exposure. An evaluation of all possible human exposures is necessary to identify receptors that are in current contact with or could come in contact with Site 14 or 15 constituents.

According to reuse plans for Alameda Point, recreational and occupational exposures are the most likely future exposures at Sites 14 and 15. Each of these exposure scenarios were evaluated, along with residential, which is considered more conservative, and construction worker exposures. The exposure scenarios for Sites 14 and 15 were evaluated for the following pathways:

- **Residential** - soil ingestion, dermal contact with soil, inhalation of particulates from soil, inhalation of VOCs in ambient air, inhalation of VOCs in indoor air, and ingestion of homegrown produce
- **Occupational** - soil ingestion, dermal contact with soil, inhalation of particulates from soil, inhalation of VOCs in ambient air, and inhalation of VOCs in indoor air
- **Recreational** - soil ingestion, dermal contact with soil, inhalation of particulates from soil, and inhalation of VOCs in ambient air
- **Construction Worker** - soil ingestion, dermal contact with soil, inhalation of particulates from soil, and inhalation of VOCs in ambient air

Because these pathways are based on future exposures, they are considered potentially complete and are evaluated to provide a conservative estimate of risk. Although construction workers may have transient dermal contact with groundwater, this exposure was considered insignificant due to the very short duration and limited extent expected. It is not assessed in this HHRA. Conceptual site models and tables that indicate which exposure pathways are complete for each exposure scenario are provided in Appendix D.

Exposure is based on "intake," which is defined as the mass of a substance taken into the body per unit body weight per unit time. Intake from a contaminated medium is determined by the amount of the chemical in the medium, the frequency and duration of exposure, body weight, the contact rate, and the averaging time.

EPA (EPA 1992) requires that exposure parameters used to determine contaminant intakes for a given pathway should be selected so that the estimated intake represents the average and

TABLE 5-7: SITES 14 AND 15 HUMAN HEALTH RISK ASSESSMENT SUMMARY

Draft Remedial Investigation Report for CERCLA Sites 14 and 15, Alameda Point, Alameda, California

EXPOSURE SCENARIOS		SITE 14[1]		SITE 15[1]	
		Cancer	Non-cancer	Cancer	Non-cancer
Residential					
EPA	RME	6.2E-05	0.99	4.4E-05	0.61
	CTE	1.9E-05	1.0	1.3E-05	1.0
DTSC	RME	7.50E-05	0.70	6.4E-05	0.47
	CTE	2.10E-05	0.73	1.9E-05	0.53
Occupational					
EPA	RME	6.3E-06	0.14	7.4E-06	0.097
	CTE	1.0E-06	0.13	1.2E-06	0.085
DTSC	RME	7.1E-06	0.083	1.1E-05	0.065
	CTE	1.2E-06	0.071	1.7E-06	0.056
Recreational					
EPA	RME	4.6E-06	0.068	6.2E-06	0.041
	CTE	2.3E-07	0.013	3.0E-07	0.0082
DTSC	RME	5.3E-06	0.04	9.8E-06	0.027
	CTE	2.7E-07	0.0069	4.8E-07	0.0051
Construction Worker					
EPA	RME	5.5E-07	0.19	3.8E-07	0.15
	CTE	1.6E-07	0.052	1.1E-07	0.041
DTSC	RME	6.0E-07	0.16	5.1E-07	0.13
	CTE	1.8E-07	0.045	1.5E-07	0.038

Notes:

1	Includes risk from background
CTE	Central tendency exposure
DTSC	Based on California Office of Environmental Health Hazard Assessment toxicity values used by California Department of Toxic Substances Control
EPA	Based on U.S. Environmental Protection Agency toxicity values
RME	Reasonable maximum exposure

TABLE 5-8: SITE 14 HHRA RISK DRIVERS

Draft Remedial Investigation Report for CERCLA Sites 14 and 15, Alameda Point, Alameda, California

Residential Scenario (0 to 10 feet bgs)
Receptor: Adult/Child

MEDIUM	CONSTITUENT	CARCINOGENIC RISK[1]						
		Ingestion of Soil	Dermal	Inhalation of Dust	Inhalation Ambient Air	Inhalation Indoor Air	Ingestion of Produce	Total Constituent Risk
Surface and Subsurface Soil	Arsenic	**2.0E-05**	**2.0E-06**	**9.7E-07**	NA	NA	**1.4E-05**	**3.7E-05**
	Benzene	NA	NA	NA	NA	**1.30E-08**	NA	1.3E-08
	Beryllium	NA	NA	**1.5E-07**	NA	NA	NA	1.5E-07
	Cadmium	NA	NA	**5.6E-08**	NA	NA	NA	5.6E-08
	Benzo(a)pyrene	**3.0E-06**	**1.3E-06**	6.1E-09	NA	NA	**2.9E-06**	**7.1E-06**
	Dibenzo(a,h)anthracene	**3.0E-06**	**1.3E-06**	1.2E-09	NA	NA	NA	**6.3E-06**
	Dioxin TEQ	2.9E-06	2.90E-07	1.40E-08	NA	NA	**2.4E-06**	5.6E-06
	Tetrachloroethene	2.2E-09	7.3E-10	4.0E-13	**2.5E-09**	**4.8E-10**	NA	5.4E-09
	Trichloroethene	2.4E-10	8.2E-11	6.4E-13	**4.9E-09**	**2.8E-09**	NA	5.2E-09
Exposure Route Totals[2]		3.1E-05	5.8E-06	1.2E-06	7.4E-09	1.6E-08	2.4E-05	
						Total Site Risk	6.2E-05	

TABLE 5-8: SITE 14 HHRA RISK DRIVERS

Draft Remedial Investigation Report for CERCLA Sites 14 and 15, Alameda Point, Alameda, California

MEDIUM	CHEMICAL	NON-CANCER RISK[1]						
		Ingestion of Soil	Dermal	Inhalation of Dust	Inhalation Ambient Air	Inhalation Indoor Air	Ingestion of Produce	Total Constituent Risk
Surface and Subsurface Soil	Aluminum	**0.04**	0.00	**0.14**	NA	NA	NA	**0.18**
	Antimony	**0.04**	**0.01**	NA	NA	NA	NA	0.044
	Arsenic	**0.10**	NA	NA	NA	NA	**0.073**	**0.18**
	Barium	0.005	0.01	**.012**	NA	NA	NA	0.028
	Cadmium	0.088	**0.000031**	NA	NA	NA	**0.079**	0.088
	cis-1,2-Dichloroethene	NA	NA	NA	NA	**0.000022**	NA	0.000022
	1,2-Dichlorethene (total)	0.00001	NA	0.000000027	**0.00029**	NA	NA	0.0003
	Dieldrin	0.003	**0.0000019**	NA	NA	NA	.003	0.0033
	Ethylbenzene	NA	NA	NA	NA	**0.0000068**	NA	0.0000068
	Manganese	0.008	NA	**0.39**	NA	NA	NA	**0.39**
	Nickel	0.001	0.0	NA	NA	NA	**0.011**	0.021
	Tetrachlorethene	0.000010	0.0	0.0000000043	**0.000027**	NA	NA	0.000037
	Toluene	NA	NA	NA	NA	**0.00017**	NA	0.00017
	Trichloroethene	0.0000086	0.00000008	0.00000004	**0.00032**	NA	NA	0.00033
Exposure Route Totals[2]		0.25	0.011	0.55	0.00071	0.00021	0.18	
						Total Site Risk	0.99	

Notes:

1 Reasonable maximum exposure (RME) risk based on Environmental Protection Agency assumptions

2 Includes total risk from all constituents evaluated in the risk assessment

bgs Below ground surface

NA Not applicable