Arom >C05-C07		1.5E+1	noMCL	NA	1.9E-1	1.1E+1	2.2E+0	1.1E+1	NA	1.0E+1	2.2E+0	1.9E-1	☐	NA
0-00-0	TPH - Arom >C07-C08		>3.9E+2	noMCL	NA	2.1E+1	>3.9E+2	2.1E+2	>3.9E+2	NA	6.9E+2	2.1E+2	2.1E+1	☐	NA
0-00-0	TPH - Arom >C08-C10		>2.7E+2	noMCL	NA	3.3E+1	>2.7E+2	1.9E+2	>2.7E+2	NA	4.6E+2	1.7E+2	3.3E+1	☐	NA
0-00-0	TPH - Arom >C10-C12		>1.6E+2	noMCL	NA	>1.6E+2	>1.6E+2	>1.6E+2	>1.6E+2	NA	7.4E+2	3.4E+2	3.4E+2	☐	NA
0-00-0	TPH - Arom >C12-C16		>7.3E+1	noMCL	NA	>7.3E+1	>7.3E+1	>7.3E+1	>7.3E+1	NA	1.0E+3	5.9E+2	5.9E+2	☐	NA
0-00-0	TPH - Arom >C16-C21		>2.6E+1	noMCL	NA	NC	NC	NC	NC	NA	NC	NC	>2.6E+1	☐	NA
0-00-0	TPH - Arom >C21-C35		>2.1E+0	noMCL	NA	NC	NC	NC	NC	NA	NC	NC	>2.1E+0	☐	NA

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RBCA SITE ASSESSMENT | **TPH Criteria SSTL Worksheet**

Site Name: Former Fire Fighting Training Facility
Site Location: Stead, Nevada

Completed By: P. S. Hackenberry
Date Completed: 16-Apr-02

Job ID: US TPH T2.IndR2

CALCULATION OF SSTL VALUES FOR TPH

CONSTITUENTS OF CONCERN		Mass Fractions		Representative Concentrations		Calculated Concentration Limits		Appilcable SSTL Values	
		Soil	Groundwater	Soil	Groundwater	Residual Soil Concentration	Solubility	Soils (0 - 48 ft)	Groundwater
CAS No.	Name	(-)	(-)	(mg/kg)	(mg/L)	(mg/kg)	(mg/L)	(mg/kg)	(mg/L)
0-00-0	TPH - Aliph >C08-C10	2.9E-2	0.0E+0			4.0E+1	4.3E-1	3.2E+1	>4.3E-1
0-00-0	TPH - Aliph >C10-C12	3.6E-2	0.0E+0			2.2E+1	3.4E-2	6.1E+2	>3.4E-2
0-00-0	TPH - Aliph >C12-C16	1.9E-1	0.0E+0			9.6E+0	7.6E-4	1.1E+3	>7.6E-4
0-00-0	TPH - Aliph >C16-C21	5.0E-1	0.0E+0			3.9E+0	2.5E-6	>3.9E+0	>2.5E-6
0-00-0	TPH - Aliph >C21-C34	2.4E-1	0.0E+0			3.9E+0	2.5E-6	>3.9E+0	>2.5E-6
0-00-0	TPH - Arom >C05-C07	0.0E+0	0.0E+0			5.6E+2	1.8E+3	1.9E-1	1.1E-1
0-00-0	TPH - Arom >C07-C08	0.0E+0	0.0E+0			3.9E+2	5.2E+2	2.1E+1	7.3E+0
0-00-0	TPH - Arom >C08-C10	1.0E-3	0.0E+0			2.7E+2	6.5E+1	3.3E+1	1.5E+0
0-00-0	TPH - Arom >C10-C12	0.0E+0	0.0E+0			1.6E+2	2.5E+1	3.4E+2	1.5E+0
0-00-0	TPH - Arom >C12-C16	0.0E+0	0.0E+0			7.3E+1	5.8E+0	5.9E+2	1.5E+0
0-00-0	TPH - Arom >C16-C21	0.0E+0	0.0E+0			2.6E+1	6.5E-1	>2.6E+1	>6.5E-1
0-00-0	TPH - Arom >C21-C35	1.0E-3	0.0E+0			2.1E+0	6.6E-3	>2.1E+0	>6.6E-3
	Total	1.0E+0	0.0E+0	0.0E+0	0.0E+0		**Total TPH SSTL value**	1.1E+3	

">" indicates risk-based target concentration greater than constituent residual saturation value. NC = Not calculated.