APPENDIX M

SUPPORTING INFORMATION FOR THE ECOLOGICAL RISK ASSESSMENT

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SUPPORTING INFORMATION FOR THE ECOLOGICAL RISK ASSESSMENT

This appendix includes supporting information related to the ecological risk assessment, as follows:

Section 1
Compilation of Toxicity Reference Values (TRVs) for the Ecological Risk Assessment

Section 2
Technical Approach for Calculating Doses to Wildlife Species

Section 3
Methods Used to Address Mixtures of PCDDs/PCDFs in the Ecological Risk Assessment

Section 4
Detailed Ecological Risk Assessment Results

APPENDIX M
SECTION 1

COMPILATION OF TOXICITY REFERENCE VALUES (TRVs) FOR THE ECOLOGICAL RISK ASSESSMENT

Toxicity reference values (TRVs) are the estimated dose or exposure level at which no adverse effects are expected to occur. For this project, TRVs were obtained from USEPA's 1999 *Screening Level Ecological Risk Protocol for Hazardous Waste Combustion Facilities* ("Screening Level Protocol") or, in the absence of data from this report, from standards, criteria, guidance, or ecological benchmarks from the data sources listed below (and in the project Working Draft Risk Assessment Workplan), in order of preference, as follows:

Birds & Mammals
- CalTox database (CEPA 2002)
- Sample et al. (1996)
- Schafer et al. (1983), Schafer and Bowles (1985)

Reptiles
- CalTox database (CEPA 2002)
- Reptile and Amphibian Toxicity Literature (RATL) database (EC 2000)

Plants
- Efromyson et al. (1997)
- USEPA Region V Ecological Screening Levels (USEPA 2003)

Aquatic Life – Surface Water
- AZDEQ water quality standards (AZDEQ 2003)
- USEPA (2005)
- USEPA (1996)
- Mayer and Ellersieck (1986)
- USEPA (2007)

Aquatic Life – Sediment
- NOAA (2006)
- MacDonald (2000)

If available and appropriate, TRVs which were associated with chronic exposures (i.e., long duration exposures) and which reported no-adverse-effects levels (NOAELs)

relating to reproduction or mortality were selected. If only acute toxicity data were available, chronic values were estimated by dividing the acute value by 100, as recommended in USEPA (1999) guidance. In some cases, TRVs with endpoints relating to reproduction or mortality were not available in the literature. In such cases, TRVs associated with other sub-lethal effects were assumed to indirectly affect survival or reproductive capacity and were therefore appropriate. Studies were also selected based on similarity of test species to the receptors considered in the risk assessment. In some cases, a TRV could not be identified. Use of TRVs assumes that the bioavailability, uptake efficiency, uptake mechanism, and toxicity mechanism of the chemical used in the TRV study is similar to the chemical form which occurs at the project site.

The TRVs compiled for this project, for compounds not already included in USEPA's Screening Level Protocol, are presented in this appendix in a series of tables. Table 1 summarizes all the TRVs that were compiled for the various ecological receptor groups. Table 2 lists the data sources for the compiled TRVs for mammals, birds and plants. Tables 3 and 4 present detailed supporting data on the TRVs compiled from Sample et al. (1996) for mammalian and avian receptors, respectively. Table 5 lists the data sources for the surface water and sediment TRVs that were compiled. Table 6 presents detailed supporting data for the aquatic TRVs compiled from Mayer and Ellersieck (1986). Table 7 presents detailed supporting data for the aquatic TRVs compiled from USEPA's Ecotox Database. It should also be noted that Arizona Water Quality Criteria took precedence over surface water TRVs available in USEPA's Screening Level Protocol.

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U.S. Environmental Protection Agency (USEPA). 2007. EcoTox Database. http://www.epa.gov/ecotox.

Table 1
Toxicity Reference Values (TRVs) for Compounds Not Included in
USEPA's 1999 Screening Level Ecological Risk Assessment Protocol

Compound (a)	CAS NO.	Freshwater TRVs mg/L	Freshwater Sediment TRVs mg/kg (dry weight)	Terrestrial Plant TRVs mg/kg (dry weight soil)	Mammal TRVs mg/kg BW-day	Bird TRVs mg/kg BW-day
Inorganic Compounds						
Cobalt	7440-48-4	0.003	N/D	20	N/D	N/D
Manganese	7439-96-5	0.08	N/D	500	88	977
Vanadium	7440-62-2	0.019	N/D	2	0.21	11.4
Organic Compounds						
1,1-Dichloropropene	563-58-6	N/D	N/D	N/D	N/D	N/D
1,2,4-Trimethylbenzene	95-63-6	0.077	N/D	N/D	N/D	N/D
1,2-Dichloroethene	540-59-0	1.4	N/D	N/D	N/D	N/D
1,3-Dichloropropane	142-28-9	1.3	N/D	N/D	N/D	N/D
1,3-Dichloropropene (trans)	10061-02-6	N/D	N/D	N/D	N/D	N/D
1-Hexane (n-hexane)	110-54-3	0.025	N/D	N/D	N/D	N/D
2,2'-oxybis (1-Chloropropane)	108-60-1	N/D	N/D	20	N/D	N/D
2,2-Dichloropropane	594-20-7	0.39	N/D	N/D	N/D	N/D
2,5-Dimethylfuran	625-86-5	0.71	N/D	N/D	N/D	N/D
2,5-Dimethylheptane	2216-30-0	N/D	N/D	N/D	N/D	N/D
2,5-Dione, 3-hexene	17559-81-8	N/D	N/D	N/D	N/D	N/D
2-Chlorotoluene	95-49-8	0.14	N/D	N/D	N/D	N/D
2-Hexanone	591-78-6	4.28	N/D	13	N/D	N/D
2-Methyl octane	3221-61-2	N/D	N/D	N/D	N/D	N/D
3-Ethyl benzaldehyde	34246-54-3	N/D	N/D	N/D	N/D	N/D
3-Hexen-2-one	763-93-9	N/D	N/D	N/D	N/D	N/D
3-Penten-2-one (ethylidene acetone)	625-33-2	N/D	N/D	N/D	N/D	N/D
3-Penten-2-one, 4-methyl	141-79-7	N/D	N/D	N/D	N/D	N/D
4,6-Dinitro-2-methylphenol	534-52-1	0.024	N/D	0.14	N/D	N/D
4-Chlorotoluene	106-43-4	3.4	N/D	N/D	N/D	N/D
4-Ethyl benzaldehyde	4748-78-1	N/D	N/D	N/D	N/D	N/D
9-Octadecenamide (oleamide)	301-02-0	N/D	N/D	N/D	N/D	N/D
Acenaphthylene	208-96-8	N/D	N/D	680	N/D	N/D
Acrylic Acid	79-10-7	3.8	N/D	N/D	N/D	N/D
Benzidine	92-87-5	0.089	N/D	N/D	N/D	N/D
Benzo(e)pyrene	192-97-2	N/D	N/D	N/D	N/D	N/D
Benzo(g,h,i)perylene	191-24-2	N/D	N/D	120	N/D	N/D
Benzoic acid, methyl ester (methyl benzoate)	93-58-3	2.3	N/D	N/D	N/D	N/D
BHC, delta (δ-hexachlorocyclohexane)	319-86-8	0.13	N/D	9.9	N/D	N/D
BHC, gamma (Lindane; γ-hexachlorocyclohexane)	58-89-9	0.00028	0.00032	0.005	8	2
Bis(2-chloroethoxy) methane	111-91-1	1.8	N/D	0.3	N/D	N/D
Bromobenzene	108-86-1	0.056	N/D	N/D	N/D	N/D
Bromochloromethane	74-97-5	N/D	N/D	N/D	N/D	N/D
Butylbenzene, n-	104-51-8	N/D	N/D	N/D	N/D	N/D
Butylbenzene, sec	135-98-8	N/D	N/D	N/D	N/D	N/D
Butylbenzene, tert	98-06-6	0.65	N/D	N/D	N/D	N/D
Carbazole	86-74-8	0.015	N/D	N/D	N/D	N/D
Chlordane, cis (α-chlordane)	5103-71-9	0.000071	0.0032	N/D	4.58	2.14
Chlordane, trans (β-chlordane)	5103-74-2	0.0005	0.0032	N/D	N/D	N/D
Dibenzofuran	132-64-9	0.02	N/D	N/D	N/D	N/D
Diphenylamine	122-39-4	0.038	N/D	1	N/D	N/D
Endosulfan II	33213-65-9	0.000056	N/D	0.12	N/D	N/D
Endosulfan sulfate	1031-07-8	0.000060	N/D	N/D	N/D	N/D
Endrin aldehyde	7421-93-4	0.000080	N/D	0.011	N/D	N/D
Endrin ketone	53494-70-5	N/D	N/D	N/D	N/D	N/D
Ethylene Glycol	107-21-1	1000	N/D	N/D	N/D	N/D
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	76-13-1	N/D	N/D	N/D	N/D	N/D
Iodomethane	74-88-4	N/D	N/D	1.2	N/D	N/D
Isopropyl toluene, p-	99-87-6	0.046	N/D	N/D	N/D	N/D
Methyl methacrylate	80-62-6	3.37	N/D	980	N/D	N/D
methyl tert-butyl ether	1634-04-4	100	N/D	N/D	N/D	N/D
Methylnaphthalene, 2-	91-57-6	0.014	N/D	3.2	N/D	N/D
N-nitrosodimethylamine	62-44-2	1.41	N/D	12	N/D	N/D
Perylene	198-55-0	N/D	N/D	N/D	N/D	N/D
Phosphine imide, P,P,P-triphenyl	2240-47-3	N/D	N/D	N/D	N/D	N/D
Propylbenzene, n-	103-65-1	0.016	N/D	N/D	N/D	N/D
Propylene oxide	75-56-9	N/D	N/D	N/D	N/D	N/D
Xylenes (mixed isomers)	1330-20-7	8.60E-02	N/D	10	N/D	N/D

BW = body weight.
N/D = no data were available from the reviewed databases and TRV sources.

(a) Listed compounds consist of those selected for consideration in the ecological risk assessment that are not addressed by USEPA in its 1999 Screening Level Ecological Risk Assessment Protocol.

Table 2
Mammal, Bird and Plant Toxicity Reference Values for Compounds Not Included in USEPA's Screening Level Ecological Risk Assessment Protocol

Compound	CAS NO.	Mammals & Birds								Plants	
		CalTox [a]		Sample, 1996 [b]		Schafer		HSDB		Efroymson [e]	EPA Reg V [f]
		Mammal	Bird	Mammal (mg/kg-d)	Bird (mg/kg-d)	Mammal [c]	Bird [d]	Mammal	Bird	(mg/kg)	(mg/kg)
Cobalt	7440-48-4	-	-	-	-	-	-			20	0.14
Manganese	7439-96-5	-	-	88	977	-	-			500	-
Vanadium	7440-62-2	-	-	0.21	11.4	-	-			2	1.59
1,1-Dichloropropene	563-58-6	-	-	-	-	-	-			-	-
1,2,4-Trimethylbenzene	95-63-6	-	-	-	-	-	-			-	-
1,2-Dichloroethene	540-59-0	-	-	-	-	-	-			-	-
1,3-Dichloropropane	142-28-9	-	-	-	-	-	-			-	-
trans-1,3-Dichloropropene	10061-02-6	-	-	-	-	-	-			-	-
1-Hexane	110-54-3	-	-	-	-	-	-			-	-
2,2'-oxybis (1-Chloropropane)	108-60-1	-	-	-	-	-	-			-	19.9
2,2-Dichloropropane	594-20-7	-	-	-	-	-	-			-	-
2,5-Dimethylfuran	625-86-5	-	-	-	-	-	-			-	-
2,5-Dimethylheptane	2216-30-0	-	-	-	-	-	-			-	-
2,5-Dione, 3-hexene	17559-81-8	-	-	-	-	-	-			-	-
2-Chlorotoluene	95-49-8	-	-	-	-	-	-			-	-
2-Hexanone	591-78-6	-	-	-	-	-	-			-	12.6
2-Methyl octane	3221-61-2	-	-	-	-	-	-			-	-
3-Ethyl benzaldehyde	34246-54-3	-	-	-	-	-	-			-	-
3-Hexen-2-one	763-93-9	-	-	-	-	-	-			-	-
3-Penten-2-one (ethylidene acetone)	625-33-2	-	-	-	-	-	-			-	-
3-Penten-2-one, 4-methyl	141-79-7	-	-	-	-	-	-			-	-
4,6-Dinitro-2-methylphenol	534-52-1	-	-	-	-	-	-			-	0.144
4-Chlorotoluene	106-43-4	-	-	-	-	-	-			-	-
4-Ethyl benzaldehyde	4748-78-1	-	-	-	-	-	-			-	-
9-Octadecenamide (oleamide)	301-02-0	-	-	-	-	-	-			-	-
Acenaphthylene	208-96-8	-	-	-	-	-	-			-	682
Acrylic Acid	79-10-7	-	-	-	-	-	-			-	-
Benzidine	92-87-5	-	-	-	-	-	-			-	-
Benzo(e)pyrene	192-97-2	-	-	-	-	-	-			-	-
Benzo(g,h,i)perylene	191-24-2	-	-	-	-	-	-			-	119
Benzoic acid, methyl ester (methyl benzoate)	93-58-3	-	-	-	-	-	-			-	-
delta-BHC	319-86-8	-	-	-	-	-	-			-	9.94
BHC, gamma (Lindane; γ-hexachlorocyclohexane)	58-89-9	-	-	8	2	-	-			-	0.005
Bis(2-chloroethoxy)methane	111-91-1	-	-	-	-	-	-			-	0.302
Bromobenzene	108-86-1	-	-	-	-	-	-			-	-
Bromochloromethane	74-97-5	-	-	-	-	-	-			-	-
n-Butylbenzene	104-51-8	-	-	-	-	-	-			-	-
sec-Butylbenzene	135-98-8	-	-	-	-	-	-			-	-
tert-Butylbenzene	98-06-6	-	-	-	-	-	-			-	-
Carbazole	86-74-8	-	-	-	-	-	-			-	-
alpha-Chlordane	5103-71-9	-	-	4.58	2.14	-	-			-	-
beta-Chlordane	5103-74-2	-	-	-	-	-	-			-	-
Dibenzofuran	132-64-9	-	-	-	-	-	-			-	-
Diphenylamine	122-39-4	-	-	-	-	-	-			-	1.01
Endosulfan II	33213-65-9	-	-	-	-	-	-			-	0.119
Endosulfan sulfate	1031-07-8	-	-	-	-	-	-			-	-
Endrin aldehyde	7421-93-4	-	-	-	-	-	-			-	0.0105
Endrin ketone	53494-70-5	-	-	-	-	-	-			-	-
Ethylene Glycol	107-21-1	-	-	-	-	-	-			-	-
Freon 133 (1,1,2-Trichloro-1,2,2-trifluoroethane)	76-13-1	-	-	-	-	-	-			-	-
Iodomethane	74-88-4	-	-	-	-	-	-			-	1.23
p-Isopropyltoluene	99-87-6	-	-	-	-	-	-			-	-
Methyl methacrylate	80-62-6	-	-	-	-	-	-			-	984
Methyl tert-Butyl Ether	1634-04-4	-	-	-	-	-	-			-	-
2-Methylnaphthalene	91-57-6	-	-	-	-	-	-			-	3.24
N-nitrosodimethylamine	62-44-2	-	-	-	-	-	-			-	11.7
Perylene	198-55-0	-	-	-	-	-	-			-	-
Phosphine imide, P,P,P-triphenyl	2240-47-3	-	-	-	-	-	-			-	-
n-Propylbenzene	103-65-1	-	-	-	-	-	-			-	-
Propylene Oxide	75-56-9	-	-	-	-	-	-			-	-
Xylene (mixed isomers)	1330-20-7	-	-	2.1	-	-	-			-	10

- = no benchmarks available

Notes:

[a] CalTox Database. California Environmental Protection Agency (CEPA). 2002. California Wildlife Exposure Factor and Toxicity Database (CalTox). Office of Environmental Health Hazard Assessment. http://www.oehha.org/cal_ecotox. Accessed May 23, 2007.

[b] Sample, B., Opresko, D., Suter, G. 1996. Toxicological Benchmarks for Wildlife. 1996 Revision. ES/ER/TM-86/R3.

[c] Schafer, E.W., and Bowles, W.A. 1985. Acute oral toxicity and repellency of 933 chemicals to house mice and deer mice. Arch. Environ. Contam. Toxicol. 14(1):111-129.

[d] Schafer, E.W., Bowles, W.A., and Hurlbut, J. 1983. The acute oral toxicity, repellency, and hazard potential of 998 chemicals to one or more species of wild and domestic birds. Arch. Envriron. Contam. Toxicol. 12:355-382.

[e] Efroymson, R.A, M. E. Will, G. W. Suter II, and A. C. Wooten. 1997. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision. Prepared for the U.S. Department of Energy. ES/ER/TM-85/R3. November 1997.

[f] USEPA. 2003. USEPA, Region V, RCRA Ecological Screening Levels. August 22, 2003.

Table 3
Detailed Summary of Mammal Benchmarks from Sample *et al* . 1996

Compound	CAS NO.	Test Species	NOAEL (mg/kg-d)	Endpoint	Duration
Cobalt	7440-48-4	-	-	-	-
Manganese	7439-96-5	Rat	88	Reproduction	Chronic
Vanadium	7440-62-2	Rat	0.21	Reproduction	Chronic
1,1-Dichloropropene	563-58-6	-	-	-	-
1,2,4-Trimethylbenzene	95-63-6	-	-	-	-
1,2-Dichloroethene	540-59-0	-	-	-	-
1,3-Dichloropropane	142-28-9	-	-	-	-
trans-1,3-Dichloropropene	10061-02-6	-	-	-	-
1-Hexane	110-54-3	-	-	-	-
2,2'-oxybis (1-Chloropropane)	108-60-1	-	-	-	-
2,2-Dichloropropane	594-20-7	-	-	-	-
2,5-Dimethylfuran	625-86-5	-	-	-	-
2,5-Dimethylheptane	2216-30-0	-	-	-	-
2,5-Dione, 3-hexene	17559-81-8	-	-	-	-
2-Chlorotoluene	95-49-8	-	-	-	-
2-Hexanone	591-78-6	-	-	-	-
2-Methyl octane	3221-61-2	-	-	-	-
3-Ethyl benzaldehyde	34246-54-3	-	-	-	-
3-Hexen-2-one	763-93-9	-	-	-	-
3-Penten-2-one (ethylidene acetone)	625-33-2	-	-	-	-
3-Penten-2-one, 4-methyl	141-79-7	-	-	-	-
4,6-Dinitro-2-methylphenol	534-52-1	-	-	-	-
4-Chlorotoluene	106-43-4	-	-	-	-
4-Ethyl benzaldehyde	4748-78-1	-	-	-	-
9-Octadecenamide (oleamide)	301-02-0	-	-	-	-
Acenaphthylene	208-96-8	-	-	-	-
Acrylic Acid	79-10-7	-	-	-	-
Benzidine	92-87-5	-	-	-	-
Benzo(e)pyrene	192-97-2	-	-	-	-
Benzo(g,h,i)perylene	191-24-2	-	-	-	-
Benzoic acid, methyl ester (methyl benzoate)	93-58-3	-	-	-	-
delta-BHC	319-86-8	-	-	-	-
BHC, gamma (Lindane; γ-hexachlorocyclohexane)	58-89-9	Rat	8	Reproduction	Chronic
Bis(2-chloroethoxy)methane	111-91-1	-	-	-	-
Bromobenzene	108-86-1	-	-	-	-
Bromochloromethane	74-97-5	-	-	-	-
n-Butylbenzene	104-51-8	-	-	-	-
sec-Butylbenzene	135-98-8	-	-	-	-
tert-Butylbenzene	98-06-6	-	-	-	-
Carbazole	86-74-8	-	-	-	-
alpha-Chlordane	5103-71-9	Mouse	4.58	Reproduction	Chronic
beta-Chlordane	5103-74-2	-	-	-	-
Dibenzofuran	132-64-9	-	-	-	-
Diphenylamine	122-39-4	-	-	-	-
Endosulfan II	33213-65-9	-	-	-	-
Endosulfan sulfate	1031-07-8	-	-	-	-
Endrin aldehyde	7421-93-4	-	-	-	-
Endrin ketone	53494-70-5	-	-	-	-
Ethylene Glycol	107-21-1	-	-	-	-
Freon 133 (1,1,2-Trichloro-1,2,2-trifluoroethane)	76-13-1	-	-	-	-
Iodomethane	74-88-4	-	-	-	-
p-Isopropyltoluene	99-87-6	-	-	-	-
Methyl methacrylate	80-62-6	-	-	-	-
Methyl tert-Butyl Ether	1634-04-4	-	-	-	-
2-Methylnaphthalene	91-57-6	-	-	-	-
N-nitrosodimethylamine	62-44-2	-	-	-	-
Perylene	198-55-0	-	-	-	-
Phosphine imide, P,P,P-triphenyl	2240-47-3	-	-	-	-
n-Propylbenzene	103-65-1	-	-	-	-
Propylene Oxide	75-56-9	-	-	-	-
Xylene (mixed isomers)	1330-20-7	Mouse	2.1	Reproduction	Chronic

- = no data available.

Table 4
Detailed Summary of Avian Benchmarks from Sample *et al* . 1996

Compound	CAS NO.	Test Species	NOAEL (mg/kg-d)	Endpoint	Duration
Cobalt	7440-48-4	-	-	-	-
Manganese	7439-96-5	Japanese quail	977	Growth	Chronic
Vanadium	7440-62-2	Mallard	11.4	Mortality	Chronic
1,1-Dichloropropene	563-58-6	-	-	-	-
1,2,4-Trimethylbenzene	95-63-6	-	-	-	-
1,2-Dichloroethene	540-59-0	-	-	-	-
1,3-Dichloropropane	142-28-9	-	-	-	-
trans-1,3-Dichloropropene	10061-02-6	-	-	-	-
1-Hexane	110-54-3	-	-	-	-
2,2'-oxybis (1-Chloropropane)	108-60-1	-	-	-	-
2,2-Dichloropropane	594-20-7	-	-	-	-
2,5-Dimethylfuran	625-86-5	-	-	-	-
2,5-Dimethylheptane	2216-30-0	-	-	-	-
2,5-Dione, 3-hexene	17559-81-8	-	-	-	-
2-Chlorotoluene	95-49-8	-	-	-	-
2-Hexanone	591-78-6	-	-	-	-
2-Methyl octane	3221-61-2	-	-	-	-
3-Ethyl benzaldehyde	34246-54-3	-	-	-	-
3-Hexen-2-one	763-93-9	-	-	-	-
3-Penten-2-one (ethylidene acetone)	625-33-2	-	-	-	-
3-Penten-2-one, 4-methyl	141-79-7	-	-	-	-
4,6-Dinitro-2-methylphenol	534-52-1	-	-	-	-
4-Chlorotoluene	106-43-4	-	-	-	-
4-Ethyl benzaldehyde	4748-78-1	-	-	-	-
9-Octadecenamide (oleamide)	301-02-0	-	-	-	-
Acenaphthylene	208-96-8	-	-	-	-
Acrylic Acid	79-10-7	-	-	-	-
Benzidine	92-87-5	-	-	-	-
Benzo(e)pyrene	192-97-2	-	-	-	-
Benzo(g,h,i)perylene	191-24-2	-	-	-	-
Benzoic acid, methyl ester (methyl benzoate)	93-58-3	-	-	-	-
delta-BHC	319-86-8	-	-	-	-
BHC, gamma (Lindane; γ-hexachlorocyclohexane)	58-89-9	Mallard	2	Reproduction	Chronic
Bis(2-chloroethoxy)methane	111-91-1	-	-	-	-
Bromobenzene	108-86-1	-	-	-	-
Bromochloromethane	74-97-5	-	-	-	-
n-Butylbenzene	104-51-8	-	-	-	-
sec-Butylbenzene	135-98-8	-	-	-	-
tert-Butylbenzene	98-06-6	-	-	-	-
Carbazole	86-74-8	-	-	-	-
alpha-Chlordane	5103-71-9	Redwinged blackbird	2.14	Mortality	Chronic
beta-Chlordane	5103-74-2	-	-	-	-
Dibenzofuran	132-64-9	-	-	-	-
Diphenylamine	122-39-4	-	-	-	-
Endosulfan II	33213-65-9	-	-	-	-
Endosulfan sulfate	1031-07-8	-	-	-	-
Endrin aldehyde	7421-93-4	-	-	-	-
Endrin ketone	53494-70-5	-	-	-	-
Ethylene Glycol	107-21-1	-	-	-	-
Freon 133 (1,1,2-Trichloro-1,2,2-trifluoroethane)	76-13-1	-	-	-	-
Iodomethane	74-88-4	-	-	-	-
p-Isopropyltoluene	99-87-6	-	-	-	-
Methyl methacrylate	80-62-6	-	-	-	-
Methyl tert-Butyl Ether	1634-04-4	-	-	-	-
2-Methylnaphthalene	91-57-6	-	-	-	-
N-nitrosodimethylamine	62-44-2	-	-	-	-
Perylene	198-55-0	-	-	-	-
Phosphine imide, P,P,P-triphenyl	2240-47-3	-	-	-	-
n-Propylbenzene	103-65-1	-	-	-	-
Propylene Oxide	75-56-9	-	-	-	-
Xylene (mixed isomers)	1330-20-7	-	-	-	-

- = no data available.

Table 5
Summary of Surface Water and Sediment Toxicity Reference Values for Aquatic Life
for Compounds Not Included in USEPA's Screening Level Ecological Risk Assessment Protocol

Compound	CAS NO.	Surface Water (ug/L)						Sediment (mg/kg)		
		ADEQ WQS [a]	NRWQC [b]	ETs [c]	Mayer & Ellersieck [d]	Ecotox Database [e]	Final Benchmark [f]	NOAA [h]	MacDonald TECs [g]	Final Benchmark [f]
Cobalt	7440-48-4	-	-	3	-	-	3	-	-	-
Manganese	7439-96-5	-	-	80	-	-	80	-	-	-
Vanadium	7440-62-2	-	-	19	-	-	19	-	-	-
1,1-Dichloropropene	563-58-6	-	-	-	-	-	-	-	-	-
1,2,4-Trimethylbenzene	95-63-6	-	-	-	-	77.2	77.2	-	-	-
1,2-Dichloroethene	540-59-0	-	-	-	-	1,400	1,400	-	-	-
1,3-Dichloropropane	142-28-9	-	-	-	-	1,310	1,310	-	-	-
trans-1,3-Dichloropropene	10061-02-6	-	-	-	-	-	-	-	-	-
1-Hexane	110-54-3	-	-	-	-	25	25	-	-	-
2,2'-oxybis (1-Chloropropane)	108-60-1	-	-	-	-	-	-	-	-	-
2,2-Dichloropropane	594-20-7	-	-	-	-	390	390	-	-	-
2,5-Dimethylfuran	625-86-5	-	-	-	-	711	711	-	-	-
2,5-Dimethylheptane	2216-30-0	-	-	-	-	-	-	-	-	-
2,5-Dione, 3-hexene	17559-81-8	-	-	-	-	-	-	-	-	-
2-Chlorotoluene	95-49-8	-	-	-	-	140	140	-	-	-
2-Hexanone	591-78-6	-	-	-	-	4,280	4,280	-	-	-
2-Methyl octane	3221-61-2	-	-	-	-	-	-	-	-	-
3-Ethyl benzaldehyde	34246-54-3	-	-	-	-	-	-	-	-	-
3-Hexen-2-one	763-93-9	-	-	-	-	-	-	-	-	-
3-Penten-2-one (ethylidene acetone)	625-33-2	-	-	-	-	-	-	-	-	-
3-Penten-2-one, 4-methyl	141-79-7	-	-	-	-	-	-	-	-	-
4,6-Dinitro-2-methylphenol	534-52-1	24	-	-	-	-	24	-	-	-
4-Chlorotoluene	106-43-4	-	-	-	-	3,400	3,400	-	-	-
4-Ethyl benzaldehyde	4748-78-1	-	-	-	-	-	-	-	-	-
9-Octadecenamide (oleamide)	301-02-0	-	-	-	-	-	-	-	-	-
Acenaphthylene	208-96-8	-	-	-	-	-	-	-	-	-
Acrylic Acid	79-10-7	-	-	-	-	3,800	3,800	-	-	-
Benzidine	92-87-5	89	-	-	-	-	89	-	-	-
Benzo(e)pyrene	192-97-2	-	-	-	-	-	-	-	-	-
Benzo(g,h,i)perylene	191-24-2	-	-	-	-	-	-	-	-	-
Benzoic acid, methyl ester (methyl benzoate)	93-58-3	-	-	-	-	2,331	2,331	-	-	-
delta-BHC	319-86-8	130	-	-	-	-	130	-	-	-
BHC, gamma (Lindane; γ-hexachlorocyclohexane)	58-89-9	0.28	-	0.08	-	-	0.28	0.00032	0.00237	0.00032
Bis(2-chloroethoxy)methane	111-91-1	-	-	-	-	1,840	1,840	-	-	-
Bromobenzene	108-86-1	-	-	-	-	56	56	-	-	-
Bromochloromethane	74-97-5	-	-	-	-	-	-	-	-	-
n-Butylbenzene	104-51-8	-	-	-	-	-	-	-	-	-
sec-Butylbenzene	135-98-8	-	-	-	-	-	-	-	-	-
tert-Butylbenzene	98-06-6	-	-	-	-	650	650	-	-	-
Carbazole	86-74-8	-	-	-	-	14.9	14.9	-	-	-
alpha-Chlordane	5103-71-9	-	-	-	0.0709	-	0.0709	-	0.00324	0.00324
beta-Chlordane	5103-74-2	-	-	-	0.505	-	0.505	-	0.00324	0.00324
Dibenzofuran	132-64-9	-	-	20	-	-	20	-	-	-
Diphenylamine	122-39-4	-	-	-	-	37.9	37.9	-	-	-
Endosulfan II	33213-65-9	-	0.056	0.051	-	-	0.056	-	-	-
Endosulfan sulfate	1031-07-8	0.06	-	-	-	-	0.06	-	-	-
Endrin aldehyde	7421-93-4	0.08	-	-	-	-	0.08	-	-	-

Table 5
Summary of Surface Water and Sediment Toxicity Reference Values for Aquatic Life
for Compounds Not Included in USEPA's Screening Level Ecological Risk Assessment Protocol

Compound	CAS NO.	Surface Water (ug/L)						Sediment (mg/kg)		
		ADEQ WQS [a]	NRWQC [b]	ETs [c]	Mayer & Ellersieck [d]	Ecotox Database [e]	Final Benchmark [f]	NOAA [h]	MacDonald TECs [g]	Final Benchmark [f]
Endrin ketone	53494-70-5	-	-	-	-	-	-	-	-	-
Ethylene Glycol	107-21-1	-	-	-	1,000,000	-	1,000,000	-	-	-
Freon 133 (1,1,2-Trichloro-1,2,2-trifluoro	76-13-1	-	-	-	-	-	-	-	-	-
Iodomethane	74-88-4	-	-	-	-	-	-	-	-	-
p-Isopropyltoluene	99-87-6	-	-	-	-	46	46	-	-	-
Methyl methacrylate	80-62-6	-	-	-	-	3,370	3370	-	-	-
Methyl tert-Butyl Ether	1634-04-4	-	-	-	-	100,000	100000	-	-	-
2-Methylnaphthalene	91-57-6	-	-	-	-	14.56	14.56	-	-	-
N-nitrosodimethylamine	62-44-2	-	-	-	-	1,410	1,410	-	-	-
Perylene	198-55-0	-	-	-	-	-	-	-	-	-
Phosphine imide, P,P,P-triphenyl	2240-47-3	-	-	-	-	-	-	-	-	-
n-Propylbenzene	103-65-1	-	-	-	-	15.5	15.5	-	-	-
Propylene Oxide	75-56-9	-	-	-	-	-	-	-	-	-
Xylene (mixed isomers)	1330-20-7	-	-	-	86	-	86	-	-	-

- = no benchmarks available.

[a] Arizona Department of Environmental Quality. 2003. Title 18, Chapter 11. ADEQ Water Quality Standards. http://www.azsos.gov/public_services/Title_18/18-11.htm

[b] U.S. Environmental Protection Agency (EPA). 2005. National Recommended Water Quality Criteria: 2005. www.epa.gov/waterscience/criteria/wqcriteria.html.

[c] U.S. Environmental Protection Agency (USEPA). 1996. Eco Update. Ecotox Thresholds. Office of Solid Waste and Emergency Response. EPA 540/F-95/038.

[d] Mayer, F.L. and Ellersieck, M.R. 1986. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. U.S. Fish and Wildlife Service, Washington, DC. Resource Publication 160.

[e] U.S. Environmental Protection Agency (USEPA). 2007. EcoTox Database. http://www.epa.gov/ecotox. Accessed May 22, 2007.

[f] Final benchmark selected according to project data source hierarchy.

[g] MacDonald, D.D., C.G. Ingersoll, and T.A. Berger. 2000. Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystem. Archives of Environmental Contamination and Toxicology 39:20-31.

[h] National Oceanic and Atomospheric Administration (NOAA). 2006. Screening Quick Reference Table (SQuiRTs). Hazmat Report 99-1.

Table 6
Summary of Aquatic Toxicity Values from Mayer & Ellersieck (1986)

Compound	CAS NO	Test Species	Effect	Duration	Concentration (ug/L)	Adjustment [a]	Final Benchmark	Page
Cobalt	7440-48-4	-	-	-	-	-	-	-
Manganese	7439-96-5	-	-	-	-	-	-	-
Vanadium	7440-62-2	-	-	-	-	-	-	-
1,1-Dichloropropene	563-58-6	-	-	-	-	-	-	-
1,2,4-Trimethylbenzene	95-63-6	-	-	-	-	-	-	-
1,2-Dichloroethene	540-59-0	-	-	-	-	-	-	-
1,3-Dichloropropane	142-28-9	-	-	-	-	-	-	-
trans-1,3-Dichloropropene	10061-02-6	-	-	-	-	-	-	-
1-Hexane	110-54-3	-	-	-	-	-	-	-
2,2'-oxybis (1-Chloropropane)	108-60-1	-	-	-	-	-	-	-
2,2-Dichloropropane	594-20-7	-	-	-	-	-	-	-
2,5-Dimethylfuran	625-86-5	-	-	-	-	-	-	-
2,5-Dimethylheptane	2216-30-0	-	-	-	-	-	-	-
2,5-Dione, 3-hexene	17559-81-8	-	-	-	-	-	-	-
2-Chlorotoluene	95-49-8	-	-	-	-	-	-	-
2-Hexanone	591-78-6	-	-	-	-	-	-	-
2-Methyl octane	3221-61-2	-	-	-	-	-	-	-
3-Ethyl benzaldehyde	34246-54-3	-	-	-	-	-	-	-
3-Hexen-2-one	763-93-9	-	-	-	-	-	-	-
3-Penten-2-one (ethylidene acetone)	625-33-2	-	-	-	-	-	-	-
3-Penten-2-one, 4-methyl	141-79-7	-	-	-	-	-	-	-
4,6-Dinitro-2-methylphenol	534-52-1	-	-	-	-	-	-	-
4-Chlorotoluene	106-43-4	-	-	-	-	-	-	-
4-Ethyl benzaldehyde	4748-78-1	-	-	-	-	-	-	-
9-Octadecenamide (oleamide)	301-02-0	-	-	-	-	-	-	-
Acenaphthylene	208-96-8	-	-	-	-	-	-	-
Acrylic Acid	79-10-7	-	-	-	-	-	-	-
Benzidine	92-87-5	-	-	-	-	-	-	-
Benzo(e)pyrene	192-97-2	-	-	-	-	-	-	-
Benzo(g,h,i)perylene	191-24-2	-	-	-	-	-	-	-
Benzoic acid, methyl ester (methyl benzoate)	93-58-3	-	-	-	-	-	-	-
delta-BHC	319-86-8	-	-	-	-	-	-	-
BHC, gamma (Lindane; γ-hexachlorocyclohexane)	58-89-9	-	-	-	-	-	-	-
Bis(2-chloroethoxy)methane	111-91-1	-	-	-	-	-	-	-
Bromobenzene	108-86-1	-	-	-	-	-	-	-
Bromochloromethane	74-97-5	-	-	-	-	-	-	-

Table 6
Summary of Aquatic Toxicity Values from Mayer & Ellersieck (1986)

Compound	CAS NO	Test Species	Effect	Duration	Concentration (ug/L)	Adjustment [a]	Final Benchmark	Page
n-Butylbenzene	104-51-8	-	-	-	-	-	-	-
sec-Butylbenzene	135-98-8	-	-	-	-	-	-	-
tert-Butylbenzene	98-06-6	-	-	-	-	-	-	-
Carbazole	86-74-8	-	-	-	-	-	-	-
alpha-Chlordane	5103-71-9	Bluegill	LC50	96-hr	7.09	100	0.0709	80
beta-Chlordane	5103-74-2	Bluegill	LC50	96 hr	50.5	100	0.505	82
Dibenzofuran	132-64-9	-	-	-	-	-	-	-
Diphenylamine	122-39-4	-	-	-	-	-	-	-
Endosulfan II	33213-65-9	-	-	-	-	-	-	-
Endosulfan sulfate	1031-07-8	-	-	-	-	-	-	-
Endrin aldehyde	7421-93-4	-	-	-	-	-	-	-
Endrin ketone	53494-70-5	-	-	-	-	-	-	-
Ethylene Glycol	107-21-1	Bluegill	LC50	96	100,000,000	100	1,000,000	218
Freon 133 (1,1,2-Trichloro-1,2,2-trifluoroethane)	76-13-1	-	-	-	-	-	-	-
Iodomethane	74-88-4	-	-	-	-	-	-	-
p-Isopropyltoluene	99-87-6	-	-	-	-	-	-	-
Methyl methacrylate	80-62-6	-	-	-	-	-	-	-
Methyl tert-Butyl Ether	1634-04-4	-	-	-	-	-	-	-
2-Methylnaphthalene	91-57-6	-	-	-	-	-	-	-
N-nitrosodimethylamine	62-44-2	-	-	-	-	-	-	-
Perylene	198-55-0	-	-	-	-	-	-	-
Phosphine imide, P,P,P-triphenyl	2240-47-3	-	-	-	-	-	-	-
n-Propylbenzene	103-65-1	-	-	-	-	-	-	-
Propylene Oxide	75-56-9	-	-	-	-	-	-	-
Xylene (mixed isomers)	1330-20-7	Bluegill	LC50	96	8600	100	86	502

- = no benchmarks available.
[a] An adjustment factor of 100 was applied in converting acute concentrations to chronic concentrations.

Source:
Mayer, F.L. and Ellersieck, M.R. 1986. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. U.S. Fish and Wildlife Service, Washington, DC. Resource Publication 160.

Table 7
Summary of Aquatic Toxicity Values from the Ecotox Database

Constituent	CAS NO.	Species name	Common Name	Group	Endpoint	Effect	Exposure Duration (days)	Concentration (ug/L)	Adjustment [a]	Final Benchmark (ug/L)
Cobalt	7440-48-4	-	-	-	-	-	-	-	-	-
Manganese	7439-96-5	-	-	-	-	-	-	-	-	-
Vanadium	7440-62-2	-	-	-	-	-	-	-	-	-
1,1-Dichloropropene	563-58-6	-	-	-	-	-	-	-	-	-
1,2,4-Trimethylbenzene	95-63-6	*Pimephales promelas*	Fathead minnow	Fish	LC50	Mortality	4	7,720	100	77.2
1,2-Dichloroethene	540-59-0	*Lepomis macrochirus*	Bluegill	Fish	LC50	Mortality	4	140,000	100	1,400
1,3-Dichloropropane	142-28-9	*Pimephales promelas*	Fathead minnow	Fish	LC50	Mortality	4	131,000	100	1,310
trans-1,3-Dichloropropene	10061-02-6	-	-	-	-	-	-	-	-	-
1-Hexane	110-54-3	*Pimephales promelas*	Fathead minnow	Fish	LC50	Mortality	4	2,500	100	25
2,2'-oxybis (1-Chloropropane)	108-60-1	-	-	-	-	-	-	-	-	-
2,2-Dichloropropane	594-20-7	*Scenedesmus subpicatus*	Green algae	Algae	EC50	Mortality	4	39,000	100	390
2,5-Dimethylfuran	625-86-5	*Pimephales promelas*	Fathead minnow	Fish	LC50	Mortality	4	71,100	100	711
2,5-Dimethylheptane	2216-30-0	-	-	-	-	-	-	-	-	-
2,5-Dione, 3-hexene	17559-81-8	-	-	-	-	-	-	-	-	-
2-Chlorotoluene	95-49-8	*Daphnia magna*	Water flea	Crustaceans	NOEC	Reproduction	21	140	1	140
2-Hexanone	591-78-6	*Pimephales promelas*	Fathead minnow	Fish	LC50	Mortality	4	428,000	100	4,280
2-Methyl octane	3221-61-2	-	-	-	-	-	-	-	-	-
3-Ethyl benzaldehyde	34246-54-3	-	-	-	-	-	-	-	-	-
3-Hexen-2-one	763-93-9	-	-	-	-	-	-	-	-	-
3-Penten-2-one (ethylidene acetone)	625-33-2	-	-	-	-	-	-	-	-	-
3-Penten-2-one, 4-methyl	141-79-7	-	-	-	-	-	-	-	-	-
4,6-Dinitro-2-methylphenol	534-52-1	-	-	-	-	-	-	-	-	-
4-Chlorotoluene	106-43-4	*Danio rerio*	Zebra danio	Fish	NOEC	Reproduction	28	3,400	1	3,400
4-Ethyl benzaldehyde	4748-78-1	-	-	-	-	-	-	-	-	-
9-Octadecenamide (oleamide)	301-02-0	-	-	-	-	-	-	-	-	-
Acenaphthylene	208-96-8	-	-	-	-	-	-	-	-	-
Acrylic Acid	79-10-7	*Daphnia magna*	Water flea	Crustaceans	NOEC	Reproduction	21	3,800	1	3,800
Benzidine	92-87-5	-	-	-	-	-	-	-	-	-
Benzo(e)pyrene	192-97-2	-	-	-	-	-	-	-	-	-
Benzo(g,h,i)perylene	191-24-2	-	-	-	-	-	-	-	-	-
Benzoic acid, methyl ester (methyl benzoate)	93-58-3	*Ptychocheilus oregonensis*	Northern squawfish	Fish	IC50	Population	2	233,130	100	2331.3
delta-BHC	319-86-8	-	-	-	-	-	-	-	-	-
BHC, gamma (Lindane; γ-hexachlorocyclohexane)	58-89-9	-	-	-	-	-	-	-	-	-
Bis(2-chloroethoxy)methane	111-91-1	*Pimephales promelas*	Fathead minnow	Fish	LC50	Mortality	4	184,000	100	1,840
Bromobenzene	108-86-1	*Pimephales promelas*	Fathead minnow	Fish	LC50	Mortality	4	5,600	100	56
Bromochloromethane	74-97-5	-	-	-	-	-	-	-	-	-
n-Butylbenzene	104-51-8	-	-	-	-	-	-	-	-	-
sec-Butylbenzene	135-98-8	-	-	-	-	-	-	-	-	-
tert-Butylbenzene	98-06-6	*Leuciscus idus melanotus*	Carp	Fish	LC50	Mortality	2	65,000	100	650
Carbazole	86-74-8	*Pimephales promelas*	Fathead minnow	Fish	LC50	Mortality	4	1,490	100	14.9
alpha-Chlordane	5103-71-9	-	-	-	-	-	-	-	-	-
beta-Chlordane	5103-74-2	-	-	-	-	-	-	-	-	-
Dibenzofuran	132-64-9	-	-	-	-	-	-	-	-	-
Diphenylamine	122-39-4	*Pimephales promelas*	Fathead minnow	Fish	LC50	Mortality	4	3,790	100	37.9

Table 7
Summary of Aquatic Toxicity Values from the Ecotox Database

Constituent	CAS NO.	Species name	Common Name	Group	Endpoint	Effect	Exposure Duration (days)	Concentration (ug/L)	Adjustment [a]	Final Benchmark (ug/L)
Endosulfan II	33213-65-9	-	-	-	-	-	-	-	-	-
Endosulfan sulfate	1031-07-8	-	-	-	-	-	-	-	-	-
Endrin aldehyde	7421-93-4	-	-	-	-	-	-	-	-	-
Endrin ketone	53494-70-5	-	-	-	-	-	-	-	-	-
Ethylene Glycol	107-21-1	-	-	-	-	-	-	-	-	-
Freon 133 (1,1,2-Trichloro-1,2,2-trifluoroethane)	76-13-1	-	-	-	-	-	-	-	-	-
Iodomethane	74-88-4	-	-	-	-	-	-	-	-	-
p-Isopropyltoluene	99-87-6	*Daphnia magna*	Water flea	Crustaceans	LC50	Mortality	2	4,600	100	46
Methyl methacrylate	80-62-6	*[b]*	[b]	[b]	[b]	[b]	4	337,000	100	3,370
Methyl tert-Butyl Ether	1634-04-4	*Rana temporaria*	Frog	Amphibians	NOEC	Development	45	100,000	1	100,000
2-Methylnaphthalene	91-57-6	*Onocorynchus mykiss*	Rainbow trout	Fish	LC50	Mortality	4	1,456	100	14.56
N-nitrosodimethylamine	62-44-2	*Gambusia affinis*	Western mosquitofish	Fish	LC50	Mortality	4	141,000	100	1,410
Perylene	198-55-0	-	-	-	-	-	-	-	-	-
Phosphine imide, P,P,P-triphenyl	2240-47-3	-	-	-	-	-	-	-	-	-
n-Propylbenzene	103-65-1	*Onocorynchus mykiss*	Rainbow trout	Fish	LC50	Mortality	4	1,550	100	15.5
Propylene Oxide	75-56-9	-	-	-	-	-	-	-	-	-
Xylene (mixed isomers)	1330-20-7	-	-	-	-	-	-	-	-	-

- = no benchmarks available.
[a] Acute (i.e. LC50, IC50) values were divided by 100 to estimate chronic values.

[b] Effects concentration for CAS# 80-62-6 was derived by calculating the average (mean) effects concentrations of the numerous studies presented in the database with warm water fish, 4-day LC50 tests with mortality endpoints.

Source: U.S. Environmental Protection Agency (USEPA). 2007. EcoTox Database. http://www.epa.gov/ecotox. Accessed May 22, 2007.

APPENDIX M
SECTION 2

TECHNICAL APPROACH FOR CALCULATING DOSES TO WILDLIFE SPECIES

This appendix presents the technical approach used to model exposures to receptor species via food chain pathways for the Siemens Water Technologies Corp. Carbon Reactivation Facility ("Facility") ecological risk assessment. The food chain models follow the approach outlined in USEPA's 1999 "*Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combus*tion *Facilities*" ("Protocol"). This appendix first describes the wildlife receptor species which were evaluated using food chain models. It then presents the food chain modeling equations. Finally, this appendix discusses specific input parameters and summarizes important input assumptions incorporated in the food chain models.

1.0 SELECTION OF WILDLIFE SPECIES

Receptor species which were selected for the food chain modeling are representative of various taxonomic groups, trophic levels, and feeding strategies which may occur within the variety of habitats in the Facility vicinity. The main risk assessment report, and the Working Draft Risk Assessment Workplan prepared for this project, provide more information on the approach used to select wildlife species for detailed evaluation. The wildlife species that were selected for evaluation using food chain models, and the habitat areas for each, consisted of the following:

- Badger – creosote bush scrub area
- Gambel's quail – creosote bush scrub area, agricultural area, riparian corridor area
- Great horned owl – creosote bush scrub area
- Burrowing owl – agricultural area
- Southwestern willow flycatcher – riparian corridor area
- Double crested cormorant – Colorado River area, Main Drain area
- Yuma clapper rail – riparian backwater area
- Mule deer – Main Drain area

2.0 DAILY DOSE CALCULATIONS

Exposures to the selected receptors were assessed by quantifying the daily dose of each evaluated chemical of potential concern (COPC) ingested through consumption of potentially impacted

food items (plants, terrestrial invertebrates, benthic invertebrates, fish, and animal prey) and environmental media (soil, sediment, and surface water). The following general equation was used to calculate the COPC daily dose for each receptor species (see Equation 5-1 in USEPA 1999):

$$DD = DD_{Tplant} + DD_{invert} + DD_{fish} + DD_{animal} + DD_{soil} + DD_{sed} + DD_{water} \qquad \text{(Equation 1)}$$

where

DD = total daily dose of COPC ingested per day (mg COPC/kg body weight-day)
DD_{Tplant} = amount of COPC ingested from terrestrial plants (mg COPC/kg body weight-day)
DD_{invert} = amount of COPC ingested from terrestrial or benthic invertebrate prey (mg COPC/kg body weight-day)
DD_{fish} = amount of COPC ingested from fish prey (mg COPC/kg body weight-day)
DD_{animal} = amount of COPC ingested from animal prey (mg COPC/kg body weight-day)
DD_{soil} = amount of COPC ingested from soil (mg COPC/kg body weight-day)
DD_{sed} = amount of COPC ingested from sediment (mg COPC/kg body weight-day)
DD_{water} = amount of COPC ingested from surface water (mg COPC/kg body weight-day)

Each of the terms in this equation are discussed in detail below.

2.1 Daily Doses from Incidental Ingestion of Environmental Media

This section presents equations for calculating daily doses from incidental ingestion of environmental media, specifically soil, sediment, and surface water.

Dose From Soil. Receptors may be exposed to COPCs through the incidental ingestion of soil while foraging. Doses of COPCs from soil were calculated using the following general equation (see Equation 5-1 in USEPA 1999):

$$DD_{soil} = IR_{soil} * C_{soil} * P_{soil} \qquad \text{(Equation 2)}$$

where

DD_{soil} = amount of COPC ingested from soil (mg COPC/kg body weight-day)
IR_{soil} = ingestion rate of soil (kg/kg body weight-day)
C_{soil} = concentration of COPC in soil (mg COPC/kg)
P_{soil} = proportion of ingested soil which is potentially contaminated (unitless)

Dose From Sediment. Receptors may be exposed to COPCs through the incidental ingestion of sediment while foraging. Doses of COPCs from sediment were calculated using the following general equation (see Equation 5-1 in USEPA 1999):

$$DD_{sed} = IR_{sed} * C_{sed} * P_{sed} \qquad \text{(Equation 3)}$$

where

DD_{sed} = amount of COPC ingested from sediment (mg COPC/kg body weight-day)
IR_{sed} = ingestion rate of sediment (kg/kg body weight-day)
C_{sed} = concentration of COPC in sediment (mg COPC/kg)
P_{sed} = proportion of ingested sediment which is potentially contaminated (unitless)

Dose from Surface Water. Receptors may also be exposed to COPCs through the ingestion of surface water. COPC doses from surface water were calculated using the following general equation:

$$DD_{water} = IR_{water} * C_{water} * P_{water} \qquad \text{(Equation 4)}$$

where

DD_{water} = amount of COPC ingested from water (mg COPC/kg body weight-day)
IR_{water} = surface water ingestion rate (L/kg body weight-day)
C_{water} = concentration (total) of COPC in surface water (mg COPC/L)
P_{water} = proportion of ingested surface water which is potentially contaminated (unitless)

2.2 Daily Doses from Consumption of Food

This section presents equations for estimating daily doses from ingestion of food items, including terrestrial plants, terrestrial and aquatic invertebrates, fish, and animal prey.

Dose From Terrestrial Plants. Receptors may be exposed to COPCs through ingestion of terrestrial plant material. COPC doses from terrestrial plants were calculated using the following general equation (see Equation 5-1 in USEPA 1999):

$$DD_{Tplant} = FIR * C_{Tplant} * P_{Tplant} * F_{Tplant} \qquad \text{(Equation 5)}$$

where

DD_{Tplant} = wet weight amount of COPC ingested from terrestrial plants (mg COPC/kg body weight-day)
FIR = food ingestion rate (kg wet weight/kg body weight-day)

C_{Tplant} = wet weight COPC concentration in terrestrial plant tissue (mg/kg WW)
P_{Tplant} = proportion of ingested plant material which is contaminated (unitless)
F_{Tplant} = fraction of diet from terrestrial plants

The concentrations of COPCs in plant tissue were modeled using the following general equation (see equation 5-6 in USEPA 1999):

$$C_{Tplant} = (P_d + P_v + P_r) * CF_{WW\text{-}Tplant} \qquad \text{(Equation 6)}$$

where

C_{Tplant} = wet weight COPC concentration in terrestrial plant tissue (mg COPC/kg)
P_d = COPC concentration in terrestrial plant tissue due to direct deposition (mg COPC/kg)
P_v = COPC concentration in terrestrial plant tissue due to air-to-plant transfer (mg COPC/kg)
P_r = COPC concentration in terrestrial plant tissue due to root-uptake (mg COPC/kg)
$CF_{WW\text{-}Tplant}$ = conversion factor from dry weight to wet weight (unitless)

The concentrations for P_d , P_v , and P_r were calculated according to equations presented in USEPA's 2005 Human Health Risk Assessment Protocol (HHRAP) and implemented using the IRAP software, as described in the human health risk assessment section of the main risk assessment report. Terrestrial plant concentrations used in the food chain model were calculated using the IRAP software. Terrestrial plant concentrations were converted from a dry weight to wet weight because the food ingestion rates used in the models require inputs in terms of wet weight.

Dose From Invertebrates. Receptors may be exposed to COPCs through ingestion of invertebrate prey. COPC doses from benthic and terrestrial invertebrates were calculated using the following general equation (see Equation 5-1 in USEPA 1999):

$$DD_{invert} = FIR * C_{invert} * P_{invert} * F_{invert} \qquad \text{(Equation 7)}$$

where

DD_{invert} = amount of COPC ingested from invertebrates (mg COPC/kg body weight-day)
FIR = food ingestion rate (kg wet weight/kg bodyweight-day)
C_{invert} = wet weight COPC concentration in invertebrate tissue (mg/kg)
P_{invert} = proportion of ingested invertebrate prey which is potentially contaminated (unitless)
F_{invert} = fraction of diet from invertebrates (unitless)

The concentrations of COPCs in terrestrial and benthic invertebrate tissue were modeled using the following general equation (see Equation 5-3 in USEPA 1999):

$$C_{invert} = C_{soil/sed} * BCF_{invert} * CF_{WW\text{-}invert} \quad \text{(Equation 8)}$$

where

C_{invert} = wet weight concentration in benthic or terrestrial invertebrate tissue (mg COPC/kg WW)
$C_{soil/sed}$ = measured concentration of COPC in soil or sediment (mg COPC/kg)
BCF_{invert} = bioconcentration factor in benthic or terrestrial invertebrates (unitless)
$CF_{WW\text{-}invert}$ = conversion factor from dry weight to wet weight (unitless)

Invertebrate concentrations were converted from a dry weight to wet weight because the food ingestion rates used in the models require inputs in terms of wet weight.

Invertebrate BCFs for organic COPCs were calculated using the following equation from Southworth *et al*. (1978) (see Equations C-1-1 and C-1-9 in USEPA 1999):

$$\log BCF_{invert} = 0.819 \times \log K_{ow} - 1.146 \quad \text{(Equation 9)}$$

where

BCF_{invert} = bioconcentration factor in invertebrates (unitless)
K_{ow} = octanol-water partition coefficient (unitless)

Inorganic BCFs for terrestrial invertebrates were obtained from USEPA's Protocol (see Table C-1 in USEPA 1999); if a value was not provided, then the arithmetic average of the available BCFs for other inorganic COPCs (0.22) was used, as directed by the Protocol (see Section C-1.1 in USEPA 1999).

Inorganic BCFs for benthic invertebrates were also obtained from the Protocol (see Table C-6 in USEPA 1999); similarly, if a value was not provided, then the arithmetic average of the available BCFs for other inorganic COPCs (0.90) was used, as directed by the Protocol (see Section C-1.6 in USEPA 1999).

Crayfish, which are the primary prey item for the Yuma clapper rail, were generally treated as benthic invertebrates. However, the BCFs for PCDDs/PCDFs listed in the Protocol were refined for this study. USEPA's default BCFs for PCDDs/PCDFs in benthic invertebreates are based on the over 15-year old non-specific regression equation published by Southworth et al. (1978)

which is based on the Kow. For this project, and as described in the main risk assessment report, a review of recently published literature was performed to identify a more appropriate (i.e., based on experimental data) sediment-to-benthic invertebrate BCF specific to crayfish. The most recent and directly applicable study identified in the published literature evaluated bioaccumulation of 2,3,7,8-TCDF in crayfish from sediment (Currie et al., 2000). This study identified mean biota-to-sediment accumulation factors (BSAFs) ranging from 0.06 - 5.23 g/kg lipid per g/kg sediment organic carbon. The highest value provided in the Currie study was used to derive a sediment-to-benthic invertebrate (i.e., crayfish) BCF of 0.4 g 2,3,7,8-TCDF/kg tissue fresh weight per g/kg dry sediment, using the study's reported crayfish lipid content of 0.17%, USEPA's HHRAP default sediment organic carbon fraction of 0.04 (USEPA 2005), and a crayfish moisture content of 82% from the U.S. Department of Agriculture's National Nutrient Database.[1] Congener specific sediment-to-benthic crayfish BCFs were then derived for the other PCDD/PCDF congeners, except 2,3,7,8-TCDF, using the methodology presented in USEPA's Protocol (USEPA 1999) which relies on USEPA (1995) bioaccumulation equivalency factors (BEFs). Table 1 presents the PCDD/PCDF benthic invertebrate BSAFs calculated for this assessment.

Dose From Fish. Receptors may be exposed to COPCs through ingestion of fish prey. COPC doses from fish were calculated using the following general equation (see Equation 5-1 in USEPA 1999):

$$DD_{fish} = FIR * C_{fish} * P_{fish} * F_{fish} \qquad \text{(Equation 10)}$$

where

DD_{fish} = amount of COPC ingested from fish (mg COPC/kg body weight-day)
FIR = food ingestion rate (kg wet weight/kg bodyweight-day)
C_{fish} = wet weight COPC concentration in fish tissue (mg/kg)
P_{fish} = proportion of ingested fish which is potentially contaminated (unitless)
F_{fish} = fraction of diet from fish (unitless)

Fish tissue concentrations were calculated according to equations presented in USEPA's 2005 Human Health Risk Assessment Protocol (HHRAP) and implemented using the IRAP software, as described in the human health risk assessment section of the main risk assessment report.

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[1] U.S. Department of Agriculture Nutrient Database, Release 19. 2006. http://riley.nal.usda.gov/NDL.

Table 1
Derivation of Sediment-to-Benthic Crayfish PCDD/PCDF Bioconcentration Factors

Congener	USEPA (1999) Default BEF	Currie et al. 2000 (a)		Calculated Congener Specific BCF (c)
		Reported BSAF (g/kg lipid / g/kg sed OC)	Calculated Sediment-to-Benthic Organism BCF (g/kg tissue WW/ g/kg dry sed) (b)	
2,3,7,8-TCDD	1		0.50	0.5
1,2,3,7,8-PeCDD	0.9			0.45
1,2,3,4,7,8-HxCDD	0.3			0.15
1,2,3,7,8,9-HxCDD	0.1			0.05
1,2,3,6,7,8-HxCDD	0.1			0.05
1,2,3,4,6,7,8-HpCDD	0.051			0.0255
OCDD	0.012			0.006
2,3,7,8-TCDF	0.8	5.23	0.40	0.4
1,2,3,7,8-PeCDF	0.2			0.1
2,3,4,7,8-PeCDF	1.6			0.8
1,2,3,4,7,8-HxCDF	0.08			0.04
1,2,3,7,8,9-HxCDF	0.6			0.3
1,2,3,6,7,8-HxCDF	0.2			0.1
2,3,4,6,7,8-HxCDF	0.7			0.35
1,2,3,4,6,7,8-HpCDF	0.01			0.005
1,2,3,4,7,8,9-HpCDF	0.4			0.2
OCDF	0.016			0.008
fraction lipid (d)			0.017	
sediment foc (USEPA HHRAP 2005 default)			0.04	
crayfish moisture content (USDA Nat'l Nutrient Database)			0.82	

BCF - Bioaccumulation factor; BEF - Bioaccumulation equivalency factor; BSAF = Biota-to-sediment accumulation factor

DW - dry weight; WW = wet weight

foc - fraction organic carbon

g/kg - grams per kilogram; mg/kg - milligrams per kilogram

USEPA HHRAP = U.S. Environmental Protection Agency Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities

(a) Value from Currie et al. (2000) was highest value reported during the study duration

(b) Sediment-to-benthic organism BCF (g/kg tissue WW / g/kg dry sed) = BSAF (g/kg lipid / g/kg sed OC) * kg lipid/kg tissue DW * (1-moisture fraction, kg DW tissue/kg WW tissue) / (foc, kg sed OC/kg sed DW)

(c) Congener specific BCFs were calculated using the crayfish-specific TCDD BCF (0.5) and the USEPA (1999) default BEF (BCF=0.5 x BEF), except for 2,3,7,8-TCDF for which a congener-specific BCF (0.4) was obtained from the literature.

(d) Listed value reported by Currie et al. (2000).

Dose from Animal Prey. Receptors may be exposed to COPCs through ingestion of animal prey. COPC doses from animal prey were calculated using the following general equation (see Equation 5-1 in USEAP, 1999):

$$DD_{animal} = FIR * C_{animal} * P_{animal} * F_{animal} \quad \text{(Equation 11)}$$

where

DD_{animal} = amount of COPC ingested from animal prey (mg COPC/kg-day)
FIR = food ingestion rate (kg wet weight/kg bodyweight-day)
C_{animal} = wet weight concentration of COPC in animal prey tissue (mg/kg)
P_{animal} = proportion of ingested animal prey which is contaminated (unitless)
F_{animal} = fraction of diet from animal prey (unitless)

Animal prey concentrations were calculated using the following general equation (see USEPA 1999, Equation 5-11):

$$C_{animal} = C_{Tplant} * BCF_{animal} * P_{Tplant} * F_{Tplant} \quad \text{(Equation 12)}$$

where

C_{animal} = modeled wet weight concentration of COPC in animal prey tissue (mg/kg)
C_{Tplant} = wet weight concentration in terrestrial plant consumed by animal prey (mg/kg)
BCF_{animal} = bioconcentration factor in herbivorous animal prey (unitless)
P_{Tplant} =proportion of ingested terrestrial plant in animal prey diet which is potentially contaminated (unitless)
F_{Tplant} = fraction of diet from terrestrial vegetation in animal prey (unitless)

Plant concentrations were converted from a dry weight to wet weight because the food ingestion rates used in the models require inputs in terms of wet weight.

It was assumed that animal prey generally consist of rodents or other small mammals which themselves are primarily herbivores (USEPA 1993), thus F_{Tplant} was assumed to be 100 percent. It was assumed that prey obtain all water metabolically. It was also assumed that incidental ingestion of soil was negligible. Therefore, Equation 13 does not contain components for incidental ingestion of surface water or soil. The white footed mouse was used to represent rodents and small mammals in the food chain models. The white footed mouse was selected because they inhabit Arizona and dietary information and ingestion rates are provided in USEPA's Protocol for this mammal.

BCFs for herbivorous prey (white footed mouse) were obtained from USEPA's Protocol (see Table D-1 in USEPA 1999). If BCFs for animal prey were not provided, then BCFs were calculated using the following equation (see USEPA 1999, Equation D-1-1):

$$BCF_{animal} = Ba_{animal} * FIR \qquad \text{(Equation 13)}$$

where

BCF_{animal} = bioconcentration factor in animal prey (unitless)
Ba_{animal} = Ba_A = COPC-specific biotransfer factor applicable to animal prey (unitless)
FIR = food ingestion rate for the white footed mouse (0.614 kg WW/kg BW-day, see Table 5-1 in USEPA 1999)

Ba_{animal} values for herbivorous prey for evaluated organic COPCs not included in USEPA's Protocol were calculated using the following equation form Travis and Arms (1988) (see Equation D-1-4 in USEPA 1999)

$$\log Ba_{animal} = -7.6 + \text{Log } K_{ow} \qquad \text{(Equation 14)}$$

where

Ba_{animal} = COPC-specific biotransfer factor applicable to animal prey (unitless)
K_{ow} = octanol-water partition coefficient (unitless)

BCFs for inorganic COPCs not provided in the Protocol were derived from ingestion-to-beef transfer coefficients in Baes *et* al. (1984), as directed by the Protocol (see Section D-1.1 in USEPA 1999).

3.0 MODEL PARAMETERS AND ASSUMPTIONS

This section discusses sources and values of food chain model inputs and explains important assumptions adopted by the food chain model.

3.1 Exposure Point Concentrations

COPC exposure point concentrations (EPCs) in surface water, sediment, soil, plants and fish were modeled using fate and transport equations specified in USEPA's HHRAP, and implemented using the IRAP software (see main report text for additional information). The EPCs were based

on the calculated maximum annual concentrations rather than long-term multiyear averages, both of which are outputs of the IRAP software.

3.2 Dietary Parameters

Dietary parameters were selected from a range of values available in the published scientific literature, including USEPA (1999), USEPA (1993), and Beyer (1994). For each selected receptor, the food chain models evaluated only the predominant food source (i.e. exclusive diets). For example, the model assumed that 100% of the diet of the badger consisted of small mammals but no other food type. The food chain models also included incidental ingestion of environmental media.

Ingestion rates for food, soil, sediment, and surface water were calculated following the methodology used by USEPA in its Protocol (see Table 5-2 in USEPA 1999). In some cases, soil and sediment ingestion rates were not specific to the receptor species but instead were based on literature values for surrogate species with similar feeding strategies. For all terrestrial species except mule deer, receptors were assumed to obtain water metabolically. Table 5.2-1 in the main risk assessment report presents the detailed calculations and sources used to derive the dietary and environmental media ingestion rates.

Log K_{ow} values were used in some cases to calculate bioconcentration and biotransfer factors. The Kow values were obtained from HHRAP or from the values compiled for this project for compounds not addressed in HHRAP (see Appendix F).

Conversion factors used to adjust dry weight concentrations to wet weight concentrations were based on default values provided in USEPA's Protocol as follows:

Tissue Type	Conversion Factor	Source
Terrestrial Plant	0.12	Table 5-1 (USEPA 1999)
Terrestrial Invertebrate	0.167	Appendix C-1.1 (USEPA 1999)
Aquatic Invertebrate	0.167	Appendix C-1.6 (USEPA 1999)
Fish Tissue	0.20	Appendix C-1.5 (USEPA 1999)
Animal Tissue	0.32	Table 5-1 (USEPA 1999)

3.3 Exposure Parameters

The models assumed that 100% of the chemical ingested in the diet is bioavailable. The models also assumed that receptor species spend their entire life cycle in potentially impacted areas, and do not migrate to, nest in, or forage from sources outside the project study area boundaries.

4.0 REFERENCES

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APPENDIX M
SECTION 3

METHODS USED TO ADDRESS MIXTURES OF PCDDS/PCDFS IN THE ECOLOGICAL RISK ASSESSMENT

Introduction

This appendix provides information regarding methods used to evaluate mixtures of PCDDs/PCDFs in the ecological risk assessment. Two types of information are presented below. First, the method used to calculate PCDD/PCDF toxic equivalent (TEQ) concentrations is described, along with supporting tables. Second, the method used to calculate PCDD/PCDF concentrations in dietary prey species for input to the food chain modeling is presented, along with supporting tables.

Calculation of PCDD/PCDF Toxic Equivalent Concentrations

As noted in the main risk assessment report, PCDDs/PCDFs were evaluated using a toxicity reference value (TRV) based on 2,3,7,8-TCDD. Congener-specific toxic equivalency factors (TEFs) for fish, birds, and mammals were used to relate the toxicity of each congener to the toxicity of 2,3,7,8-TCDD. The USEPA-approved TEFs used in this assessment were presented in the project Workplan and were developed by the World Health Organization.

To apply the TEF concept in the ecological risk assessment, the congener-specific TEF was multiplied by its respective concentration in a given medium and the products were summed to obtain the total TCDD toxic equivalents (TEQs) of the mixture. This calculation was performed for each environmental medium and each food item addressed in the ecological risk assessment. The tables that follow present the results of these calculations. Table 1 presents the calculated TEF concentrations for the agricultural area, the creosote bush scrub area and the riparian corridor area. Table 2 presents the analogous concentrations for the Colorado River and Main Drain areas.

Calculation of Congener-Specific PCDD/PCDF Prey Concentrations

Exposures to PCDDs/PCDFs via the food chain were evaluated by calculating the concentration of each PCDD/PCDF congener in a number of prey items. The general approach for calculating concentrations in prey involved multiplying the environmental media concentration of each PCDD/PCDF congener (e.g., sediment, plant, or soil) by its congener-specific bioaccumulation factor (BCF). Once the prey concentrations were calculated for each PCDD/PCDF congener, then toxic equivalent concentrations reflecting the entire PCDD/PCDF mixture were calculated as described above.

The environmental media concentrations used to calculate prey concentrations were obtained from fate and transport modeling results which were determined according to USEPA's Human Health Risk Assessment Protocol (HHRAP) equations as implemented

by the IRAP software program. More information on the calculation of environmental media concentrations is provided in the main risk assessment report.

The congener-specific bioaccumulation factors for PCDDs/PCDFs were obtained from USEPA's 1999 Screening Level Ecological Risk Assessment Protocol for mammalian prey and terrestrial invertebrates. As described in the food chain modeling discussion elsewhere in this appendix and in the main risk assessment report, congener specific BCFs for benthic invertebrates were derived following the USEPA 1999 methodology, but were based on a recent published scientific study from which BCFs for crayfish were derived rather than the USEPA default BCF values. Crayfish were selected as the basis of the BCF because crayfish are the primary diet item for the Yuma clapper rail. The crayfish-specific BCFs were calculated using a 2,3,7,8-TCDD BCF (0.5 g/kg tissue WW/ g/kg dry sediment) and the congener-specific bioequivalence factors (BEFs) from USEPA 1999, except for 2,3,7,8-TCDF for which a congener-specific BCF (0.4 g/kg tissue WW/ g/kg dry sediment) was obtained directly from the published scientific study.

The tables that follow show the resulting congener-specific PCDD/PCDF concentrations that were calculated in each prey item considered in the ecological risk assessment. Table 3 presents the mammalian BCFs and the calculated tissue concentrations in mammalian prey. Table 4 presents the terrestrial invertebrate BCFs and the calculated terrestrial invertebrate tissue concentrations. Table 5 present the benthic invertebrate BCFs and the calculated benthic invertebrate tissue concentrations.

Table 1
Calculation of PCDD/PCDF Toxic Equivalent Concentrations - Agricultural, Creosote Bush Scrub, Riparian Corridor Areas

				Agricultural Area (b)			Creosote Bush Scrub Area (b)			Riparian Corridor Area (b)		
Parameter	TEF Mammals (a)	TEF Birds (a)	TEF Fish (a)	Soil Concentration (mg/kg)	Plant Concentration (mg/kg)	Mammalian Prey Concentration (mg/kg)	Soil Concentration (mg/kg)	Plant Concentration (mg/kg)	Mammalian Prey Concentration (mg/kg)	Soil Concentration (mg/kg)	Plant Concentration (mg/kg)	Terrestrial Invertebrate Prey Concentration (mg/kg)
2,3,7,8-TCDD	1	1	1	8.7E-12	7.4E-14	1.1E-17	6.0E-10	8.4E-13	1.2E-16	9.0E-11	1.1E-13	1.4E-10
1,2,3,7,8-PeCDD	1	1	1	8.5E-12	1.8E-13	2.5E-17	1.5E-09	3.4E-12	4.5E-16	1.4E-10	3.2E-13	2.0E-10
1,2,3,4,7,8-HxCDD	0.1	0.05	0.5	4.1E-12	9.1E-14	4.1E-18	1.0E-09	1.9E-12	8.7E-17	8.2E-11	1.6E-13	4.0E-11
1,2,3,7,8,9-HxCDD	0.1	0.01	0.01	4.7E-12	9.6E-14	2.0E-18	1.2E-09	2.3E-12	4.7E-17	9.5E-11	1.9E-13	2.1E-11
1,2,3,6,7,8-HxCDD	0.1	0.1	0.01	4.3E-12	9.8E-14	1.7E-18	1.0E-09	2.0E-12	3.6E-17	8.3E-11	1.8E-13	1.6E-11
1,2,3,4,6,7,8-HpCDD	0.01	0.001	0.001	3.9E-12	7.0E-14	5.3E-19	1.1E-09	1.9E-12	1.4E-17	8.2E-11	1.5E-13	6.6E-12
OCDD	0.0001	--	--	4.9E-12	9.7E-14	1.7E-19	1.4E-09	2.4E-12	4.2E-18	1.0E-10	1.9E-13	2.0E-12
2,3,7,8-TCDF	0.1	1	0.05	9.3E-11	6.2E-13	7.2E-17	6.1E-09	9.5E-12	1.1E-15	9.6E-10	1.4E-12	1.2E-09
1,2,3,7,8-PeCDF	0.05	0.1	0.05	4.6E-11	6.1E-13	2.0E-17	5.8E-09	1.1E-11	3.4E-16	6.3E-10	1.1E-12	2.0E-10
2,3,4,7,8-PeCDF	0.5	1	0.5	4.3E-11	5.9E-13	1.4E-16	6.0E-09	1.2E-11	2.8E-15	6.1E-10	1.2E-12	1.6E-09
1,2,3,4,7,8-HxCDF	0.1	0.1	0.1	2.9E-11	5.1E-13	5.7E-18	6.6E-09	1.3E-11	1.4E-16	5.5E-10	1.0E-12	6.6E-11
1,2,3,7,8,9-HxCDF	0.1	0.1	0.1	4.9E-12	8.6E-14	8.0E-18	9.6E-10	1.8E-12	1.7E-16	8.4E-11	1.6E-13	8.4E-11
1,2,3,6,7,8-HxCDF	0.1	0.1	0.1	1.6E-11	2.8E-13	7.8E-18	3.6E-09	6.9E-12	1.9E-16	3.0E-10	5.7E-13	9.0E-11
2,3,4,6,7,8-HxCDF	0.1	0.1	0.1	9.2E-12	1.6E-13	1.6E-17	2.0E-09	3.9E-12	3.8E-16	1.7E-10	3.2E-13	1.8E-10
1,2,3,4,6,7,8-HpCDF	0.01	0.01	0.01	1.9E-11	4.1E-13	6.6E-19	5.1E-09	9.7E-12	1.6E-17	4.0E-10	8.1E-13	6.8E-12
1,2,3,4,7,8,9-HpCDF	0.01	0.01	0.01	5.7E-12	2.1E-13	1.2E-17	1.2E-09	2.9E-12	1.7E-16	1.0E-10	3.0E-13	6.5E-11
OCDF	0.0001	0.0001	0.0001	2.7E-12	5.3E-14	1.3E-19	7.5E-10	1.3E-12	3.1E-18	5.8E-11	1.1E-13	1.5E-12
Toxic Equivalents - Mammals (TEQM)				5.8E-11	7.8E-13	NA	7.74E-09	1.49E-11	2.21E-15	NA	NA	NA
Toxic Equivalents - Birds (TEQB)				1.65E-10	1.65E-12	2.53E-16	1.63E-08	2.97E-11	4.62E-15	1.99E-09	3.33E-12	3.19E-09
Toxic Equivalents - Fish (TEQF)				NA	NA	NA	NA	NA	NA	NA	NA	NA

-- - A TEF is not available.
NA - Not Applicable
TEF - Toxic Equivalency Factor
TEQ - Toxic Equivalents
mg/kg - milligrams per kilogram
mg/L - milligrams per liter
TEQM is calculated by multiplying each congener concentration by its corresponding mammal TEF then summing all of the results.
TEQB is calculated by multiplying each congener concentration by its corresponding bird TEF then summing all of the results.
TEQF is calculated by multiplying each congener concentration by its corresponding fish TEF then summing all of the results.
(a) World Health Organization (WHO). 1998. WHO toxic equivalency factors (TEFs) for dioxin-like compounds for humans and wildlife.
Prepared by Younes, M. Summary of WHO meeting in Stockholm, Sweden on June 15-18, 1998. International Programme on Chemical Safety.
(b) Soil and plant tissue concentrations were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program.

Table 2
Calculation of PCDD/PCDF Toxic Equivalent Concentrations - Colorado River and Main Drain Areas

				Colorado River Area (b) (c)					Main Drain Area (b)			
Parameter	TEF Mammals (a)	TEF Birds (a)	TEF Fish (a)	Sediment Concentration (mg/kg)	Dissolved Surface Water Concentration (mg/L)	Total Surface Water Concentration (mg/L)	Benthic Invertebrate (Crayfish) Concentrations (mg/L)	Fish Tissue Concentration (mg/kg)	Sediment Concentration (mg/kg)	Total Surface Water Concentration (mg/L)	Dissolved Surface Water Concentration (mg/L)	Fish Tissue Concentration (mg/kg)
2,3,7,8-TCDD	1	1	1	1.1E-10	7.3E-16	1.3E-15	5.7E-11	1.8E-11	2.1E-10	2.4E-15	1.3E-15	3.3E-11
1,2,3,7,8-PeCDD	1	1	1	2.0E-10	1.9E-15	2.8E-15	9.0E-11	3.1E-11	2.1E-10	3.0E-15	1.9E-15	3.3E-11
1,2,3,4,7,8-HxCDD	0.1	0.05	0.5	4.2E-10	2.7E-16	2.3E-15	6.3E-11	3.0E-11	1.2E-10	6.5E-16	7.5E-17	8.2E-12
1,2,3,7,8,9-HxCDD	0.1	0.01	0.01	3.6E-10	7.3E-16	2.5E-15	1.8E-11	2.5E-11	1.3E-10	9.0E-16	2.6E-16	9.1E-12
1,2,3,6,7,8-HxCDD	0.1	0.1	0.01	3.1E-10	6.3E-16	2.1E-15	1.6E-11	2.2E-11	1.2E-10	8.1E-16	2.4E-16	8.2E-12
1,2,3,4,6,7,8-HpCDD	0.01	0.001	0.001	4.6E-10	1.9E-16	2.4E-15	1.2E-11	4.1E-12	1.1E-10	5.9E-16	4.5E-17	9.7E-13
OCDD	0.0001	--	--	6.2E-10	1.6E-16	3.2E-15	3.7E-12	1.1E-13	1.4E-10	7.3E-16	3.6E-17	2.5E-14
2,3,7,8-TCDF	0.1	1	0.05	3.4E-10	1.1E-14	1.3E-14	1.4E-10	5.4E-11	1.6E-09	6.1E-14	5.3E-14	2.6E-10
1,2,3,7,8-PeCDF	0.05	0.1	0.05	1.0E-09	6.6E-15	1.2E-14	1.0E-10	1.6E-10	1.2E-09	1.4E-14	7.8E-15	1.9E-10
2,3,4,7,8-PeCDF	0.5	1	0.5	6.3E-10	8.1E-15	1.1E-14	5.1E-10	9.9E-11	1.0E-09	1.8E-14	1.3E-14	1.6E-10
1,2,3,4,7,8-HxCDF	0.1	0.1	0.1	1.4E-09	5.8E-15	1.3E-14	5.7E-11	1.0E-10	7.8E-10	7.0E-15	3.2E-15	5.5E-11
1,2,3,7,8,9-HxCDF	0.1	0.1	0.1	2.1E-10	8.6E-16	1.9E-15	6.3E-11	1.5E-11	1.3E-10	1.2E-15	5.3E-16	9.2E-12
1,2,3,6,7,8-HxCDF	0.1	0.1	0.1	7.8E-10	3.2E-15	7.0E-15	7.8E-11	5.5E-11	4.3E-10	3.9E-15	1.8E-15	3.0E-11
2,3,4,6,7,8-HxCDF	0.1	0.1	0.1	4.4E-10	1.8E-15	3.9E-15	1.5E-10	3.1E-11	2.5E-10	2.2E-15	1.0E-15	1.7E-11
1,2,3,4,6,7,8-HpCDF	0.01	0.01	0.01	1.7E-09	2.7E-15	1.1E-14	8.4E-12	1.5E-11	5.4E-10	3.5E-15	8.8E-16	4.8E-12
1,2,3,4,7,8,9-HpCDF	0.01	0.01	0.01	4.1E-10	6.6E-16	2.7E-15	8.2E-11	3.6E-12	1.6E-10	1.0E-15	2.6E-16	1.4E-12
OCDF	0.0001	0.0001	0.0001	3.3E-10	1.3E-16	1.7E-15	2.6E-12	5.8E-14	7.8E-11	4.1E-16	3.2E-17	1.4E-14
Toxic Equivalents - Mammals (TEQM)				NA	NA	NA	NA	NA	NA	2.27E-14	NA	NA
Toxic Equivalents - Birds (TEQB)				1.75E-09	NA	3.23E-14	8.41E-10	2.43E-10	3.37E-09	8.70E-14	NA	5.16E-10
Toxic Equivalents - Fish (TEQF)				1.22E-09	8.86E-15	NA	NA	NA	1.29E-09	NA	1.35E-14	NA

-- - A TEF is not available.
NA - Not Applicable
TEF - Toxic Equivalency Factor
TEQ - Toxic Equivalents
mg/kg - milligrams per kilogram
mg/L - milligrams per liter
TEQM is calculated by multiplying each congener concentration by its corresponding mammal TEF then summing all of the results.
TEQB is calculated by multiplying each congener concentration by its corresponding bird TEF then summing all of the results.
TEQF is calculated by multiplying each congener concentration by its corresponding fish TEF then summing all of the results.
(a) World Health Organization (WHO). 1998. WHO toxic equivalency factors (TEFs) for dioxin-like compounds for humans and wildlife.
Prepared by Younes, M. Summary of WHO meeting in Stockholm, Sweden on June 15-18, 1998. International Programme on Chemical Safety.
(b) Sediment, surface water (total and dissolved), and fish tissue concentrations were calculated using USEPA's
HHRAP fate and transport equations, using the IRAP software program.
(c) Colorado River sediment concentrations were used to estimate benthic invertebrate (crayfish) tissue concentrations in the Riparian Backwater Area.

Table 3
Mammalian Prey PCDD/PCFD Bioconcentration Factors and Tissue Concentrations

Congener	USEPA (1999) default BCF (a)	Agricultural Area		Creosote Bush Scrub Area	
		Plant Tissue Concentration (mg/kg) (b)	Prey Tissue Concentration (mg/kg) (c)	Plant Tissue Concentration (mg/kg) (b)	Prey Tissue Concentration (mg/kg) (c)
2,3,7,8-TCDD	1.47E-04	7.4E-14	1.1E-17	8.42E-13	1.24E-16
1,2,3,7,8-PeCDD	1.35E-04	1.8E-13	2.5E-17	3.35E-12	4.53E-16
1,2,3,4,7,8-HxCDD	4.55E-05	9.1E-14	4.1E-18	1.91E-12	8.69E-17
1,2,3,7,8,9-HxCDD	2.05E-05	9.6E-14	2.0E-18	2.30E-12	4.71E-17
1,2,3,6,7,8-HxCDD	1.76E-05	9.8E-14	1.7E-18	2.04E-12	3.59E-17
1,2,3,4,6,7,8-HpCDD	7.48E-06	7.0E-14	5.3E-19	1.85E-12	1.39E-17
OCDD	1.76E-06	9.7E-14	1.7E-19	2.39E-12	4.21E-18
2,3,7,8-TCDF	1.17E-04	6.2E-13	7.2E-17	9.54E-12	1.12E-15
1,2,3,7,8-PeCDF	3.23E-05	6.1E-13	2.0E-17	1.05E-11	3.41E-16
2,3,4,7,8-PeCDF	2.35E-04	5.9E-13	1.4E-16	1.19E-11	2.80E-15
1,2,3,4,7,8-HxCDF	1.12E-05	5.1E-13	5.7E-18	1.26E-11	1.41E-16
1,2,3,7,8,9-HxCDF	9.24E-05	8.6E-14	8.0E-18	1.85E-12	1.71E-16
1,2,3,6,7,8-HxCDF	2.79E-05	2.8E-13	7.8E-18	6.87E-12	1.92E-16
2,3,4,6,7,8-HxCDF	9.83E-05	1.6E-13	1.6E-17	3.86E-12	3.79E-16
1,2,3,4,6,7,8-HpCDF	1.61E-06	4.1E-13	6.6E-19	9.73E-12	1.57E-17
1,2,3,4,7,8,9-HpCDF	5.72E-05	2.1E-13	1.2E-17	2.89E-12	1.65E-16
OCDF	2.35E-06	5.3E-14	1.3E-19	1.33E-12	3.14E-18

BCF - Bioaccumulation Factor
mg/kg - milligrams per kilogram
(a) BCF values for mammalian prey (white-footed mouse) were obtained from Table D-1 in USEPA, 1999. It was assumed that the prey diet consists 100% of plant material.
(b) Plant tissue concentrations were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program.
(c) Prey tissue concentration = Plant concentration X BCF.

Table 4
Terrestrial Invertebrate PCDD/PCDF Bioconcentration Factors and Tissue Concentrations

Congener	USEPA (1999) default BCF (a)	Riparian Corridor	
		Soil Concentration (mg/kg)	Terrestrial Invertebrate Tissue Concentration (mg/kg) (b)
2,3,7,8-TCDD	1.59	8.95E-11	1.42E-10
1,2,3,7,8-PeCDD	1.46	1.39E-10	2.02E-10
1,2,3,4,7,8-HxCDD	0.49	8.20E-11	4.02E-11
1,2,3,7,8,9-HxCDD	0.22	9.52E-11	2.09E-11
1,2,3,6,7,8-HxCDD	0.19	8.32E-11	1.58E-11
1,2,3,4,6,7,8-HpCDD	0.081	8.20E-11	6.64E-12
OCDD	0.019	1.05E-10	1.99E-12
2,3,7,8-TCDF	1.27	9.60E-10	1.22E-09
1,2,3,7,8-PeCDF	0.32	6.29E-10	2.01E-10
2,3,4,7,8-PeCDF	2.54	6.14E-10	1.56E-09
1,2,3,4,7,8-HxCDF	0.121	5.47E-10	6.62E-11
1,2,3,7,8,9-HxCDF	1	8.44E-11	8.44E-11
1,2,3,6,7,8-HxCDF	0.3	3.00E-10	8.99E-11
2,3,4,6,7,8-HxCDF	1.07	1.69E-10	1.81E-10
1,2,3,4,6,7,8-HpCDF	0.017	4.03E-10	6.85E-12
1,2,3,4,7,8,9-HpCDF	0.62	1.04E-10	6.46E-11
OCDF	0.025	5.80E-11	1.45E-12

mg/kg - milligrams per kilogram
(a) Bioaccumulation Factor (BCF) values for terrestrial invertebrates were obtained from Table C-1 in USEPA, 1999
(b) Terrestrial invertebrate tissue concentration = BCF X soil concentration

Table 5
Benthic Invertebrate (Crayfish) PCDD/PCDF Bioconcentration Factors and Tissue Concentrations
Concentrations for Yuma Clapper Rail Analysis

Congener	Congener Specific BCF (a)	Colorado River Area Sediment Concentration (mg/kg) (b)	Benthic Invertebrate Tissue Concentration (mg/kg) (c)
2,3,7,8-TCDD	0.5	1.1E-10	5.7E-11
1,2,3,7,8-PeCDD	0.45	2.0E-10	9.0E-11
1,2,3,4,7,8-HxCDD	0.15	4.2E-10	6.3E-11
1,2,3,7,8,9-HxCDD	0.05	3.6E-10	1.8E-11
1,2,3,6,7,8-HxCDD	0.05	3.1E-10	1.6E-11
1,2,3,4,6,7,8-HpCDD	0.0255	4.6E-10	1.2E-11
OCDD	0.006	6.2E-10	3.7E-12
2,3,7,8-TCDF	0.4	3.4E-10	1.4E-10
1,2,3,7,8-PeCDF	0.1	1.0E-09	1.0E-10
2,3,4,7,8-PeCDF	0.8	6.3E-10	5.1E-10
1,2,3,4,7,8-HxCDF	0.04	1.4E-09	5.7E-11
1,2,3,7,8,9-HxCDF	0.3	2.1E-10	6.3E-11
1,2,3,6,7,8-HxCDF	0.1	7.8E-10	7.8E-11
2,3,4,6,7,8-HxCDF	0.35	4.4E-10	1.5E-10
1,2,3,4,6,7,8-HpCDF	0.005	1.7E-09	8.4E-12
1,2,3,4,7,8,9-HpCDF	0.2	4.1E-10	8.2E-11
OCDF	0.008	3.3E-10	2.6E-12

BEF - Bioaccumulation equivalency factor
BCF - Bioaccumulation factor
foc - fraction organic carbon
DW - dry weight
WW - wet weight
g/kg - grams per kilogram
mg/kg - milligrams per kilogram
(a) Congener specific BCFs were calculated using the crayfish-specific TCDD BCF (0.5) and the USEPA (1999) default BEF (BCF=0.5 x BEF), except for 2,3,7,8-TCDF for which a congener-specific BCF (0.4) was obtained from the literature.
(b) Sediment concentrations were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program.
(c) Benthic invertebrate tissue concentrations = BCF X sediment concentration

APPENDIX M
SECTION 4

DETAILED ECOLOGICAL RISK ASSESSMENT RESULTS

Table 1
Calculation of Hazard Quotients for Badger - Creosote Bush Scrub Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg WW) (c)	Kow	Biotransfer Factor (BaA) (d)	BCF plant-herbivore (e)	Mammal Prey Tissue Concentration (mg/kg) (f)	Daily Dose from Prey (mg/kg-BW-d) (g)	Daily Dose from Soil (mg/kg-BW-d) (h)	Total Daily Dose (mg/kg-BW-d) (i)	TRV (mg/kg-BW-d) (j)	Hazard Quotient (k)
Acetone	1.63E-08	1.64E-08			9.3E-09	1.5E-16	2.3E-17	6.5E-13	6.5E-13	1.0E+01	6.5E-14
Acrylonitrile	2.62E-10	2.64E-10			2.8E-08	7.3E-18	1.1E-18	1.0E-14	1.0E-14	4.6E-01	2.3E-14
Aluminum	6.52E-03	3.49E-05		8.0E-04	4.9E-04	1.7E-08	2.6E-09	2.6E-07	2.6E-07	1.9E+00	1.4E-07
Antimony	1.36E-09	5.20E-12			6.1E-04	3.2E-15	4.9E-16	5.4E-14	5.4E-14	6.6E-02	8.2E-13
Aroclor 1254	3.61E-07	1.80E-10			2.5E-02	4.5E-12	6.9E-13	1.4E-11	1.5E-11	2.1E-04	7.3E-08
Arsenic	1.06E-08	3.73E-05			1.2E-03	4.6E-08	7.1E-09	4.2E-13	7.1E-09	1.3E+00	5.7E-09
Barium	1.44E-03	5.98E-06			9.2E-05	5.5E-10	8.5E-11	5.7E-08	5.7E-08	5.1E-01	1.1E-07
Benzo(a)Anthracene	5.51E-09	4.79E-11			7.4E-03	3.5E-13	5.4E-14	2.2E-13	2.7E-13	1.7E-01	1.6E-12
Benzo(a)pyrene	5.17E-09	8.48E-11			2.1E-02	1.8E-12	2.7E-13	2.0E-13	4.8E-13	1.0E-01	4.8E-12
Beryllium	1.48E-05	3.72E-05			6.1E-04	2.3E-08	3.5E-09	5.9E-10	4.1E-09	6.6E-01	6.2E-09
Cadmium	1.69E-06	9.20E-05			7.4E-05	6.8E-09	1.0E-09	6.7E-11	1.1E-09	2.5E-02	4.4E-08
Chloroform (Trichloromethane)	2.57E-11	8.61E-12			1.4E-06	1.2E-17	1.8E-18	1.0E-15	1.0E-15	6.0E+01	1.7E-17
Chromium, hexavalent	5.76E-04	1.94E-06			3.4E-03	6.6E-09	1.0E-09	2.3E-08	2.4E-08	3.5E+00	6.8E-09
Copper	4.61E-06	3.56E-05		8.0E-02	4.9E-02	1.7E-06	2.7E-07	1.8E-10	2.7E-07	1.2E+01	2.2E-08
DDE, 4,4'-	6.13E-07	9.06E-10			2.8E-02	2.5E-11	3.9E-12	2.4E-11	2.8E-11	1.0E+00	2.8E-11
Dibenz(a,h)anthracene	1.50E-08	2.84E-10			5.4E-02	1.5E-11	2.4E-12	5.9E-13	3.0E-12	2.0E-03	1.5E-09
Dinitrobenzene, 1,3-	4.81E-07	2.98E-07			4.8E-07	1.4E-13	2.2E-14	1.9E-11	1.9E-11	1.1E+00	1.8E-11
Dinitrotoluene, 2,4-	2.52E-07	8.53E-08			1.5E-06	1.3E-13	2.0E-14	1.0E-11	1.0E-11	7.0E-01	1.4E-11
Dinitrotoluene, 2,6-	2.05E-07	9.61E-08			1.2E-06	1.1E-13	1.8E-14	8.1E-12	8.1E-12	4.0E-01	2.0E-11
Di-n-octylphthalate	1.21E-07	7.97E-08			3.3E+01	2.6E-06	4.1E-07	4.8E-12	4.1E-07	7.5E+03	5.4E-11
Dioxane, 1,4-	1.21E-14	1.22E-14			8.4E-09	1.0E-22	1.6E-23	4.8E-19	4.8E-19	1.1E+02	4.5E-21
Ethylhexyl phthalate, bis-2-	1.03E-06	3.78E-07			2.5E-03	9.3E-10	1.4E-10	4.1E-11	1.8E-10	6.0E+01	3.1E-12
gamma-BHC (Lindane)	1.62E-09	6.78E-11	4.0E+03	1.0E-04	6.1E-05	4.2E-15	6.4E-16	6.4E-14	6.5E-14	8.0E+00	8.1E-15
Heptachlor	7.17E-10	1.09E-11			1.6E-03	1.7E-14	2.7E-15	2.8E-14	3.1E-14	2.5E-03	1.2E-11
Hexachlorobenzene	2.33E-08	9.68E-11			4.9E-03	4.8E-13	7.3E-14	9.2E-13	9.9E-13	1.6E+00	6.2E-13
Hexachlorocyclopentadiene	2.80E-07	1.59E-09			1.3E-03	2.0E-12	3.1E-13	1.1E-11	1.1E-11	3.8E+00	3.0E-12
Lead	2.51E-05	9.22E-05			1.8E-04	1.7E-08	2.6E-09	9.9E-10	3.6E-09	3.8E-02	9.6E-08
Manganese	2.75E-07	1.37E-05		5.0E-02	3.1E-02	4.2E-07	6.5E-08	1.1E-11	6.5E-08	8.8E+01	7.4E-10
Mercuric chloride	5.18E-04	9.92E-07			3.2E-03	3.2E-09	4.9E-10	2.1E-08	2.1E-08	1.0E+00	2.1E-08
Methyl mercury	1.05E-05	1.71E-07			4.8E-04	8.2E-11	1.3E-11	4.2E-10	4.3E-10	3.2E-02	1.3E-08
Nickel	5.75E-08	2.92E-06			3.7E-03	1.1E-08	1.7E-09	2.3E-12	1.7E-09	5.0E+01	3.3E-11
Pentachlorobenzene	2.79E-07	1.32E-09			1.9E-03	2.5E-12	3.8E-13	1.1E-11	1.1E-11	7.3E+00	1.6E-12
Pentachloronitrobenzene (PCNB)	1.95E-06	1.74E-08			6.8E-04	1.2E-11	1.8E-12	7.7E-11	7.9E-11	4.6E+02	1.7E-13
Pentachlorophenol	4.55E-06	1.74E-06			1.9E-03	3.2E-09	5.0E-10	1.8E-10	6.8E-10	3.0E-01	2.3E-09
Selenium	4.36E-09	1.12E-06			1.4E-03	1.6E-09	2.4E-10	1.7E-13	2.4E-10	7.6E-02	3.2E-09
Silver	1.30E-04	2.58E-06			1.8E-03	4.8E-09	7.3E-10	5.1E-09	5.9E-09	3.8E-01	1.6E-08
Dioxin - TEQM	7.74E-09	1.49E-11			(l)	2.2E-15	3.4E-16	3.1E-13	3.1E-13	1.0E-06	3.1E-07
Thallium (l)	1.82E-03	2.83E-06			2.5E-02	7.0E-08	1.1E-08	7.2E-08	8.3E-08	1.3E-02	6.3E-06
Vanadium	6.50E-04	8.53E-07		1.1E-03	6.8E-04	5.8E-10	8.9E-11	2.6E-08	2.6E-08	2.1E-01	1.2E-07
Vinyl Chloride	1.31E-13	9.50E-14			2.2E-07	2.1E-20	3.2E-21	5.2E-18	5.2E-18	1.7E-01	3.0E-17
Xylene, m-	1.38E-11	1.11E-12	1.6E+03	4.0E-05	2.4E-05	2.7E-17	4.2E-18	5.4E-16	5.5E-16	2.1E+00	2.6E-16
Xylene, o-	8.94E-12	8.10E-13	1.3E+03	3.2E-05	1.9E-05	1.6E-17	2.4E-18	3.5E-16	3.6E-16	2.1E+00	1.7E-16
Xylene, p-	1.14E-11	1.01E-12	1.3E+03	3.2E-05	1.9E-05	2.0E-17	3.0E-18	4.5E-16	4.6E-16	2.1E+00	2.2E-16
Zinc	8.37E-07	4.46E-05			5.5E-05	2.5E-09	3.8E-10	3.3E-11	4.1E-10	1.0E+01	4.0E-11
										Cumulative HI (m) :	**7E-06**

Table 1
Calculation of Hazard Quotients for Badger - Creosote Bush Scrub Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg WW) (c)	Kow	Biotransfer Factor (BaA) (d)	BCF plant-herbivore (e)	Mammal Prey Tissue Concentration (mg/kg) (f)	Daily Dose from Prey (mg/kg-BW-d) (g)	Daily Dose from Soil (mg/kg-BW-d) (h)	Total Daily Dose (mg/kg-BW-d) (i)	TRV (mg/kg-BW-d) (j)	Hazard Quotient (k)

(a) Only those compounds with TRVs are listed in this table.
(b) Soil concentrations (Csoil) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program.
(c) Plant concentrations (Cplant) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program. Wet weight plant concentrations were calculated from the IRAP outputs dry weight concentrations using a moisture content of 88% as specified in USEPA's 1999 Screening Ecological Risk Assessment Protocol. (USEPA, 1999)
(d) For organic compounds not included in USEPA, 1999, the BaA was calculated using Travis & Arms equation: logBaA = -7.6 + logKow
For inorganic compounds not included in USEPA, 1999, the BaA was taken from Baes 1984.
(e) Bioconcentration Factors (BCFs) in prey items are based on the white footed mouse and were obtained from Appendix D of USEPA's 1999 Screening Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. If a BCF was not available then it was calculated using the following equation:
BCFplant-herbivore = BaA X Food IR, Food Ingestion Rate for mouse = 0.614 (kg WW/kg BW-d)
(f) Prey tissue concentration = plant tissue concentration X BCFplant-herbivore; except for Dioxin - TEQM which is calculated on a congener-specific basis and is shown elsewhere in this appendix.
(g) DDdiet = Cprey x Food IR; assumes that 100% of ingested prey is potentially contaminated
(h) DDsoil = Csoil x Soil IR; assumes that 100% of ingested soil is potentially contaminated
(i) Total Daily Dose = DDdiet + DDsoil
(j) Toxicity Reference Values (TRVs) are discussed in the text.
(k) Hazard Quotients (HQ) are calculated by dividing the daily dose by the TRV.
(l) BCFs were calculated for individual congeners using bioaccumulation equivalency factors (BEFs) from Appendix D of USEPA (1999).
See elsewhere in this appendix for more information.
(m) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQM is the Toxic Equivalents (TEQ) for mammals calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results.
This calculation is presented elsewhere in this appendix.
Food IR - Food ingestion rate as shown in Table 5.2-2
Soil IR - Soil ingestion rate as shown in Table 5.2-2

mg - milligrams
kg - kilograms
BW - body weight
WW- wet weight
d - day
DD - daily dose
Kow - octanol-water partition coefficient

Table 2
Calculation of Hazard Quotients for Gambel's Quail - Creosote Bush Scrub Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg WW) (c)	Daily Dose from Diet (mg/kg BW-d) (d)	Daily Dose from Soil (mg/kg BW-d) (e)	Total Daily Dose (mg/kg bw-d) (f)	TRV (Bird) (mg/kg bw-d) (g)	Hazard Quotient (h)
Acetone	1.63E-08	1.64E-08	7.8E-09	2.8E-11	2.4E-08	5.2E+01	4.7E-10
Aluminum	6.52E-03	3.49E-05	1.7E-05	1.1E-05	6.3E-05	1.0E+02	6.3E-07
Aroclor 1254	3.61E-07	1.80E-10	8.6E-11	6.2E-10	8.9E-10	7.2E-02	1.2E-08
Arsenic	1.06E-08	3.73E-05	1.8E-05	1.8E-11	5.5E-05	2.5E+00	2.2E-05
Barium	1.44E-03	5.98E-06	2.9E-06	2.5E-06	1.1E-05	2.1E+01	5.4E-07
Benzo(a)Anthracene	5.51E-09	4.79E-11	2.3E-11	9.5E-12	8.0E-11	7.9E-04	1.0E-07
Benzo(a)pyrene	5.17E-09	8.48E-11	4.1E-11	8.9E-12	1.3E-10	1.0E-03	1.3E-07
Benzo(b)fluoranthene	5.60E-08	9.89E-11	4.7E-11	9.7E-11	2.4E-10	1.4E-04	1.7E-06
Benzo(k)fluoranthene	3.04E-08	1.71E-10	8.2E-11	5.3E-11	3.1E-10	1.4E-04	2.2E-06
Cadmium	1.69E-06	9.20E-05	4.4E-05	2.9E-09	1.4E-04	1.5E+00	9.4E-05
Chromium, hexavalent	5.76E-04	1.94E-06	9.3E-07	1.0E-06	3.9E-06	1.0E+00	3.9E-06
Chrysene	3.31E-08	1.29E-10	6.2E-11	5.7E-11	2.5E-10	1.0E-03	2.5E-07
Copper	4.61E-06	3.56E-05	1.7E-05	8.0E-09	5.3E-05	4.7E+01	1.1E-06
DDE, 4,4'-	6.13E-07	9.06E-10	4.3E-10	1.1E-09	2.4E-09	8.5E-01	2.8E-09
Dibenz(a,h)anthracene	1.50E-08	2.84E-10	1.4E-10	2.6E-11	4.5E-10	3.9E-04	1.1E-06
Dinitrobenzene, 1,3-	4.81E-07	2.98E-07	1.4E-07	8.3E-10	4.4E-07	4.2E-04	1.0E-03
Ethylhexyl phthalate, bis-2-	1.03E-06	3.78E-07	1.8E-07	1.8E-09	5.6E-07	1.1E+02	5.1E-09
gamma-BHC (Lindane)	1.62E-09	6.78E-11	3.2E-11	2.8E-12	1.0E-10	2.0E+00	5.1E-11
Heptachlor	7.17E-10	1.09E-11	5.2E-12	1.2E-12	1.7E-11	6.5E-02	2.7E-10
Hexachloro-1,3-butadiene (Perchlorobutadiene)	1.94E-07	1.50E-09	7.2E-10	3.4E-10	2.6E-09	3.2E+00	8.0E-10
Hexachlorobenzene	2.33E-08	9.68E-11	4.6E-11	4.0E-11	1.8E-10	2.3E-01	8.2E-10
Indeno(1,2,3-cd) pyrene	1.32E-07	1.60E-09	7.6E-10	2.3E-10	2.6E-09	1.0E-03	2.6E-06
Lead	2.51E-05	9.22E-05	4.4E-05	4.3E-08	1.4E-04	2.5E-02	5.5E-03
Manganese	2.75E-07	1.37E-05	6.6E-06	4.8E-10	2.0E-05	9.8E+02	2.1E-08
Mercuric chloride	5.18E-04	9.92E-07	4.7E-07	9.0E-07	2.4E-06	3.3E+00	7.3E-07
Methyl mercury	1.05E-05	1.71E-07	8.2E-08	1.8E-08	2.7E-07	6.4E-03	4.2E-05
Nickel	5.75E-08	2.92E-06	1.4E-06	1.0E-10	4.3E-06	6.5E+01	6.6E-08
Pentachloronitrobenzene (PCNB)	1.95E-06	1.74E-08	8.3E-09	3.4E-09	2.9E-08	6.9E+01	4.2E-10
Pentachlorophenol	4.55E-06	1.74E-06	8.3E-07	7.9E-09	2.6E-06	4.0E+00	6.4E-07
Selenium	4.36E-09	1.12E-06	5.3E-07	7.6E-12	1.7E-06	5.0E-01	3.3E-06
Silver	1.30E-04	2.58E-06	1.2E-06	2.2E-07	4.0E-06	1.8E+02	2.3E-08
Dioxin - TEQB	1.63E-08	2.97E-11	1.4E-11	2.8E-11	7.2E-11	1.0E-05	7.2E-06
Thallium (l)	1.82E-03	2.83E-06	1.4E-06	3.2E-06	7.3E-06	3.5E-01	2.1E-05
Vanadium	6.50E-04	8.53E-07	4.1E-07	1.1E-06	2.4E-06	1.1E+01	2.1E-07
Zinc	8.37E-07	4.46E-05	2.1E-05	1.4E-09	6.6E-05	1.3E+02	5.0E-07
						Cumulative HI (i):	**7E-03**

(a) Only those compounds with TRVs are listed in this table.
(b) Soil concentrations (Csoil) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program.
(c) Plant concentrations (Cplant) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program. Wet weight plant concentrations were calculated from the IRAP outputs dry weight concentrations using a moisture content of 88% as specified in USEPA's 1999 Screening Ecological Risk Assessment Protocol.
(d) DDdiet = Cplant x Food IR; assumes that 100% of ingested plant material is potentially contaminated
(e) DDsoil = Csoil x Soil IR; assumes that 100% of ingested soil is potentially contaminated
(f) Total Daily Dose = DDdiet + DDsoil

Table 2
Calculation of Hazard Quotients for Gambel's Quail - Creosote Bush Scrub Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg WW) (c)	Daily Dose from Diet (mg/kg BW-d) (d)	Daily Dose from Soil (mg/kg BW-d) (e)	Total Daily Dose (mg/kg bw-d) (f)	TRV (Bird) (mg/kg bw-d) (g)	Hazard Quotient (h)

(g) Toxicity Reference Values (TRVs) are discussed in the text

(h) Hazard Quotients (HQ) are calculated by dividing the daily dose by the TRV.

(i) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQB is the Toxic Equivalents (TEQ) for birds calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results. This calculation is presented elsewhere in this appendix.

Food IR - Food ingestion rate as shown in Table 5.2-2

Soil IR - Soil ingestion rate as shown in Table 5.2-2

mg - milligrams

kg - kilograms

BW - body weight

d - day

DD - daily dose

Table 3
Calculation of Hazard Quotients for Great Horned Owl - Creosote Bush Scrub Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg) (c)	Biotrasfer Factor (BaA) (d)	BCF plant-herbivore (e)	Mammal Prey Tissue Concentration (mg/kg) (f)	Daily Dose from Prey (mg/kg-BW-d) (g)	Daily Dose from Soil (mg/kg-BW-d) (h)	Total Daily Dose (mg/kg-BW-d) (i)	TRV (mg/kg-BW-d) (j)	Hazard Quotient (k)
Acetone	1.63E-08	1.64E-08		9.3E-09	1.5E-16	2.9E-17	1.7E-10	1.7E-10	5.2E+01	3.3E-12
Aluminum	6.52E-03	3.49E-05	8.0E-04	4.9E-04	1.7E-08	3.2E-09	6.8E-05	6.8E-05	1.0E+02	6.8E-07
Aroclor 1254	3.61E-07	1.80E-10		2.5E-02	4.5E-12	8.4E-13	3.8E-09	3.8E-09	7.2E-02	5.3E-08
Arsenic	1.06E-08	3.73E-05		1.2E-03	4.6E-08	8.6E-09	1.1E-10	8.7E-09	2.5E+00	3.5E-09
Barium	1.44E-03	5.98E-06		9.2E-05	5.5E-10	1.0E-10	1.5E-05	1.5E-05	2.1E+01	7.3E-07
Benzo(a)Anthracene	5.51E-09	4.79E-11		7.4E-03	3.5E-13	6.6E-14	5.8E-11	5.8E-11	7.9E-04	7.3E-08
Benzo(a)pyrene	5.17E-09	8.48E-11		2.1E-02	1.8E-12	3.3E-13	5.4E-11	5.5E-11	1.0E-03	5.5E-08
Benzo(b)fluoranthene	5.60E-08	9.89E-11		2.5E-02	2.4E-12	4.6E-13	5.9E-10	5.9E-10	1.4E-04	4.2E-06
Benzo(k)fluoranthene	3.04E-08	1.71E-10		2.4E-02	4.2E-12	7.8E-13	3.2E-10	3.2E-10	1.4E-04	2.3E-06
Cadmium	1.69E-06	9.20E-05		7.4E-05	6.8E-09	1.3E-09	1.8E-08	1.9E-08	1.5E+00	1.3E-08
Chromium, hexavalent	5.76E-04	1.94E-06		3.4E-03	6.6E-09	1.2E-09	6.0E-06	6.0E-06	1.0E+00	6.0E-06
Chrysene	3.31E-08	1.29E-10		8.5E-03	1.1E-12	2.1E-13	3.5E-10	3.5E-10	1.0E-03	3.5E-07
Copper	4.61E-06	3.56E-05	8.0E-02	4.9E-02	1.7E-06	3.3E-07	4.8E-08	3.8E-07	4.7E+01	8.0E-09
DDE, 4,4'-	6.13E-07	9.06E-10		2.8E-02	2.5E-11	4.7E-12	6.4E-09	6.4E-09	8.5E-01	7.6E-09
Dibenz(a,h)anthracene	1.50E-08	2.84E-10		5.4E-02	1.5E-11	2.9E-12	1.6E-10	1.6E-10	3.9E-04	4.1E-07
Dinitrobenzene, 1,3-	4.81E-07	2.98E-07		4.8E-07	1.4E-13	2.7E-14	5.0E-09	5.0E-09	4.2E-04	1.2E-05
Ethylhexyl phthalate, bis-2-	1.03E-06	3.78E-07		2.5E-03	9.3E-10	1.8E-10	1.1E-08	1.1E-08	1.1E+02	9.9E-11
gamma-BHC (Lindane)	1.62E-09	6.78E-11	1.0E-04	6.1E-05	4.2E-15	7.8E-16	1.7E-11	1.7E-11	2.0E+00	8.5E-12
Heptachlor	7.17E-10	1.09E-11		1.6E-03	1.7E-14	3.3E-15	7.5E-12	7.5E-12	6.5E-02	1.2E-10
Hexachloro-1,3-butadiene (Perchlorobutadiene)	1.94E-07	1.50E-09		8.3E-04	1.2E-12	2.3E-13	2.0E-09	2.0E-09	3.2E+00	6.4E-10
Hexachlorobenzene	2.33E-08	9.68E-11		4.9E-03	4.8E-13	8.9E-14	2.4E-10	2.4E-10	2.3E-01	1.1E-09
Indeno(1,2,3-cd) pyrene	1.32E-07	1.60E-09		1.3E-01	2.0E-10	3.8E-11	1.4E-09	1.4E-09	1.0E-03	1.4E-06
Lead	2.51E-05	9.22E-05		1.8E-04	1.7E-08	3.2E-09	2.6E-07	2.7E-07	2.5E-02	1.1E-05
Manganese	2.75E-07	1.37E-05	5.0E-02	3.1E-02	4.2E-07	7.9E-08	2.9E-09	8.2E-08	9.8E+02	8.4E-11
Mercuric chloride	5.18E-04	9.92E-07		3.2E-03	3.2E-09	6.0E-10	5.4E-06	5.4E-06	3.3E+00	1.7E-06
Methyl mercury	1.05E-05	1.71E-07		4.8E-04	8.2E-11	1.5E-11	1.1E-07	1.1E-07	6.4E-03	1.7E-05
Nickel	5.75E-08	2.92E-06		3.7E-03	1.1E-08	2.0E-09	6.0E-10	2.6E-09	6.5E+01	4.0E-11
Pentachloronitrobenzene (PCNB)	1.95E-06	1.74E-08		6.8E-04	1.2E-11	2.2E-12	2.0E-08	2.0E-08	6.9E+01	3.0E-10
Pentachlorophenol	4.55E-06	1.74E-06		1.9E-03	3.2E-09	6.0E-10	4.8E-08	4.8E-08	4.0E+00	1.2E-08
Selenium	4.36E-09	1.12E-06		1.4E-03	1.6E-09	2.9E-10	4.6E-11	3.4E-10	5.0E-01	6.8E-10
Silver	1.30E-04	2.58E-06		1.8E-03	4.8E-09	8.9E-10	1.4E-06	1.4E-06	1.8E+02	7.6E-09
TEQB	1.63E-08	2.97E-11		(l)	4.6E-15	8.7E-16	1.7E-10	1.7E-10	1.0E-05	1.7E-05
Thallium (l)	1.82E-03	2.83E-06		2.5E-02	7.0E-08	1.3E-08	1.9E-05	1.9E-05	3.5E-01	5.5E-05
Vanadium	6.50E-04	8.53E-07	1.1E-03	6.8E-04	5.8E-10	1.1E-10	6.8E-06	6.8E-06	1.1E+01	6.0E-07
Zinc	8.37E-07	4.46E-05		5.5E-05	2.5E-09	4.6E-10	8.8E-09	9.2E-09	1.3E+02	7.1E-11
									Cumulative HI (m) :	**1E-04**

(a) Only those compounds with TRVs are listed in this table.
(b) Soil concentrations (Csoil) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program.
(c) Plant concentrations (Cplant) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program. Wet weight plant concentrations were calculated from the IRAP outputs dry weight concentrations using a moisture content of 88% as specified in USEPA's 1999 Screening Ecological Risk Assessment Protocol.
(d) For organic compounds not included in USEPA, 1999, the BaA was calculated using Travis & Arms equation: logBaA = -7.6 + logKow
For inorganic compounds not included in USEPA, 1999, the BaA was taken from Baes 1984.
(e) Bioconcentration Factors (BCFs) in prey items are based on the white footed mouse and were obtained from Appendix D of USEPA's 1999 Screening Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. If a BCF was not available then it was calculated using the following equation:
BCFplant-herbivore = BaA X Food IR, Food Ingestion Rate for mouse = 0.614 (kg WW/kg BW-d)
(f) Prey tissue concentration = plant tissue concentration X BCFplant-herbivore; except for Dioxin - TEQB which is calculated on a congener-specific basis and is shown elsewhere in this appendix.
(g) DDdiet = Cprey x Food IR; assumes that 100% of ingested prey is potentially contaminated
(h) DDsoil = Csoil x Soil IR; assumes that 100% of ingested soil is potentially contaminated
(i) Total Daily Dose = DDdiet + DDsoil
(j) Toxicity Reference Values (TRVs) are discussed in the text.

Table 3
Calculation of Hazard Quotients for Great Horned Owl - Creosote Bush Scrub Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg) (c)	Biotrasfer Factor (BaA) (d)	BCF plant-herbivore (e)	Mammal Prey Tissue Concentration (mg/kg) (f)	Daily Dose from Prey (mg/kg-BW-d) (g)	Daily Dose from Soil (mg/kg-BW-d) (h)	Total Daily Dose (mg/kg-BW-d) (i)	TRV (mg/kg-BW-d) (j)	Hazard Quotient (k)

(k) Hazard Quotients (HQ) are calculated by dividing the daily dose by the TRV.
(l) BCFs were calculated for individual congeners using bioaccumulation equivalency factors (BEFs) from Appendix D of USEPA (1999).
See elsewhere in this appendix for more information.
(m) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQB is the Toxic Equivalents (TEQ) for birds calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results.
This calculation is presented elsewhere in this appendix.
Food IR - Food ingestion rate as shown in Table 5.2-2
Soil IR - Soil ingestion rate as shown in Table 5.2-2

mg - milligrams
kg - kilograms
BW - body weight
WW- wet weight
d - day
DD - daily dose
Kow - octanol-water partition coefficient

Table 4
Hazard Quotients for Plants (Creosote Bush) in the Creosote Bush Area

CAS No	Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Toxicity Reference Value (TRV) (mg/kg) (c)	Hazard Quotient (d)
108-60-1	2,2'-oxybis (1-Chloropropane)	1.15E-09	2.0E+01	5.8E-11
591-78-6	2-Hexanone	7.76E-10	1.3E+01	6.2E-11
91-57-6	2-Methylnaphthalene	3.03E-08	3.2E+00	9.4E-09
534-52-1	4,6-Dinitro-2-methylphenol	4.12E-06	1.4E-01	2.9E-05
208-96-8	Acenaphthylene	3.65E-08	6.8E+02	5.3E-11
7429-90-5	Aluminum	6.52E-03	5.0E+00	1.3E-03
7440-36-0	Antimony	1.36E-09	5.0E-01	2.7E-09
11097-69-1	Aroclor 1254	3.61E-07	1.0E+01	3.6E-08
7440-38-2	Arsenic	1.06E-08	1.0E+00	1.1E-08
7440-39-3	Barium	1.44E-03	5.0E+00	2.9E-04
56-55-3	Benzo(a)Anthracene	5.51E-09	1.2E+00	4.6E-09
50-32-8	Benzo(a)pyrene	5.17E-09	1.2E+00	4.3E-09
205-99-2	Benzo(b)fluoranthene	5.60E-08	1.2E+00	4.7E-08
191-24-2	Benzo(g,h,i)perylene	2.24E-07	1.2E+02	1.9E-09
207-08-9	Benzo(k)fluoranthene	3.04E-08	1.2E+00	2.5E-08
7440-41-7	Beryllium	1.48E-05	1.0E-01	1.5E-04
111-91-1	Bis(2-chloroethoxy) methane	2.34E-07	3.0E-01	7.8E-07
7440-43-9	Cadmium	1.69E-06	2.0E-01	8.4E-06
18540-29-9	Chromium, hexavalent	5.76E-04	1.8E-02	3.2E-02
218-01-9	Chrysene	3.31E-08	1.2E+00	2.8E-08
7440-48-4	Cobalt	9.81E-05	2.0E+01	4.9E-06
7440-50-8	Copper	4.61E-06	1.0E+00	4.6E-06
319-86-8	delta-BHC	6.13E-07	9.9E+00	6.2E-08
53-70-3	Dibenz(a,h)anthracene	1.50E-08	1.2E+00	1.2E-08
122-39-4	Diphenylamine	2.17E-05	1.0E+00	2.2E-05
33213-65-9	Endosulfan II	3.58E-09	1.2E-01	3.0E-08
7421-93-4	Endrin aldehyde	1.33E-06	1.1E-02	1.3E-04
58-89-9	gamma-BHC (Lindane)	1.62E-09	5.0E-03	3.2E-07
76-44-8	Heptachlor	7.17E-10	1.0E+00	7.2E-10
77-47-4	Hexachlorocyclopentadiene	2.80E-07	1.0E-01	2.8E-06
193-39-5	Indeno(1,2,3-cd) pyrene	1.32E-07	1.2E+00	1.1E-07
74-88-4	Iodomethane	1.69E-10	1.2E+00	1.4E-10
7439-92-1	Lead	2.51E-05	4.6E+00	5.5E-06
7439-96-5	Manganese	2.75E-07	5.0E+02	5.5E-10
7487-94-7	Mercuric chloride	5.18E-04	3.5E-01	1.5E-03
80-62-6	Methyl methacrylate	6.98E-13	9.8E+02	7.1E-16
7440-02-0	Nickel	5.75E-08	2.5E+01	2.3E-09
62-75-9	N-nitrosodimethylamine	1.19E-08	1.2E+01	1.0E-09
87-86-5	Pentachlorophenol	4.55E-06	1.7E+00	2.6E-06
7782-49-2	Selenium	4.36E-09	5.0E-02	8.7E-08
7440-22-4	Silver	1.30E-04	2.0E-02	6.5E-03
7440-28-0	Thallium (I)	1.82E-03	1.0E-02	1.8E-01
7440-62-2	Vanadium	6.50E-04	2.0E+00	3.3E-04
7440-66-6	Zinc	8.37E-07	9.0E-01	9.3E-07
			Cumulative HI (e) =	**2E-01**

(a) Only those compounds with TRVs are listed in this table.
(b) Soil concentrations were calculated using USEPA's 2005 HHRAP fate and transport equations, using the IRAP software program.
(c) Toxicity Reference Values (TRVs) are discussed in the text.
(d) Maximum Hazard Quotient (HQ) is calculated by dividing the maximum annual soil concentration by the TRV.
(e) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

mg/kg - milligrams per kilogram

Table 5
Calculation of Hazard Quotients for Gambel's Quail - Agricultural Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg WW) (c)	Daily Dose from Diet (mg/kg BW-d) (d)	Daily Dose from Soil (mg/kg BW-d) (e)	Total Daily Dose (mg/kg BW-d) (f)	TRV (Bird) (mg/kg BW-d) (g)	Hazard Quotient (h)
Acetone	1.14E-08	8.59E-09	4.1E-09	2.0E-11	4.1E-09	5.2E+01	7.9E-11
Aluminum	1.36E-05	9.01E-07	4.3E-07	2.4E-08	4.5E-07	1.0E+02	4.5E-09
Aroclor 1254	6.38E-09	4.70E-12	2.2E-12	1.1E-11	1.3E-11	7.2E-02	1.8E-10
Arsenic	2.76E-09	9.80E-07	4.7E-07	4.8E-12	4.7E-07	2.5E+00	1.9E-07
Barium	3.37E-06	7.85E-08	3.8E-08	5.8E-09	4.3E-08	2.1E+01	2.1E-09
Benzo(a)Anthracene	6.09E-11	2.07E-12	9.9E-13	1.1E-13	1.1E-12	7.9E-04	1.4E-09
Benzo(a)pyrene	4.29E-11	6.10E-12	2.9E-12	7.4E-14	3.0E-12	1.0E-03	3.0E-09
Benzo(b)fluoranthene	9.68E-10	3.23E-12	1.5E-12	1.7E-12	3.2E-12	1.4E-04	2.3E-08
Benzo(k)fluoranthene	2.42E-10	1.31E-11	6.2E-12	4.2E-13	6.7E-12	1.4E-04	4.8E-08
Cadmium	4.38E-07	2.42E-06	1.2E-06	7.6E-10	1.2E-06	1.5E+00	8.0E-07
Chlordane	4.36E-09	1.17E-11	5.6E-12	7.5E-12	1.3E-11	2.1E+00	6.1E-12
Chromium, hexavalent	1.25E-06	4.55E-08	2.2E-08	2.2E-09	2.4E-08	1.0E+00	2.4E-08
Chrysene	4.81E-10	3.19E-12	1.5E-12	8.3E-13	2.4E-12	1.0E-03	2.4E-09
Copper	1.19E-06	9.60E-07	4.6E-07	2.1E-09	4.6E-07	4.7E+01	9.8E-09
DDE, 4,4'-	1.07E-08	2.14E-11	1.0E-11	1.9E-11	2.9E-11	8.5E-01	3.4E-11
Dibenz(a,h)anthracene	4.05E-11	2.85E-11	1.4E-11	7.0E-14	1.4E-11	3.9E-04	3.5E-08
Dinitrobenzene, 1,3-	8.08E-09	3.86E-09	1.8E-09	1.4E-11	1.9E-09	4.2E-04	4.4E-06
Ethylhexyl phthalate, bis-2-	5.92E-09	2.18E-08	1.0E-08	1.0E-11	1.0E-08	1.1E+02	9.4E-11
gamma-BHC (Lindane)	1.69E-10	5.90E-12	2.8E-12	2.9E-13	3.1E-12	2.0E+00	1.6E-12
Heptachlor	1.28E-11	1.46E-13	7.0E-14	2.2E-14	9.2E-14	6.5E-02	1.4E-12
Hexachloro-1,3-butadiene (Perchlorobutadiene)	1.08E-08	6.32E-11	3.0E-11	1.9E-11	4.9E-11	3.2E+00	1.5E-11
Hexachlorobenzene	2.90E-08	8.79E-11	4.2E-11	5.0E-11	9.2E-11	2.3E-01	4.1E-10
Indeno(1,2,3-cd) pyrene	3.48E-10	4.02E-11	1.9E-11	6.0E-13	2.0E-11	1.0E-03	2.0E-08
Lead	6.53E-06	2.43E-06	1.2E-06	1.1E-08	1.2E-06	2.5E-02	4.7E-05
Manganese	7.13E-08	3.61E-07	1.7E-07	1.2E-10	1.7E-07	9.8E+02	1.8E-10
Mercuric chloride	8.22E-06	9.67E-08	4.6E-08	1.4E-08	6.0E-08	3.3E+00	1.9E-08
Methyl mercury	1.67E-07	2.51E-08	1.2E-08	2.9E-10	1.2E-08	6.4E-03	1.9E-06
Nickel	1.50E-08	7.69E-08	3.7E-08	2.6E-11	3.7E-08	6.5E+01	5.7E-10
Pentachloronitrobenzene (PCNB)	3.95E-08	2.86E-10	1.4E-10	6.8E-11	2.1E-10	6.9E+01	3.0E-12
Pentachlorophenol	7.31E-08	3.04E-07	1.5E-07	1.3E-10	1.5E-07	4.0E+00	3.6E-08
Selenium	1.13E-09	2.94E-08	1.4E-08	1.9E-12	1.4E-08	5.0E-01	2.8E-08
Silver	2.71E-07	2.45E-08	1.2E-08	4.7E-10	1.2E-08	1.8E+02	6.8E-11
Dioxin - TEQB	1.65E-10	1.65E-12	7.9E-13	2.9E-13	1.1E-12	1.0E-05	1.1E-07
Thallium (I)	4.45E-06	7.20E-08	3.4E-08	7.7E-09	4.2E-08	3.5E-01	1.2E-07
Vanadium	1.70E-06	1.94E-08	9.3E-09	2.9E-09	1.2E-08	1.1E+01	1.1E-09
Zinc	2.17E-07	1.17E-06	5.6E-07	3.8E-10	5.6E-07	1.3E+02	4.3E-09
						Cumulative HI (i):	**5E-05**

(a) Only those compounds with TRVs are listed in this table.
(b) Soil concentrations (Csoil) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program.
(c) Plant concentrations (Cplant) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program. Wet weight plant concentrations were calculated from the IRAP outputs dry weight concentrations using a moisture content of 88% as specified in USEPA's 1999 Screening Ecological Risk Assessment Protocol.
(d) DDdiet = Cplant x Food IR; assumes that 100% of ingested plant material is potentially contaminated
(e) DDsoil = Csoil x Soil IR; assumes that 100% of ingested soil is potentially contaminated
(f) Total Daily Dose = DDdiet + DDsoil

Table 5
Calculation of Hazard Quotients for Gambel's Quail - Agricultural Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg WW) (c)	Daily Dose from Diet (mg/kg BW-d) (d)	Daily Dose from Soil (mg/kg BW-d) (e)	Total Daily Dose (mg/kg BW-d) (f)	TRV (Bird) (mg/kg BW-d) (g)	Hazard Quotient (h)

(g) Toxicity Reference Values (TRVs) are discussed in the text.
(h) Hazard Quotients (HQ) are calculated by dividing the daily dose by the TRV.
(i) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQB is the Toxic Equivalents (TEQ) for birds calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results. This calculation is presented elsewhere in this appendix.
Food IR - Food ingestion rate as shown in Table 5.2-2
Soil IR - Soil ingestion rate as shown in Table 5.2-2

mg - milligrams
kg - kilograms
BW - body weight
d - day
DD - daily dose

Table 6
Calculation of Hazard Quotients for Burrowing Owl - Agricultural Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg) (c)	Kow	Biotransfer Factor (BaA) (d)	BCF plant-herbivore (e)	Mammal Prey Tissue Concentration (mg/kg) (f)	Daily Dose from Prey (mg/kg-BW-d) (g)	Daily Dose from Soil (mg/kg-BW-d) (h)	Total Daily Dose (mg/kg-BW-d) (i)	TRV (mg/kg-BW-d) (j)	Hazard Quotient (k)
Acetone	1.14E-08	8.59E-09			9.3E-09	8.0E-17	2.8E-17	7.2E-10	7.2E-10	5.2E+01	1.4E-11
Aluminum	1.36E-05	9.01E-07		8.0E-04	4.9E-04	4.4E-10	1.6E-10	8.7E-07	8.7E-07	1.0E+02	8.7E-09
Aroclor 1254	6.38E-09	4.70E-12			2.5E-02	1.2E-13	4.1E-14	4.1E-10	4.1E-10	7.2E-02	5.6E-09
Arsenic	2.76E-09	9.80E-07			1.2E-03	1.2E-09	4.2E-10	1.8E-10	6.0E-10	2.5E+00	2.4E-10
Barium	3.37E-06	7.85E-08			9.2E-05	7.2E-12	2.5E-12	2.1E-07	2.1E-07	2.1E+01	1.0E-08
Benzo(a)Anthracene	6.09E-11	2.07E-12			7.4E-03	1.5E-14	5.4E-15	3.9E-12	3.9E-12	7.9E-04	4.9E-09
Benzo(a)pyrene	4.29E-11	6.10E-12			2.1E-02	1.3E-13	4.5E-14	2.7E-12	2.8E-12	1.0E-03	2.8E-09
Benzo(b)fluoranthene	9.68E-10	3.23E-12			2.5E-02	7.9E-14	2.8E-14	6.2E-11	6.2E-11	1.4E-04	4.4E-07
Benzo(k)fluoranthene	2.42E-10	1.31E-11			2.4E-02	3.2E-13	1.1E-13	1.5E-11	1.6E-11	1.4E-04	1.1E-07
Cadmium	4.38E-07	2.42E-06			7.4E-05	1.8E-10	6.3E-11	2.8E-08	2.8E-08	1.5E+00	1.9E-08
Chlordane	4.36E-09	1.17E-11	3.2E+05	7.9E-03	4.9E-03	5.7E-14	2.0E-14	2.8E-10	2.8E-10	2.1E+00	1.3E-10
Chromium, hexavalent	1.25E-06	4.55E-08			3.4E-03	1.5E-10	5.4E-11	8.0E-08	8.0E-08	1.0E+00	8.0E-08
Chrysene	4.81E-10	3.19E-12			8.5E-03	2.7E-14	9.5E-15	3.1E-11	3.1E-11	1.0E-03	3.1E-08
Copper	1.19E-06	9.60E-07		8.0E-02	4.9E-02	4.7E-08	1.7E-08	7.6E-08	9.3E-08	4.7E+01	2.0E-09
DDE, 4,4'-	1.07E-08	2.14E-11			2.8E-02	6.0E-13	2.1E-13	6.8E-10	6.8E-10	8.5E-01	8.1E-10
Dibenz(a,h)anthracene	4.05E-11	2.85E-11			5.4E-02	1.5E-12	5.5E-13	2.6E-12	3.1E-12	3.9E-04	8.0E-09
Dinitrobenzene, 1,3-	8.08E-09	3.86E-09			4.8E-07	1.8E-15	6.5E-16	5.1E-10	5.1E-10	4.2E-04	1.2E-06
Ethylhexyl phthalate, bis-2-	5.92E-09	2.18E-08			2.5E-03	5.4E-11	1.9E-11	3.8E-10	4.0E-10	1.1E+02	3.6E-12
gamma-BHC (Lindane)	1.69E-10	5.90E-12	4.0E+03	1.0E-04	6.1E-05	3.6E-16	1.3E-16	1.1E-11	1.1E-11	2.0E+00	5.4E-12
Heptachlor	1.28E-11	1.46E-13			1.6E-03	2.3E-16	8.2E-17	8.1E-13	8.1E-13	6.5E-02	1.3E-11
Hexachloro-1,3-butadiene (Perchlorobutadiene)	1.08E-08	6.32E-11			8.3E-04	5.2E-14	1.8E-14	6.9E-10	6.9E-10	3.2E+00	2.2E-10
Hexachlorobenzene	2.90E-08	8.79E-11			4.9E-03	4.3E-13	1.5E-13	1.8E-09	1.8E-09	2.3E-01	8.2E-09
Indeno(1,2,3-cd) pyrene	3.48E-10	4.02E-11			1.3E-01	5.1E-12	1.8E-12	2.2E-11	2.4E-11	1.0E-03	2.4E-08
Lead	6.53E-06	2.43E-06			1.8E-04	4.5E-10	1.6E-10	4.2E-07	4.2E-07	2.5E-02	1.7E-05
Manganese	7.13E-08	3.61E-07		5.0E-02	3.1E-02	1.1E-08	3.9E-09	4.5E-09	8.4E-09	9.8E+02	8.6E-12
Mercuric chloride	8.22E-06	9.67E-08			3.2E-03	3.1E-10	1.1E-10	5.2E-07	5.2E-07	3.3E+00	1.6E-07
Methyl mercury	1.67E-07	2.51E-08			4.8E-04	1.2E-11	4.2E-12	1.1E-08	1.1E-08	6.4E-03	1.7E-06
Nickel	1.50E-08	7.69E-08			3.7E-03	2.8E-10	1.0E-10	9.5E-10	1.1E-09	6.5E+01	1.6E-11
Pentachloronitrobenzene (PCNB)	3.95E-08	2.86E-10			6.8E-04	1.9E-13	6.8E-14	2.5E-09	2.5E-09	6.9E+01	3.7E-11
Pentachlorophenol	7.31E-08	3.04E-07			1.9E-03	5.6E-10	2.0E-10	4.7E-09	4.9E-09	4.0E+00	1.2E-09
Selenium	1.13E-09	2.94E-08			1.4E-03	4.1E-11	1.4E-11	7.2E-11	8.6E-11	5.0E-01	1.7E-10
Silver	2.71E-07	2.45E-08			1.8E-03	4.5E-11	1.6E-11	1.7E-08	1.7E-08	1.8E+02	9.7E-11
Dioxin - TEQB	1.65E-10	1.65E-12			(l)	2.5E-16	8.9E-17	1.0E-11	1.0E-11	1.0E-05	1.0E-06
Thallium (l)	4.45E-06	7.20E-08			2.5E-02	1.8E-09	6.2E-10	2.8E-07	2.8E-07	3.5E-01	8.1E-07
Vanadium	1.70E-06	1.94E-08		1.1E-03	6.8E-04	1.3E-11	4.6E-12	1.1E-07	1.1E-07	1.1E+01	9.5E-09
Zinc	2.17E-07	1.17E-06			5.5E-05	6.5E-11	2.3E-11	1.4E-08	1.4E-08	1.3E+02	1.1E-10
										Cumulative HI (m) :	**2E-05**

(a) Only those compounds with TRVs are listed in this table.
(b) Soil concentrations (Csoil) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program.
(c) Plant concentrations (Cplant) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program. Wet weight plant concentrations were calculated from the IRAP outputs dry weight concentrations using a moisture content of 88% as specified in USEPA's 1999 Screening Ecological Risk Assessment Protocol.
(d) For organic compounds not included in USEPA, 1999, the BaA was calculated using Travis & Arms equation: logBaA = -7.6 + logKow
For inorganic compounds not included in USEPA, 1999, the BaA was taken from Baes 1984.
(e) Bioconcentration Factors (BCFs) in prey items are based on the white footed mouse and were obtained from Appendix D of USEPA's 1999 Screening Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. If a BCF was not available then it was calculated using the following equation:
BCFplant-herbivore = BaA X Food IR, Food Ingestion Rate for mouse = 0.614 (kg WW/kg BW-d)
(f) Prey tissue concentration = plant tissue concentration X BCFplant-herbivore; except for Dioxin TEQB which is calculated on a congener-specific basis and is shown elsewhere in this appendix.
(g) DDdiet = Cprey x Food IR; assumes that 100% of ingested prey is potentially contaminated
(h) DDsoil = Csoil x Soil IR; assumes that 100% of ingested soil is potentially contaminated
(i) Total Daily Dose = DDdiet + DDsoil

Table 6
Calculation of Hazard Quotients for Burrowing Owl - Agricultural Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg) (c)	Kow	Biotransfer Factor (BaA) (d)	BCF plant-herbivore (e)	Mammal Prey Tissue Concentration (mg/kg) (f)	Daily Dose from Prey (mg/kg-BW-d) (g)	Daily Dose from Soil (mg/kg-BW-d) (h)	Total Daily Dose (mg/kg-BW-d) (i)	TRV (mg/kg-BW-d) (j)	Hazard Quotient (k)

(j) Toxicity Reference Values (TRVs) are discussed in the text.
(k) Hazard Quotients (HQ) are calculated by dividing the daily dose by the TRV.
(l) BCFs were calculated for individual congeners using bioaccumulation equivalency factors (BEFs) from Appendix D of USEPA (1999).
See elsewhere in this appendix for more information.
(m) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQB is the Toxic Equivalents (TEQ) for birds calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results. This calculation is presented elsewhere in this appendix.
Food IR - Food ingestion rate as shown in Table 5.2-2
Soil IR - Soil ingestion rate as shown in Table 5.2-2

mg - milligrams
kg - kilograms
BW - body weight
WW- wet weight
d - day
DD - daily dose
Kow - octanol-water partition coefficient

Table 7
Hazard Quotients for Plants (Alfalfa) in the Agricultural Area

CAS No	Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Toxicity Reference Value (TRV) (mg/kg) (c)	Hazard Quotient (d)
108-60-1	2,2'-oxybis (1-Chloropropane)	1.40E-09	2.0E+01	7.0E-11
591-78-6	2-Hexanone	1.05E-09	1.3E+01	8.3E-11
91-57-6	2-Methylnaphthalene	1.88E-08	3.2E+00	5.8E-09
534-52-1	4,6-Dinitro-2-methylphenol	8.05E-08	1.4E-01	5.6E-07
208-96-8	Acenaphthylene	3.23E-09	6.8E+02	4.7E-12
7429-90-5	Aluminum	1.36E-05	5.0E+00	2.7E-06
7440-36-0	Antimony	2.36E-09	5.0E-01	4.7E-09
11097-69-1	Aroclor 1254	6.38E-09	1.0E+01	6.4E-10
7440-38-2	Arsenic	2.76E-09	1.0E+00	2.8E-09
7440-39-3	Barium	3.37E-06	5.0E+00	6.7E-07
56-55-3	Benzo(a)Anthracene	6.09E-11	1.2E+00	5.1E-11
50-32-8	Benzo(a)pyrene	4.29E-11	1.2E+00	3.6E-11
205-99-2	Benzo(b)fluoranthene	9.68E-10	1.2E+00	8.1E-10
191-24-2	Benzo(g,h,i)perylene	1.06E-09	1.2E+02	8.9E-12
207-08-9	Benzo(k)fluoranthene	2.42E-10	1.2E+00	2.0E-10
7440-41-7	Beryllium	3.85E-06	1.0E-01	3.8E-05
111-91-1	Bis(2-chloroethoxy) methane	4.23E-09	3.0E-01	1.4E-08
7440-43-9	Cadmium	4.38E-07	2.0E-01	2.2E-06
18540-29-9	Chromium, hexavalent	1.25E-06	1.8E-02	7.0E-05
218-01-9	Chrysene	4.81E-10	1.2E+00	4.0E-10
7440-48-4	Cobalt	2.30E-07	2.0E+01	1.1E-08
7440-50-8	Copper	1.19E-06	1.0E+00	1.2E-06
319-86-8	delta-BHC	1.10E-08	9.9E+00	1.1E-09
53-70-3	Dibenz(a,h)anthracene	4.05E-11	1.2E+00	3.4E-11
122-39-4	Diphenylamine	4.01E-07	1.0E+00	4.0E-07
33213-65-9	Endosulfan II	7.18E-10	1.2E-01	6.0E-09
7421-93-4	Endrin aldehyde	2.17E-08	1.1E-02	2.1E-06
58-89-9	gamma-BHC (Lindane)	1.69E-10	5.0E-03	3.4E-08
76-44-8	Heptachlor	1.28E-11	1.0E+00	1.3E-11
77-47-4	Hexachlorocyclopentadiene	1.14E-08	1.0E-01	1.1E-07
193-39-5	Indeno(1,2,3-cd) pyrene	3.48E-10	1.2E+00	2.9E-10
74-88-4	Iodomethane	2.91E-10	1.2E+00	2.4E-10
7439-92-1	Lead	6.53E-06	4.6E+00	1.4E-06
7439-96-5	Manganese	7.13E-08	5.0E+02	1.4E-10
7487-94-7	Mercuric chloride	8.22E-06	3.5E-01	2.4E-05
80-62-6	Methyl methacrylate	1.11E-12	9.8E+02	1.1E-15
7440-02-0	Nickel	1.50E-08	2.5E+01	6.0E-10
62-75-9	N-nitrosodimethylamine	1.49E-09	1.2E+01	1.3E-10
87-86-5	Pentachlorophenol	7.31E-08	1.7E+00	4.2E-08
7782-49-2	Selenium	1.13E-09	5.0E-02	2.3E-08
7440-22-4	Silver	2.71E-07	2.0E-02	1.4E-05
7440-28-0	Thallium (I)	4.45E-06	1.0E-02	4.5E-04
7440-62-2	Vanadium	1.70E-06	2.0E+00	8.5E-07
7440-66-6	Zinc	2.17E-07	9.0E-01	2.4E-07
			Cumulative HI (e) =	**6E-04**

(a) Only those compounds with TRVs are listed in this table.
(b) Soil concentrations were calculated using USEPA's 2005 HHRAP fate and transport equations, using the IRAP software program.
(c) Toxicity Reference Values (TRVs) are discussed in the text.
(d) Hazard Quotient (HQ) is calculated by dividing the maximum annual soil concentration by the TRV.
(e) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

mg/kg - milligrams per kilogram

Table 8
Calculation of Hazard Quotients for Southwest Willow Flycatcher - Riparian Corridor Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Kow	BCF soil-soil invert (c)	Invertebrate Prey Tissue Concentration (mg/kg) (d)	Daily Dose from Prey (mg/kg-BW-d) (e)	Total Daily Dose (mg/kg-BW-d) (f)	TRV (mg/kg-BW-d) (g)	Hazard Quotient (h)
Acetone	2.90E-09		5.0E-02	8.7E-10	1.5E-09	1.5E-09	5.2E+01	2.8E-11
Aluminum	2.37E-04		2.2E-01	3.1E-04	5.2E-04	5.2E-04	1.0E+02	5.2E-06
Aroclor 1254	6.39E-08		1.1E+00	4.3E-07	7.3E-07	7.3E-07	7.2E-02	1.0E-05
Arsenic	3.87E-10		1.1E-01	2.5E-10	4.3E-10	4.3E-10	2.5E+00	1.7E-10
Barium	5.26E-05		2.2E-01	6.9E-05	1.2E-04	1.2E-04	2.1E+01	5.6E-06
Benzo(a)Anthracene	7.18E-10		3.0E-02	1.3E-10	2.2E-10	2.2E-10	7.9E-04	2.7E-07
Benzo(a)pyrene	5.72E-10		7.0E-02	2.4E-10	4.0E-10	4.0E-10	1.0E-03	4.0E-07
Benzo(b)fluoranthene	9.80E-09		7.0E-02	4.1E-09	6.9E-09	6.9E-09	1.4E-04	4.9E-05
Benzo(k)fluoranthene	3.29E-09		8.0E-02	1.6E-09	2.6E-09	2.6E-09	1.4E-04	1.9E-05
Cadmium	6.15E-08		9.6E-01	3.5E-07	5.9E-07	5.9E-07	1.5E+00	4.1E-07
Chromium, hexavalent	2.10E-05		2.2E-01	2.8E-05	4.7E-05	4.7E-05	1.0E+00	4.7E-05
Chrysene	5.14E-09		4.0E-02	1.2E-09	2.1E-09	2.1E-09	1.0E-03	2.1E-06
Copper	1.68E-07		4.0E-02	4.0E-08	6.7E-08	6.7E-08	4.7E+01	1.4E-09
DDE, 4,4'-	1.08E-07		1.3E+00	8.2E-07	1.4E-06	1.4E-06	8.5E-01	1.6E-06
Dibenz(a,h)anthracene	5.56E-10		7.0E-02	2.3E-10	3.9E-10	3.9E-10	3.9E-04	1.0E-06
Dinitrobenzene, 1,3-	8.56E-08		1.2E+00	6.1E-07	1.0E-06	1.0E-06	4.2E-04	2.4E-03
Ethylhexyl phthalate, bis-2-	9.50E-08		1.3E+03	7.4E-04	1.3E-03	1.3E-03	1.1E+02	1.1E-05
gamma-BHC (Lindane)	2.88E-10	4.0E+03	6.3E+01	1.1E-07	1.8E-07	1.8E-07	2.0E+00	9.2E-08
Heptachlor	1.28E-10		1.4E+00	1.1E-09	1.8E-09	1.8E-09	6.5E-02	2.8E-08
Hexachloro-1,3-butadiene (Perchlorobutadiene)	3.44E-08		5.4E+02	1.1E-04	1.9E-04	1.9E-04	3.2E+00	5.8E-05
Hexachlorobenzene	4.14E-09		2.3E+03	5.7E-05	9.6E-05	9.6E-05	2.3E-01	4.3E-04
Indeno(1,2,3-cd) pyrene	4.80E-09		8.0E-02	2.3E-09	3.9E-09	3.9E-09	1.0E-03	3.9E-06
Lead	9.16E-07		3.0E-02	1.6E-07	2.8E-07	2.8E-07	2.5E-02	1.1E-05
Manganese	1.00E-08		2.2E-01	1.3E-08	2.2E-08	2.2E-08	9.8E+02	2.3E-11
Mercuric chloride	8.55E-05		4.0E-02	2.0E-05	3.4E-05	3.4E-05	3.3E+00	1.1E-05
Methyl mercury	1.73E-06		8.5E+00	8.8E-05	1.5E-04	1.5E-04	6.4E-03	2.3E-02
Nickel	2.10E-09		2.0E-02	2.5E-10	4.2E-10	4.2E-10	6.5E+01	6.5E-12
Pentachloronitrobenzene (PCNB)	3.47E-07		4.5E+02	9.4E-04	1.6E-03	1.6E-03	6.9E+01	2.3E-05
Pentachlorophenol	8.08E-07		1.0E+03	5.0E-03	8.4E-03	8.4E-03	4.0E+00	2.1E-03
Selenium	1.59E-10		2.2E-01	2.1E-10	3.5E-10	3.5E-10	5.0E-01	7.0E-10
Silver	4.73E-06		2.2E-01	6.2E-06	1.0E-05	1.0E-05	1.8E+02	5.9E-08
Dioxin - TEQB	1.99E-09		(i)	3.2E-09	5.4E-09	5.4E-09	1.0E-05	5.4E-04
Thallium (l)	6.65E-05		2.2E-01	8.8E-05	1.5E-04	1.5E-04	3.5E-01	4.2E-04
Vanadium	2.36E-05		2.2E-01	3.1E-05	5.2E-05	5.2E-05	1.1E+01	4.6E-06
Zinc	3.05E-08		5.6E-01	1.0E-07	1.7E-07	1.7E-07	1.3E+02	1.3E-09
							Cumulative HI (j) :	**3E-02**

(a) Only those compounds with TRVs are listed in this table.

(b) Soil concentrations (Csoil) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program.

(c) For organic compounds not included in USEPA, 1999, a BCF value was calculated using the following equation:
logBCF=0.819 x logKow 1.146. For inorganic compounds not included in USEPA, 1999, a BCF value of 0.22 was used.

(d) Prey Tissue Concentration = Csoil x BCF/$CF_{WWinvert}$; except for Dioxin - TEQB which is calculated on a congener-specific basis and is shown elsewhere in this appendix.
Assumes 100% of prey tissue is potentially contaminated

Table 8
Calculation of Hazard Quotients for Southwest Willow Flycatcher - Riparian Corridor Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Kow	BCF soil-soil invert (c)	Invertebrate Prey Tissue Concentration (mg/kg) (d)	Daily Dose from Prey (mg/kg-BW-d) (e)	Total Daily Dose (mg/kg-BW-d) (f)	TRV (mg/kg-BW-d) (g)	Hazard Quotient (h)

(e) DDprey = Prey Tissue Concentration x Food IR; assumes 100% of prey tissue is potentially contaminated
(f) Total daily dose is the daily dose from prey with the assumption the flycatcher does not ingest soil.
(g) Toxicity Reference Values (TRVs) are discussed in the text.
(h) Hazard Quotients (HQ) are calculated by dividing the daily dose by the TRV.
(i) BCFs were calculated for individual congeners using bioaccumulation equivalency factors (BEFs) from Appendix D of USEPA (1999).
See elsewhere in this appendix for more information.
(j) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQB is the Toxic Equivalents (TEQ) for birds calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results. This calculation is presented elsewhere in this appendix.
Food IR - Food ingestion rate as shown in Table 5.2-2
Soil IR - Soil ingestion rate as shown in Table 5.2-2
$CF_{WW\text{-}invert}$ - Conversion factor from wet weight to dry weight (0.167)

mg - milligrams
kg - kilograms
BW - body weight
d - day
WW - wet weight
Kow - octanol-water partition coefficient

Table 9
Calculation of Hazard Quotients for Gambel's Quail - Riparian Corridor Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg WW) (c)	Daily Dose from Diet (mg/kg BW-d) (d)	Daily Dose from Soil (mg/kg BW-d) (e)	Total Daily Dose (mg/kg BW-d) (f)	TRV (Bird) (mg/kg BW-d) (g)	Hazard Quotient (h)
Acetone	2.90E-09	2.91E-09	1.4E-09	5.0E-12	1.4E-09	5.2E+01	2.7E-11
Aluminum	2.37E-04	1.27E-06	6.1E-07	4.1E-07	1.0E-06	1.0E+02	1.0E-08
Aroclor 1254	6.39E-08	3.14E-11	1.5E-11	1.1E-10	1.3E-10	7.2E-02	1.7E-09
Arsenic	3.87E-10	1.36E-06	6.5E-07	6.7E-13	6.5E-07	2.5E+00	2.6E-07
Barium	5.26E-05	2.18E-07	1.0E-07	9.1E-08	2.0E-07	2.1E+01	9.4E-09
Benzo(a)Anthracene	7.18E-10	4.78E-12	2.3E-12	1.2E-12	3.5E-12	7.9E-04	4.5E-09
Benzo(a)pyrene	5.72E-10	9.07E-12	4.3E-12	9.9E-13	5.3E-12	1.0E-03	5.3E-09
Benzo(b)fluoranthene	9.80E-09	1.52E-11	7.3E-12	1.7E-11	2.4E-11	1.4E-04	1.7E-07
Benzo(k)fluoranthene	3.29E-09	1.96E-11	9.4E-12	5.7E-12	1.5E-11	1.4E-04	1.1E-07
Cadmium	6.15E-08	3.35E-06	1.6E-06	1.1E-10	1.6E-06	1.5E+00	1.1E-06
Chromium, hexavalent	2.10E-05	7.07E-08	3.4E-08	3.6E-08	7.0E-08	1.0E+00	7.0E-08
Chrysene	5.14E-09	1.54E-11	7.3E-12	8.9E-12	1.6E-11	1.0E-03	1.6E-08
Copper	1.68E-07	1.29E-06	6.2E-07	2.9E-10	6.2E-07	4.7E+01	1.3E-08
DDE, 4,4'-	1.08E-07	1.58E-10	7.6E-11	1.9E-10	2.6E-10	8.5E-01	3.1E-10
Dibenz(a,h)anthracene	5.56E-10	3.00E-11	1.4E-11	9.6E-13	1.5E-11	3.9E-04	3.9E-08
Dinitrobenzene, 1,3-	8.56E-08	5.30E-08	2.5E-08	1.5E-10	2.5E-08	4.2E-04	6.0E-05
Ethylhexyl phthalate, bis-2-	9.50E-08	3.50E-08	1.7E-08	1.6E-10	1.7E-08	1.1E+02	1.5E-10
gamma-BHC (Lindane)	2.88E-10	1.20E-11	5.8E-12	5.0E-13	6.3E-12	2.0E+00	3.1E-12
Heptachlor	1.28E-10	1.94E-12	9.3E-13	2.2E-13	1.1E-12	6.5E-02	1.8E-11
Hexachloro-1,3-butadiene (Perchlorobutadiene)	3.44E-08	2.67E-10	1.3E-10	6.0E-11	1.9E-10	3.2E+00	5.9E-11
Hexachlorobenzene	4.14E-09	1.72E-11	8.2E-12	7.2E-12	1.5E-11	2.3E-01	6.8E-11
Indeno(1,2,3-cd) pyrene	4.80E-09	5.83E-11	2.8E-11	8.3E-12	3.6E-11	1.0E-03	3.6E-08
Lead	9.16E-07	3.36E-06	1.6E-06	1.6E-09	1.6E-06	2.5E-02	6.4E-05
Manganese	1.00E-08	4.99E-07	2.4E-07	1.7E-11	2.4E-07	9.8E+02	2.4E-10
Mercuric chloride	8.55E-05	1.64E-07	7.8E-08	1.5E-07	2.3E-07	3.3E+00	7.0E-08
Methyl mercury	1.73E-06	2.83E-08	1.4E-08	3.0E-09	1.7E-08	6.4E-03	2.6E-06
Nickel	2.10E-09	1.06E-07	5.1E-08	3.6E-12	5.1E-08	6.5E+01	7.8E-10
Pentachloronitrobenzene (PCNB)	3.47E-07	3.09E-09	1.5E-09	6.0E-10	2.1E-09	6.9E+01	3.0E-11
Pentachlorophenol	8.08E-07	3.06E-07	1.5E-07	1.4E-09	1.5E-07	4.0E+00	3.7E-08
Selenium	1.59E-10	4.07E-08	1.9E-08	2.7E-13	1.9E-08	5.0E-01	3.9E-08
Silver	4.73E-06	9.41E-08	4.5E-08	8.2E-09	5.3E-08	1.8E+02	3.0E-10
Dioxin - TEQB	1.99E-09	3.33E-12	1.6E-12	3.5E-12	5.0E-12	1.0E-05	5.0E-07
Thallium (I)	6.65E-05	1.03E-07	4.9E-08	1.2E-07	1.6E-07	3.5E-01	4.7E-07
Vanadium	2.36E-05	3.10E-08	1.5E-08	4.1E-08	5.6E-08	1.1E+01	4.9E-09
Zinc	3.05E-08	1.62E-06	7.8E-07	5.3E-11	7.8E-07	1.3E+02	5.9E-09
						Cumulative HI (i):	**1E-04**

(a) Only those compounds with TRVs are listed in this table.
(b) Soil concentrations (Csoil) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program.
(c) Plant concentrations (Cplant) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program. Wet weight plant concentrations were calculated from the IRAP outputs dry weight concentrations using a moisture content of 88% as specified in USEPA's 1999 Screening Ecological Risk Assessment Protocol.
(d) DDdiet = Cplant x Food IR; assumes that 100% of ingested plant material is potentially contaminated
(e) DDsoil = Csoil x Soil IR; assumes that 100% of ingested soil is potentially contaminated
(f) Total Daily Dose = DDdiet + DDsoil
(g) Toxicity Reference Values (TRVs) are discussed in the text.

Table 9
Calculation of Hazard Quotients for Gambel's Quail - Riparian Corridor Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg WW) (c)	Daily Dose from Diet (mg/kg BW-d) (d)	Daily Dose from Soil (mg/kg BW-d) (e)	Total Daily Dose (mg/kg BW-d) (f)	TRV (Bird) (mg/kg BW-d) (g)	Hazard Quotient (h)

(h) Hazard Quotients (HQ) are calculated by dividing the daily dose by the TRV.

(i) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQB is the Toxic Equivalents (TEQ) for birds calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results. This calculation is presented elsewhere in this appendix.

Food IR - Food ingestion rate as shown in Table 5.2-2

Soil IR - Soil ingestion rate as shown in Table 5.2-2

mg - milligrams

kg - kilograms

BW - body weight

d - day

DD - daily dose

Table 10
Hazard Quotients for Plants (Screwbean mesquite) in the Riparian Corridor Area

CAS No	Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Toxicity Reference Value (TRV) (mg/kg) (c)	Hazard Quotient (d)
108-60-1	2,2'-oxybis (1-Chloropropane)	2.04E-10	2.0E+01	1.0E-11
591-78-6	2-Hexanone	1.38E-10	1.3E+01	1.1E-11
91-57-6	2-Methylnaphthalene	5.39E-09	3.2E+00	1.7E-09
534-52-1	4,6-Dinitro-2-methylphenol	7.33E-07	1.4E-01	5.1E-06
208-96-8	Acenaphthylene	6.48E-09	6.8E+02	9.5E-12
7429-90-5	Aluminum	2.37E-04	5.0E+00	4.7E-05
7440-36-0	Antimony	2.42E-10	5.0E-01	4.8E-10
11097-69-1	Aroclor 1254	6.39E-08	1.0E+01	6.4E-09
7440-38-2	Arsenic	3.87E-10	1.0E+00	3.9E-10
7440-39-3	Barium	5.26E-05	5.0E+00	1.1E-05
56-55-3	Benzo(a)Anthracene	7.18E-10	1.2E+00	6.0E-10
50-32-8	Benzo(a)pyrene	5.72E-10	1.2E+00	4.8E-10
205-99-2	Benzo(b)fluoranthene	9.80E-09	1.2E+00	8.2E-09
191-24-2	Benzo(g,h,i)perylene	1.91E-08	1.2E+02	1.6E-10
207-08-9	Benzo(k)fluoranthene	3.29E-09	1.2E+00	2.7E-09
7440-41-7	Beryllium	5.40E-07	1.0E-01	5.4E-06
111-91-1	Bis(2-chloroethoxy) methane	4.17E-08	3.0E-01	1.4E-07
7440-43-9	Cadmium	6.15E-08	2.0E-01	3.1E-07
18540-29-9	Chromium, hexavalent	2.10E-05	1.8E-02	1.2E-03
218-01-9	Chrysene	5.14E-09	1.2E+00	4.3E-09
7440-48-4	Cobalt	3.57E-06	2.0E+01	1.8E-07
7440-50-8	Copper	1.68E-07	1.0E+00	1.7E-07
319-86-8	delta-BHC	1.09E-07	9.9E+00	1.1E-08
53-70-3	Dibenz(a,h)anthracene	5.56E-10	1.2E+00	4.6E-10
122-39-4	Diphenylamine	3.86E-06	1.0E+00	3.8E-06
33213-65-9	Endosulfan II	6.35E-10	1.2E-01	5.3E-09
7421-93-4	Endrin aldehyde	2.23E-07	1.1E-02	2.1E-05
58-89-9	gamma-BHC (Lindane)	2.88E-10	5.0E-03	5.8E-08
76-44-8	Heptachlor	1.28E-10	1.0E+00	1.3E-10
77-47-4	Hexachlorocyclopentadiene	4.99E-08	1.0E-01	5.0E-07
193-39-5	Indeno(1,2,3-cd) pyrene	4.80E-09	1.2E+00	4.0E-09
74-88-4	Iodomethane	3.01E-11	1.2E+00	2.4E-11
7439-92-1	Lead	9.16E-07	4.6E+00	2.0E-07
7439-96-5	Manganese	1.00E-08	5.0E+02	2.0E-11
7487-94-7	Mercuric chloride	8.55E-05	3.5E-01	2.4E-04
80-62-6	Methyl methacrylate	1.24E-13	9.8E+02	1.3E-16
7440-02-0	Nickel	2.10E-09	2.5E+01	8.4E-11
62-75-9	N-nitrosodimethylamine	2.11E-09	1.2E+01	1.8E-10
87-86-5	Pentachlorophenol	8.08E-07	1.7E+00	4.7E-07
7782-49-2	Selenium	1.59E-10	5.0E-02	3.2E-09
7440-22-4	Silver	4.73E-06	2.0E-02	2.4E-04
7440-28-0	Thallium (I)	6.65E-05	1.0E-02	6.7E-03
7440-62-2	Vanadium	2.36E-05	2.0E+00	1.2E-05
7440-66-6	Zinc	3.05E-08	9.0E-01	3.4E-08
			Cumulative HI (e):	**8E-03**

(a) Only those compounds with TRVs are listed in this table.
(b) Soil concentrations were calculated using USEPA's 2005 HHRAP fate and transport equations, using the IRAP software program.
(c) Toxicity Reference Values (TRVs) are discussed in the text.
(d) Hazard Quotient (HQ) is calculated by dividing the maximum annual soil concentration by the TRV.
(e) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted.
A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

mg/kg - milligrams per kilogram

Table 11
Calculation of Hazard Quotients for Double-crested Cormorant - Colorado River Area

Compound (a)	Maximum Annual Sediment Concentration (mg/kg) (b)	Maximum Annual Total Surface Water Concentration (mg/L) (c)	Maximum Annual Fish Concentration (mg COPC/kg WW tissue) (d)	Daily Dose from Sediment (mg/kg BW-d) (e)	Daily Dose from Surface Water (mg/kg BW-d) (f)	Daily Dose from Diet (mg/kg BW-d) (g)	Total Daily Dose (mg/kg BW-d) (h)	TRV (Bird) (mg/kg BW-d) (i)	Hazard Quotient (j)
Acetone	6.70E-12	3.35E-10	1.06E-09	3.7E-14	1.9E-11	2.9E-10	3.1E-10	5.2E+01	5.9E-12
Aluminum	5.48E-06	5.54E-07	2.77E-04	3.0E-08	3.1E-08	7.6E-05	7.6E-05	1.0E+02	7.6E-07
Aroclor 1254	4.48E-08	6.75E-13	1.57E-07	2.4E-10	3.7E-14	4.3E-08	4.3E-08	7.2E-02	6.0E-07
Arsenic	1.31E-08	4.52E-10	5.15E-08	7.2E-11	2.5E-11	1.4E-08	1.4E-08	2.5E+00	5.8E-09
Barium	1.24E-06	3.02E-08	1.91E-05	6.8E-09	1.7E-09	5.2E-06	5.2E-06	2.1E+01	2.5E-07
Benzo(a)Anthracene	2.09E-10	1.56E-14	7.27E-10	1.1E-12	8.7E-16	2.0E-10	2.0E-10	7.9E-04	2.5E-07
Benzo(a)pyrene	4.94E-10	1.52E-14	1.70E-09	2.7E-12	8.4E-16	4.6E-10	4.7E-10	1.0E-03	4.7E-07
Benzo(b)fluoranthene	6.89E-09	1.98E-13	3.39E-08	3.8E-11	1.1E-14	9.2E-09	9.3E-09	1.4E-04	6.6E-05
Benzo(k)fluoranthene	1.95E-09	5.88E-14	8.70E-09	1.1E-11	3.3E-15	2.4E-09	2.4E-09	1.4E-04	1.7E-05
Cadmium	8.57E-08	1.14E-09	1.04E-06	4.7E-10	6.3E-11	2.8E-07	2.8E-07	1.5E+00	2.0E-07
Chromium, hexavalent	4.52E-07	2.38E-08	4.52E-07	2.5E-09	1.3E-09	1.2E-07	1.3E-07	1.0E+00	1.3E-07
Chrysene	1.20E-09	8.08E-14	3.74E-09	6.6E-12	4.5E-15	1.0E-09	1.0E-09	1.0E-03	1.0E-06
Copper	1.90E-07	4.41E-10	8.82E-08	1.0E-09	2.5E-11	2.4E-08	2.5E-08	4.7E+01	5.3E-10
DDE, 4,4'-	3.92E-09	1.15E-12	5.65E-08	2.1E-11	6.4E-14	1.5E-08	1.5E-08	8.5E-01	1.8E-08
Dibenz(a,h)anthracene	1.35E-09	2.55E-14	9.38E-09	7.4E-12	1.4E-15	2.6E-09	2.6E-09	3.9E-04	6.6E-06
Dinitrobenzene, 1,3-	2.19E-10	1.84E-10	5.24E-10	1.2E-12	1.0E-11	1.4E-10	1.5E-10	4.2E-04	3.7E-07
Ethylhexyl phthalate, bis-2-	1.07E-07	2.46E-11	4.67E-09	5.8E-10	1.4E-12	1.3E-09	1.9E-09	1.1E+02	1.7E-11
gamma-BHC (Lindane)	6.66E-11	1.23E-12	1.45E-10	3.6E-13	6.8E-14	4.0E-11	4.0E-11	2.0E+00	2.0E-11
Heptachlor	3.00E-11	7.88E-14	4.79E-11	1.6E-13	4.4E-15	1.3E-11	1.3E-11	6.5E-02	2.0E-10
Hexachloro-1,3-butadiene (Perchlorobutadiene)	7.62E-10	2.52E-12	6.11E-09	4.2E-12	1.4E-13	1.7E-09	1.7E-09	3.2E+00	5.2E-10
Hexachlorobenzene	8.14E-09	2.58E-12	2.94E-08	4.4E-11	1.4E-13	8.0E-09	8.1E-09	2.3E-01	3.6E-08
Indeno(1,2,3-cd) pyrene	1.86E-08	2.42E-13	9.36E-08	1.0E-10	1.3E-14	2.6E-08	2.6E-08	1.0E-03	2.6E-05
Lead	1.04E-06	1.16E-09	1.04E-10	5.7E-09	6.4E-11	2.8E-11	5.8E-09	2.5E-02	2.3E-07
Manganese	1.11E-08	1.71E-10	6.82E-08	6.0E-11	9.5E-12	1.9E-08	1.9E-08	9.8E+02	1.9E-11
Mercuric chloride	1.54E-05	3.89E-10	0.00E+00	8.4E-08	2.2E-11	0.0E+00	8.4E-08	3.3E+00	2.6E-08
Methyl mercury	7.43E-08	4.63E-11	3.15E-04	4.1E-10	2.6E-12	8.6E-05	8.6E-05	6.4E-03	1.3E-02
Nickel	2.37E-09	3.65E-11	2.84E-09	1.3E-11	2.0E-12	7.8E-10	7.9E-10	6.5E+01	1.2E-11
Pentachloronitrobenzene (PCNB)	1.79E-08	1.24E-11	2.00E-08	9.8E-11	6.9E-13	5.4E-09	5.5E-09	6.9E+01	8.1E-11
Pentachlorophenol	1.38E-07	5.82E-09	1.42E-05	7.5E-10	3.2E-10	3.9E-06	3.9E-06	4.0E+00	9.6E-07
Selenium	7.24E-11	1.45E-11	5.93E-09	4.0E-13	8.0E-13	1.6E-09	1.6E-09	5.0E-01	3.2E-09
Silver	1.09E-07	1.31E-08	1.15E-06	5.9E-10	7.3E-10	3.1E-07	3.1E-07	1.8E+02	1.8E-09
Dioxin - TEQB	1.75E-09	3.23E-14	2.43E-10	9.6E-12	1.8E-15	6.6E-11	7.6E-11	1.0E-05	7.6E-06
Thallium (I)	1.59E-06	2.23E-08	2.23E-04	8.6E-09	1.2E-09	6.1E-05	6.1E-05	3.5E-01	1.7E-04
Vanadium	7.40E-07	7.42E-10	0.00E+00	4.0E-09	4.1E-11	0.0E+00	4.1E-09	1.1E+01	3.6E-10
Zinc	3.45E-08	5.56E-10	1.14E-06	1.9E-10	3.1E-11	3.1E-07	3.1E-07	1.3E+02	2.4E-09
								Cumulative HI (k):	**1E-02**

(a) Only those compounds with TRVs are listed in this table.
(b) Sediment concentrations (Csed) were calculated using USEPA's 2005 HHRAP fate and transport equations, using the IRAP software program.
(c) Surface water concentrations (Csw) were calculated using USEPA's 2005 HHRAP fate and transport equations, using the IRAP software program.
HHRAP calculates dissolved, but not total, water column concentrations for methyl mercury, and thus the dissolved concentration was used in this table for methyl mercury.
(d) Cfish were derived using IRAP software; assumes trophic level 4.
(e) DDsed = Csed x Sediment IR; assumes 100% of fish is potentially contaminated
(f) DDsw = Csw x Water IR; assumes 100% of surface water is potentially contaminated
(g) DDdiet = Cfish x Food IR; assumes 100% of fish is potentially contaminated
(h) Total Daily Dose = DDdiet + DDsed + DDsw

Table 11
Calculation of Hazard Quotients for Double-crested Cormorant - Colorado River Area

Compound (a)	Maximum Annual Sediment Concentration (mg/kg) (b)	Maximum Annual Total Surface Water Concentration (mg/L) (c)	Maximum Annual Fish Concentration (mg COPC/kg WW tissue) (d)	Daily Dose from Sediment (mg/kg BW-d) (e)	Daily Dose from Surface Water (mg/kg BW-d) (f)	Daily Dose from Diet (mg/kg BW-d) (g)	Total Daily Dose (mg/kg BW-d) (h)	TRV (Bird) (mg/kg BW-d) (i)	Hazard Quotient (j)

(i) Toxicity Reference Values (TRVs) are discussed in the text.
(j) Hazard Quotient is calculated by dividing the Daily Dose by the TRV.
(k) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQB is the Toxic Equivalents (TEQ) for birds calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results. This calculation is presented elsewhere in this appendix.
Sediment IR - Sediment ingestion rate as shown in Table 5.2-2
Food IR - Food ingestion rate as shown in Table 5.2-2
Water IR - Surface water ingestion rate as shown in Table 5.2-2

mg - milligrams
kg - kilograms
L - liters
BW - body weight
d - day
WW - wet weight

Table 12
Calculation of Hazard Quotients for Surface Water - Colorado River Area*

CAS No	Compound (a)	Maximum Annual Dissolved Surface Water Concentration (mg/L) (b)	TRV (mg/L) (c)	Hazard Quotient (d)
95-63-6	1,2,4-Trimethylbenzene	1.26E-12	7.7E-02	1.6E-11
142-28-9	1,3-Dichloropropane	9.36E-13	1.3E+00	7.1E-13
110-54-3	1-Hexane (n-hexane)	1.51E-15	2.5E-02	6.1E-14
594-20-7	2,2-Dichloropropane	5.23E-13	3.9E-01	1.3E-12
625-86-5	2,5-Dimethylfuran	1.60E-12	7.1E-01	2.3E-12
95-49-8	2-Chlorotoluene	1.19E-12	1.4E-01	8.5E-12
591-78-6	2-Hexanone	9.45E-12	4.3E+00	2.2E-12
91-57-6	2-Methylnaphthalene	2.26E-13	1.5E-02	1.5E-11
534-52-1	4,6-Dinitro-2-methylphenol	2.58E-09	2.4E-02	1.1E-07
106-43-4	4-Chlorotoluene	9.00E-13	3.4E+00	2.6E-13
67-64-1	Acetone	3.35E-10	1.5E+00	2.2E-10
79-10-7	Acrylic Acid	1.10E-16	3.8E+00	2.9E-17
107-13-1	Acrylonitrile	3.85E-11	2.5E-01	1.5E-10
7429-90-5	Aluminum	5.54E-07	8.7E-02	6.4E-06
7440-36-0	Antimony	7.22E-12	3.0E-02	2.4E-10
11097-69-1	Aroclor 1254	4.56E-13	2.0E-05	2.3E-08
7440-38-2	Arsenic	4.52E-10	1.9E-01	2.4E-09
7440-39-3	Barium	3.02E-08	4.0E-03	7.6E-06
92-87-5	Benzidine	1.93E-08	8.9E-02	2.2E-07
56-55-3	Benzo(a)Anthracene	1.46E-14	2.7E-05	5.4E-10
50-32-8	Benzo(a)pyrene	1.28E-14	1.4E-05	9.1E-10
205-99-2	Benzo(b)fluoranthene	1.64E-13	2.7E-05	6.1E-09
207-08-9	Benzo(k)fluoranthene	4.93E-14	2.7E-05	1.8E-09
7440-41-7	Beryllium	4.76E-10	5.3E-03	9.0E-08
111-91-1	Bis(2-chloroethoxy) methane	5.33E-10	1.8E+00	2.9E-10
108-86-1	Bromobenzene	1.08E-12	5.6E-02	1.9E-11
98-06-6	Butylbenzene, tert	1.13E-12	6.5E-01	1.7E-12
7440-43-9	Cadmium	1.14E-09	5.3E-03	2.2E-07
86-74-8	Carbazole	1.12E-10	1.5E-02	7.5E-09
67-66-3	Chloroform (Trichloromethane)	1.62E-11	2.8E-02	5.8E-10
18540-29-9	Chromium, hexavalent	2.38E-08	1.1E-02	2.2E-06
218-01-9	Chrysene	7.50E-14	2.7E-05	2.8E-09
7440-50-8	Copper	4.41E-10	2.5E-02	1.8E-08
72-55-9	DDE, 4,4'-	1.13E-12	2.0E-05	5.7E-08
319-86-8	delta-BHC	2.53E-11	1.3E-01	1.9E-10
53-70-3	Dibenz(a,h)anthracene	1.89E-14	2.7E-05	7.0E-10
132-64-9	Dibenzofuran	5.95E-11	2.0E-02	3.0E-09
99-65-0	Dinitrobenzene, 1,3-	1.84E-10	2.6E-02	7.1E-09
121-14-2	Dinitrotoluene, 2,4-	4.24E-10	2.3E-02	1.8E-08
606-20-2	Dinitrotoluene, 2,6-	5.59E-10	6.0E-02	9.3E-09
117-84-0	Di-n-octylphthalate	3.94E-13	3.2E-01	1.2E-12
123-91-1	Dioxane, 1,4-	4.72E-16	6.2E+01	7.6E-18
122-39-4	Diphenylamine	1.45E-10	3.8E-02	3.8E-09
33213-65-9	Endosulfan II	1.43E-12	5.6E-05	2.5E-08
1031-07-8	Endosulfan sulfate	8.30E-12	6.0E-05	1.4E-07
7421-93-4	Endrin aldehyde	2.62E-12	8.0E-05	3.3E-08
107-21-1	Ethylene Glycol	5.40E-11	1.0E+03	5.4E-14
117-81-7	Ethylhexyl phthalate, bis-2-	2.41E-11	3.0E-03	8.0E-09
58-89-9	gamma-BHC (Lindane)	1.23E-12	2.8E-04	4.4E-09
76-44-8	Heptachlor	7.87E-14	4.0E-06	2.0E-08
87-68-3	Hexachloro-1,3-butadiene (Perchlorobutadiene)	2.52E-12	8.2E-03	3.1E-10
118-74-1	Hexachlorobenzene	2.54E-12	3.7E-03	6.9E-10
77-47-4	Hexachlorocyclopentadiene	1.65E-11	3.0E-04	5.5E-08
193-39-5	Indeno(1,2,3-cd) pyrene	1.51E-13	2.7E-05	5.6E-09
99-87-6	Isopropyl toluene, p-	1.01E-12	4.6E-02	2.2E-11
7439-92-1	Lead	1.16E-09	8.7E-03	1.3E-07
7439-96-5	Manganese	1.71E-10	8.0E-02	2.1E-09
7487-94-7	Mercuric chloride	2.62E-10	7.7E-04	3.4E-07
22967-92-6	Methyl mercury	4.63E-11	2.8E-06	1.7E-05
80-62-6	Methyl methacrylate	1.77E-14	3.4E+00	5.2E-15
1634-04-4	methyl tert-butyl ether	2.31E-13	1.0E+02	2.3E-15
7440-02-0	Nickel	3.65E-11	1.4E-01	2.6E-10
98-95-3	Nitrobenzene	1.20E-11	8.5E-01	1.4E-11

Table 12
Calculation of Hazard Quotients for Surface Water - Colorado River Area*

CAS No	Compound (a)	Maximum Annual Dissolved Surface Water Concentration (mg/L) (b)	TRV (mg/L) (c)	Hazard Quotient (d)
608-93-5	Pentachlorobenzene	2.76E-12	4.7E-04	5.9E-09
82-68-8	Pentachloronitrobenzene (PCNB)	1.23E-11	1.0E-02	1.2E-09
87-86-5	Pentachlorophenol	5.82E-09	1.6E-02	3.7E-07
103-65-1	Propylbenzene, n-	8.06E-13	1.6E-02	5.2E-11
7782-49-2	Selenium (e)	1.45E-11	2.0E-03	7.2E-09
7440-22-4	Silver	1.31E-08	1.2E-04	1.1E-04
TEQF	Dioxin - TEQF	8.86E-15	5.0E-06	1.8E-09
7440-28-0	Thallium (l)	2.23E-08	1.5E-01	1.5E-07
7440-62-2	Vanadium	7.40E-10	1.9E-02	3.9E-08
75-01-4	Vinyl Chloride	1.19E-12	3.9E+00	3.1E-13
7440-66-6	Zinc	5.56E-10	3.2E-01	1.8E-09
			Cumulative HI (f):	**1E-04**

(a) Only those compounds with TRVs are listed in this table.
(b) Surface water concentrations were calculated using USEPA's 2005 HHRAP fate and transport equations, using the IRAP software program.
(c) Toxicity Reference Values (TRVs) are discussed in the text.
(d) Maximum Hazard Quotient (HQ) is calculated by dividing the maximum annual surface water concentration by the TRV.
(e) The water concentration and the TRV for selenium is for total selenium.
(f) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQF is the Toxic Equivalents (TEQ) for fish calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results. This calculation is presented elsewhere in this appendix.
* Surface water concentrations for the Colorado River Area are used as a surrogate for the Riparian Backwater Area. Therefore, hazard quotients for Colorado River Area apply to the Riparian Backwater Area as well.

mg/L - milligrams per liter

Table 13
Calculation of Hazard Quotients for Sediment - Colorado River Area*

CAS No	Compound (a)	Maximum Annual Sediment Concentration (mg/kg) (b)	Toxicity Reference Value (TRV) (mg/kg) (c)	Hazard Quotient (d)
67-64-1	Acetone	6.70E-12	5.7E-02	1.2E-10
107-13-1	Acrylonitrile	2.70E-12	2.3E-02	1.2E-10
7429-90-5	Aluminum	5.48E-06	1.4E+04	3.9E-10
7440-36-0	Antimony	3.25E-10	6.4E+01	5.1E-12
11097-69-1	Aroclor 1254	4.48E-08	5.0E-02	9.0E-07
7440-38-2	Arsenic	1.31E-08	6.0E+00	2.2E-09
7440-39-3	Barium	1.24E-06	2.0E+01	6.2E-08
56-55-3	Benzo(a)Anthracene	2.09E-10	1.9E-02	1.1E-08
50-32-8	Benzo(a)pyrene	4.94E-10	8.4E-02	5.9E-09
205-99-2	Benzo(b)fluoranthene	6.89E-09	3.7E-02	1.9E-07
207-08-9	Benzo(k)fluoranthene	1.95E-09	3.7E-02	5.3E-08
7440-43-9	Cadmium	8.57E-08	6.0E-01	1.4E-07
67-66-3	Chloroform (Trichloromethane)	3.41E-11	5.9E-02	5.7E-10
7440-47-3	Chromium	4.52E-07	2.6E+01	1.7E-08
218-01-9	Chrysene	1.20E-09	3.0E-02	4.0E-08
7440-50-8	Copper	1.90E-07	1.6E+01	1.2E-08
72-55-9	DDE, 4,4'-	3.92E-09	5.0E-03	7.8E-07
53-70-3	Dibenz(a,h)anthracene	1.35E-09	1.0E-02	1.4E-07
99-65-0	Dinitrobenzene, 1,3-	2.19E-10	2.1E-02	1.0E-08
121-14-2	Dinitrotoluene, 2,4-	1.50E-09	4.7E-02	3.2E-08
606-20-2	Dinitrotoluene, 2,6-	1.10E-09	1.0E-01	1.1E-08
117-84-0	Di-n-octylphthalate	1.45E-06	1.2E+07	1.2E-13
123-91-1	Dioxane, 1,4-	9.44E-18	2.2E+00	4.3E-18
117-81-7	Ethylhexyl phthalate, bis-2-	1.07E-07	1.3E+01	8.0E-09
58-89-9	gamma-BHC (Lindane)	6.66E-11	3.2E-04	2.1E-07
76-44-8	Heptachlor	3.00E-11	3.0E-04	1.0E-07
87-68-3	Hexachloro-1,3-butadiene (Perchlorobutadiene)	7.62E-10	2.6E-01	3.0E-09
118-74-1	Hexachlorobenzene	8.14E-09	2.0E-02	4.1E-07
77-47-4	Hexachlorocyclopentadiene	7.75E-09	2.0E-01	3.9E-08
193-39-5	Indeno(1,2,3-cd) pyrene	1.86E-08	3.0E-02	6.2E-07
7439-92-1	Lead	1.04E-06	3.1E+01	3.4E-08
7487-94-7	Mercuric chloride	1.54E-05	2.0E-01	7.7E-05
22967-92-6	Methyl mercury	7.43E-08	2.0E-01	3.7E-07
7440-02-0	Nickel	2.37E-09	1.6E+01	1.5E-10
98-95-3	Nitrobenzene	5.70E-11	1.3E+00	4.4E-11
608-93-5	Pentachlorobenzene	1.34E-08	6.0E-01	2.2E-08
87-86-5	Pentachlorophenol	1.38E-07	7.0E+00	2.0E-08
7782-49-2	Selenium	7.24E-11	1.0E-01	7.2E-10
7440-22-4	Silver	1.09E-07	4.5E+00	2.4E-08
TEQF	Dioxin - TEQF	1.22E-09	4.1E-04	3.0E-06
75-01-4	Vinyl Chloride	7.37E-13	1.7E+00	4.3E-13
7440-66-6	Zinc	3.45E-08	1.1E+02	3.1E-10
			Cumulative HI (e):	**8E-05**

(a) Only those compounds with TRVs are listed in this table.
(b) Sediment concentrations were calculated using USEPA's 2005 HHRAP fate and transport equations, using the IRAP software program.
(c) Toxicity Reference Values (TRVs) are discussed in the text.
(d) Maximum Hazard Quotient (HQ) is calculated by dividing the maximum annual sediment concentration by the TRV.
(e) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.
Dioxin-TEQF is the Toxic Equivalents (TEQ) for fish calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results. This calculation is presented elsewhere in this appendix.
* Sediment concentrations for the Colorado River Area are used as a surrogate for the Riparian Backwater Area. Therefore, hazard quotients for Colorado River Area apply to the Riparian Backwater Area as well.

mg/kg - milligrams per kilogram

Table 14
Calculation of Hazard Quotients for Yuma Clapper Rail - Riparian Backwater Area

Compound (a)	Maximum Annual Sediment Concentration (mg/kg) (b)	Maximum Annual Total Surface Water Concentration (mg/L) (c)	Kow	BCF sediment-benthic invert (d)	Prey Tissue Concentration (mg/kg) (e)	Daily Dose from Sediment (mg/kg BW-d) (f)	Daily Dose from Surface Water (mg/kg BW-d) (g)	Daily Dose from Diet (mg/kg BW-d) (h)	Total Daily Dose (mg/kg BW-d) (i)	TRV (Bird) (mg/kg BW-d) (j)	Hazard Quotient (k)
Acetone	6.70E-12	3.35E-10		5.0E-02	2.8E-12	1.4E-13	3.6E-11	1.8E-12	3.8E-11	5.2E+01	7.3E-13
Aluminum	5.48E-06	5.54E-07		9.0E-01	4.1E-05	1.1E-07	6.0E-08	2.7E-05	2.7E-05	1.0E+02	2.7E-07
Aroclor 1254	4.48E-08	6.75E-13		5.3E-01	2.0E-07	9.3E-10	7.3E-14	1.3E-07	1.3E-07	7.2E-02	1.8E-06
Arsenic	1.31E-08	4.52E-10		9.0E-01	9.8E-08	2.7E-10	4.9E-11	6.5E-08	6.5E-08	2.5E+00	2.7E-08
Barium	1.24E-06	3.02E-08		9.0E-01	9.3E-06	2.6E-08	3.3E-09	6.1E-06	6.2E-06	2.1E+01	3.0E-07
Benzo(a)Anthracene	2.09E-10	1.56E-14		1.5E+00	2.5E-09	4.3E-12	1.7E-15	1.7E-09	1.7E-09	7.9E-04	2.1E-06
Benzo(a)pyrene	4.94E-10	1.52E-14		1.6E+00	6.6E-09	1.0E-11	1.6E-15	4.3E-09	4.3E-09	1.0E-03	4.3E-06
Benzo(b)fluoranthene	6.89E-09	1.98E-13		1.6E+00	9.2E-08	1.4E-10	2.1E-14	6.1E-08	6.1E-08	1.4E-04	4.4E-04
Benzo(k)fluoranthene	1.95E-09	5.88E-14		1.6E+00	2.6E-08	4.0E-11	6.3E-15	1.7E-08	1.7E-08	1.4E-04	1.2E-04
Cadmium	8.57E-08	1.14E-09		3.4E+00	2.4E-06	1.8E-09	1.2E-10	1.6E-06	1.6E-06	1.5E+00	1.1E-06
Chromium, hexavalent	4.52E-07	2.38E-08	1.0E+00	7.1E-02	2.7E-07	9.3E-09	2.6E-09	1.8E-07	1.9E-07	1.0E+00	1.9E-07
Chrysene	1.20E-09	8.08E-14		1.4E+00	1.4E-08	2.5E-11	8.7E-15	9.1E-09	9.2E-09	1.0E-03	9.2E-06
Copper	1.90E-07	4.41E-10		3.0E-01	4.7E-07	3.9E-09	4.8E-11	3.1E-07	3.2E-07	4.7E+01	6.7E-09
DDE, 4,4'-	3.92E-09	1.15E-12		9.5E-01	3.1E-08	8.1E-11	1.2E-13	2.0E-08	2.1E-08	8.5E-01	2.4E-08
Dibenz(a,h)anthracene	1.35E-09	2.55E-14		1.6E+00	1.8E-08	2.8E-11	2.8E-15	1.2E-08	1.2E-08	3.9E-04	3.1E-05
Dinitrobenzene, 1,3-	2.19E-10	1.84E-10		1.2E+00	2.2E-09	4.5E-12	2.0E-11	1.4E-09	1.5E-09	4.2E-04	3.4E-06
Ethylhexyl phthalate, bis-2-	1.07E-07	2.46E-11		1.3E+03	1.2E-03	2.2E-09	2.7E-12	7.7E-04	7.7E-04	1.1E+02	6.9E-06
gamma-BHC (Lindane)	6.66E-11	1.23E-12	4.0E+03	6.3E+01	3.5E-08	1.4E-12	1.3E-13	2.3E-08	2.3E-08	2.0E+00	1.2E-08
Heptachlor	3.00E-11	7.88E-14		1.7E+00	4.2E-10	6.2E-13	8.5E-15	2.8E-10	2.8E-10	6.5E-02	4.2E-09
Hexachloro-1,3-butadiene (Perchlorobutadiene)	7.62E-10	2.52E-12		4.4E-01	2.8E-09	1.6E-11	2.7E-13	1.8E-09	1.9E-09	3.2E+00	5.8E-10
Hexachlorobenzene	8.14E-09	2.58E-12		2.3E+03	1.6E-04	1.7E-10	2.8E-13	1.0E-04	1.0E-04	2.3E-01	4.6E-04
Indeno(1,2,3-cd) pyrene	1.86E-08	2.42E-13		1.6E+00	2.5E-07	3.9E-10	2.6E-14	1.6E-07	1.7E-07	1.0E-03	1.7E-04
Lead	1.04E-06	1.16E-09		6.3E-01	5.5E-06	2.1E-08	1.3E-10	3.6E-06	3.6E-06	2.5E-02	1.5E-04
Manganese	1.11E-08	1.71E-10		9.0E-01	8.3E-08	2.3E-10	1.8E-11	5.5E-08	5.5E-08	9.8E+02	5.6E-11
Mercuric chloride	1.54E-05	3.89E-10		6.8E-02	8.7E-06	3.2E-07	4.2E-11	5.8E-06	6.1E-06	3.3E+00	1.9E-06
Methyl mercury	7.43E-08	4.63E-11		4.8E-01	3.0E-07	1.5E-09	5.0E-12	2.0E-07	2.0E-07	6.4E-03	3.1E-05
Nickel	2.37E-09	3.65E-11		9.0E-01	1.8E-08	4.9E-11	3.9E-12	1.2E-08	1.2E-08	6.5E+01	1.8E-10
Pentachloronitrobenzene (PCNB)	1.79E-08	1.24E-11		4.5E+02	6.7E-05	3.7E-10	1.3E-12	4.4E-05	4.4E-05	6.9E+01	6.5E-07
Pentachlorophenol	1.38E-07	5.82E-09		1.0E+03	1.2E-03	2.8E-09	6.3E-10	7.8E-04	7.8E-04	4.0E+00	1.9E-04
Selenium	7.24E-11	1.45E-11		9.0E-01	5.4E-10	1.5E-12	1.6E-12	3.6E-10	3.6E-10	5.0E-01	7.2E-10
Silver	1.09E-07	1.31E-08		9.0E-01	8.2E-07	2.2E-09	1.4E-09	5.4E-07	5.4E-07	1.8E+02	3.0E-09
Dioxin - TEQB	1.75E-09	3.23E-14		(l)	8.4E-10	3.6E-11	3.5E-15	5.6E-10	5.9E-10	1.0E-05	5.9E-05
Thallium (l)	1.59E-06	2.23E-08		9.0E-01	1.2E-05	3.3E-08	2.4E-09	7.8E-06	7.9E-06	3.5E-01	2.3E-05
Vanadium	7.40E-07	7.42E-10		9.0E-01	5.6E-06	1.5E-08	8.0E-11	3.7E-06	3.7E-06	1.1E+01	3.2E-07
Zinc	3.45E-08	5.56E-10		5.7E-01	1.6E-07	7.1E-10	6.0E-11	1.1E-07	1.1E-07	1.3E+02	8.3E-10
										Cumulative HI (m) :	**2E-03**

(a) Only those compounds with TRVs are listed in this table.
(b) Sediment concentrations (Csed) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program.
Riparian backwater area sediment concentrations were assumed to be the same as those calculated for the Colorado River.
(c) Surface water concentrations (Csw) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program.
Riparian backwater area surface water concentrations were assumed to be the same as those calculated for the Colorado River.
(d) For organic compounds not included in USEPA, 1999, a BCF value was calculated using the following equation:
logBCF=0.819 x logKow 1.146. For inorganic compounds not included in USEPA, 1999, a BCF value of 0.9 was used.
(e) Prey Tissue Concentration (benthic invertebrates) = Csoil x BCF/$CF_{WWinvert}$; except for Dioxin - TEQB which is calculated on a congener-specific basis and is shown elsewhere in this appendix.
(f) $DD_{sed} = C_{sed}$ x Sediment IR; assumes 100% of sediment ingested is potentially contaminated
(g) $DD_{sw} = C_{sw}$ x Water IR; assumes 100% of surface water ingested is potentially contaminated
(h) $DD_{diet} = C_{prey}$ x Food IR; assumes 100% of prey tissue is potentially contaminated

Table 14
Calculation of Hazard Quotients for Yuma Clapper Rail - Riparian Backwater Area

Compound (a)	Maximum Annual Sediment Concentration (mg/kg) (b)	Maximum Annual Total Surface Water Concentration (mg/L) (c)	Kow	BCF sediment-benthic invert (d)	Prey Tissue Concentration (mg/kg) (e)	Daily Dose from Sediment (mg/kg BW-d) (f)	Daily Dose from Surface Water (mg/kg BW-d) (g)	Daily Dose from Diet (mg/kg BW-d) (h)	Total Daily Dose (mg/kg BW-d) (i)	TRV (Bird) (mg/kg BW-d) (j)	Hazard Quotient (k)

(i) Total Daily Dose = $DD_{diet} + DD_{soil} + DD_{sw}$
(j) Toxicity Reference Values (TRVs) are discussed in the text.
(k) Hazard Quotients (HQ) are calculated by dividing the daily dose by the TRV.
(l) BCFs were calculated for individual congeners following the methodology of USEPA (1999) but based on crayfish specific values. See elsewhere in this appendix for more information.
(m) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQB is the Toxic Equivalents (TEQ) for birds calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results. This calculation is presented elsewhere in this appendix.
Food IR - Food ingestion rate as shown in Table 5.2-2
Sediment IR - Sediment ingestion rate as shown in Table 5.2-2
Water IR - Water ingestion rate as shown in Table 5.2-2
$CF_{WW\text{-}invert}$ - Conversion factor from wet weight to dry weight (0.12)

mg - milligrams
kg - kilograms
BW - body weight
d - day
WW - wet weight
L - liters

Table 15
Calculation of Hazard Quotients for Double-crested Cormorant - Main Drain Area

Compound (a)	Maximum Annual Sediment Concentration (mg/kg) (b)	Maximum Annual Total Surface Water Concentration (mg/L) (c)	Maximum Annual Fish Concentration (mg COPC/kg WW tissue) (d)	Daily Dose from Sediment (mg/kg BW-d) (e)	Daily Dose from Surface Water (mg/kg BW-d) (f)	Daily Dose from Diet (mg/kg BW-d) (g)	Total Daily Dose (mg/kg BW-d) (h)	TRV (Bird) (mg/kg BW-d) (i)	Hazard Quotient (j)
Acetone	2.83E-11	1.41E-09	4.47E-09	1.5E-13	7.9E-11	1.2E-09	1.3E-09	5.2E+01	2.5E-11
Aluminum	7.05E-07	7.12E-08	3.56E-05	3.8E-09	4.0E-09	9.7E-06	9.7E-06	1.0E+02	9.7E-08
Aroclor 1254	1.44E-07	2.17E-12	5.04E-07	7.9E-10	1.2E-13	1.4E-07	1.4E-07	7.2E-02	1.9E-06
Arsenic	3.36E-09	1.16E-10	1.32E-08	1.8E-11	6.4E-12	3.6E-09	3.6E-09	2.5E+00	1.5E-09
Barium	2.31E-07	5.63E-09	3.56E-06	1.3E-09	3.1E-10	9.7E-07	9.7E-07	2.1E+01	4.7E-08
Benzo(a)Anthracene	7.70E-10	5.75E-14	2.68E-09	4.2E-12	3.2E-15	7.3E-10	7.4E-10	7.9E-04	9.3E-07
Benzo(a)pyrene	8.74E-10	2.68E-14	3.00E-09	4.8E-12	1.5E-15	8.2E-10	8.2E-10	1.0E-03	8.2E-07
Benzo(b)fluoranthene	1.98E-08	5.68E-13	9.74E-08	1.1E-10	3.2E-14	2.7E-08	2.7E-08	1.4E-04	1.9E-04
Benzo(k)fluoranthene	4.69E-09	1.41E-13	2.09E-08	2.6E-11	7.8E-15	5.7E-09	5.7E-09	1.4E-04	4.1E-05
Cadmium	2.40E-08	3.19E-10	2.90E-07	1.3E-10	1.8E-11	7.9E-08	7.9E-08	1.5E+00	5.5E-08
Chlordane	2.96E-08	1.46E-11	3.50E-07	1.6E-10	8.1E-13	9.6E-08	9.6E-08	2.1E+00	4.5E-08
Chromium, hexavalent	6.16E-08	3.24E-09	6.16E-08	3.4E-10	1.8E-10	1.7E-08	1.7E-08	1.0E+00	1.7E-08
Chrysene	5.75E-09	3.86E-13	1.79E-08	3.1E-11	2.1E-14	4.9E-09	4.9E-09	1.0E-03	4.9E-06
Copper	5.40E-08	1.26E-10	2.51E-08	2.9E-10	7.0E-12	6.9E-09	7.2E-09	4.7E+01	1.5E-10
DDE, 4,4'-	4.28E-08	1.26E-11	6.18E-07	2.3E-10	7.0E-13	1.7E-07	1.7E-07	8.5E-01	2.0E-07
Dibenz(a,h)anthracene	9.18E-10	1.73E-14	6.37E-09	5.0E-12	9.6E-16	1.7E-09	1.7E-09	3.9E-04	4.5E-06
Dinitrobenzene, 1,3-	7.12E-10	5.98E-10	1.70E-09	3.9E-12	3.3E-11	4.7E-10	5.0E-10	4.2E-04	1.2E-06
Ethylhexyl phthalate, bis-2-	8.28E-08	1.91E-11	3.63E-09	4.5E-10	1.1E-12	9.9E-10	1.4E-09	1.1E+02	1.3E-11
gamma-BHC (Lindane)	2.85E-10	5.28E-12	6.23E-10	1.6E-12	2.9E-13	1.7E-10	1.7E-10	2.0E+00	8.6E-11
Heptachlor	2.62E-11	6.88E-14	4.18E-11	1.4E-13	3.8E-15	1.1E-11	1.2E-11	6.5E-02	1.8E-10
Hexachloro-1,3-butadiene (Perchlorobutadiene)	1.42E-09	4.70E-12	1.14E-08	7.8E-12	2.6E-13	3.1E-09	3.1E-09	3.2E+00	9.8E-10
Hexachlorobenzene	1.32E-08	4.20E-12	4.78E-08	7.2E-11	2.3E-13	1.3E-08	1.3E-08	2.3E-01	5.8E-08
Indeno(1,2,3-cd) pyrene	8.71E-09	1.13E-13	4.37E-08	4.8E-11	6.3E-15	1.2E-08	1.2E-08	1.0E-03	1.2E-05
Lead	3.01E-07	3.36E-10	3.01E-11	1.6E-09	1.9E-11	8.2E-12	1.7E-09	2.5E-02	6.7E-08
Manganese	3.14E-09	4.83E-11	1.93E-08	1.7E-11	2.7E-12	5.3E-09	5.3E-09	9.8E+02	5.4E-12
Mercuric chloride	5.83E-05	1.47E-09	0.00E+00	3.2E-07	8.2E-11	0.0E+00	3.2E-07	3.3E+00	9.8E-08
Methyl mercury	5.58E-07	1.75E-10	1.19E-03	3.0E-09	9.7E-12	3.2E-04	3.2E-04	6.4E-03	5.1E-02
Nickel	6.76E-10	1.04E-11	8.11E-10	3.7E-12	5.8E-13	2.2E-10	2.3E-10	6.5E+01	3.5E-12
Pentachloronitrobenzene (PCNB)	1.24E-07	8.60E-11	1.39E-07	6.8E-10	4.8E-12	3.8E-08	3.9E-08	6.9E+01	5.6E-10
Pentachlorophenol	2.42E-07	1.02E-08	2.50E-05	1.3E-09	5.7E-10	6.8E-06	6.8E-06	4.0E+00	1.7E-06
Selenium	2.34E-11	4.68E-12	1.91E-09	1.3E-13	2.6E-13	5.2E-10	5.2E-10	5.0E-01	1.0E-09
Silver	1.40E-08	1.68E-09	1.48E-07	7.6E-11	9.4E-11	4.0E-08	4.0E-08	1.8E+02	2.3E-10
Dioxin - TEQB	3.37E-09	8.70E-14	5.16E-10	1.8E-11	4.8E-15	1.4E-10	1.6E-10	1.0E-05	1.6E-05
Thallium (I)	4.15E-07	5.85E-09	5.85E-05	2.3E-09	3.2E-10	1.6E-05	1.6E-05	3.5E-01	4.6E-05
Vanadium	9.65E-07	9.68E-10	0.00E+00	5.3E-09	5.4E-11	0.0E+00	5.3E-09	1.1E+01	4.7E-10
Zinc	9.82E-09	1.58E-10	3.26E-07	5.4E-11	8.8E-12	8.9E-08	8.9E-08	1.3E+02	6.8E-10
								Cumulative HI (k):	**5E-02**

(a) Only those compounds with TRVs are listed in this table.
(b) Sediment concentrations (Csed) were calculated using USEPA's 2005 HHRAP fate and transport equations, using the IRAP software program.
(c) Surface water concentrations (Csw) were calculated using USEPA's 2005 HHRAP fate and transport equations, using the IRAP software program.
HHRAP calculates dissolved, but not total, water column concentrations for methyl mercury, and thus the dissolved concentration was used in this table for methyl mercury.
(d) Cfish were derived using IRAP software; assumes trophic level 4.

Table 15
Calculation of Hazard Quotients for Double-crested Cormorant - Main Drain Area

Compound (a)	Maximum Annual Sediment Concentration (mg/kg) (b)	Maximum Annual Total Surface Water Concentration (mg/L) (c)	Maximum Annual Fish Concentration (mg COPC/kg WW tissue) (d)	Daily Dose from Sediment (mg/kg BW-d) (e)	Daily Dose from Surface Water (mg/kg BW-d) (f)	Daily Dose from Diet (mg/kg BW-d) (g)	Total Daily Dose (mg/kg BW-d) (h)	TRV (Bird) (mg/kg BW-d) (i)	Hazard Quotient (j)

(e) DDsed = Csed x Sediment IR; assumes 100% of fish is potentially contaminated
(f) DDsw = Csw x Water IR; assumes 100% of surface water is potentially contaminated
(g) DDdiet = Cfish x Food IR; assumes 100% of fish is potentially contaminated
(h) Total Daily Dose = DDdiet + DDsed + DDsw
(i) Toxicity Reference Values (TRVs) are discussed in the text.
(j) Hazard Quotient is calculated by dividing the Daily Dose by the TRV.
(k) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQB is the Toxic Equivalents (TEQ) for birds calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results. This calculation is presented elsewhere in this appendix.
Sediment IR - Sediment ingestion rate as shown in Table 5.2-2
Food IR - Food ingestion rate as shown in Table 5.2-2
Water IR - Surface water ingestion rate as shown in Table 5.2-2

mg - milligrams
kg - kilograms
L - liters
BW - body weight
d - day
WW - wet weight

Table 16
Calculation of Hazard Quotients for Mule Deer - Main Drain Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg WW) (c)	Maximum Annual Total Surface Water Concentration (mg/L) (d)	Daily Dose from Soil (mg/kg BW-d) (e)	Daily Dose from Diet (mg/kg BW-d) (f)	Daily Dose from Surface Water (mg/kg BW-d) (g)	Total Daily Dose (mg/kg BW-d) (h)	TRV (Mammal) (mg/kg BW-d) (i)	Hazard Quotient (j)
Acetone	1.14E-08	8.59E-09	1.41E-09	8.0E-12	2.5E-09	9.6E-11	2.6E-09	1.0E+01	2.6E-10
Acrylonitrile	4.26E-10	3.21E-10	5.80E-11	3.0E-13	9.4E-11	3.9E-12	9.8E-11	4.6E-01	2.1E-10
Aluminum	1.36E-05	9.01E-07	7.12E-08	9.5E-09	2.6E-07	4.8E-09	2.8E-07	1.9E+00	1.4E-07
Antimony	2.36E-09	6.78E-12	5.88E-12	1.7E-12	2.0E-12	4.0E-13	4.0E-12	6.6E-02	6.1E-11
Aroclor 1254	6.38E-09	4.70E-12	2.17E-12	4.5E-12	1.4E-12	1.5E-13	6.0E-12	2.1E-04	2.9E-08
Arsenic	2.76E-09	9.80E-07	1.16E-10	1.9E-12	2.9E-07	7.9E-12	2.9E-07	1.3E+00	2.3E-07
Barium	3.37E-06	7.85E-08	5.63E-09	2.4E-09	2.3E-08	3.8E-10	2.6E-08	5.1E-01	5.0E-08
Benzo(a)Anthracene	6.09E-11	2.07E-12	5.75E-14	4.3E-14	6.0E-13	3.9E-15	6.5E-13	1.7E-01	3.9E-12
Benzo(a)pyrene	4.29E-11	6.10E-12	2.68E-14	3.0E-14	1.8E-12	1.8E-15	1.8E-12	1.0E-01	1.8E-11
Beryllium	3.85E-06	9.78E-07	1.50E-10	2.7E-09	2.9E-07	1.0E-11	2.9E-07	6.6E-01	4.4E-07
Cadmium	4.38E-07	2.42E-06	3.19E-10	3.1E-10	7.1E-07	2.2E-11	7.1E-07	2.5E-02	2.8E-05
Chlordane	4.36E-09	1.17E-11	1.46E-11	3.1E-12	3.4E-12	9.9E-13	7.5E-12	4.6E+00	1.6E-12
Chloroform (Trichloromethane)	4.45E-11	1.09E-11	1.37E-11	3.1E-14	3.2E-12	9.3E-13	4.1E-12	6.0E+01	6.9E-14
Chromium, hexavalent	1.25E-06	4.55E-08	3.24E-09	8.8E-10	1.3E-08	2.2E-10	1.4E-08	3.5E+00	4.1E-09
Copper	1.19E-06	9.60E-07	1.26E-10	8.4E-10	2.8E-07	8.5E-12	2.8E-07	1.2E+01	2.3E-08
DDE, 4,4'-	1.07E-08	2.14E-11	1.26E-11	7.5E-12	6.3E-12	8.5E-13	1.5E-11	1.0E+00	1.5E-11
Dibenz(a,h)anthracene	4.05E-11	2.85E-11	1.73E-14	2.8E-14	8.3E-12	1.2E-15	8.4E-12	2.0E-03	4.2E-09
Dinitrobenzene, 1,3-	8.08E-09	3.86E-09	5.98E-10	5.7E-12	1.1E-09	4.1E-11	1.2E-09	1.1E+00	1.1E-09
Dinitrotoluene, 2,4-	5.35E-09	1.66E-09	8.48E-10	3.8E-12	4.8E-10	5.8E-11	5.5E-10	7.0E-01	7.8E-10
Dinitrotoluene, 2,6-	3.15E-09	1.13E-09	7.32E-10	2.2E-12	3.3E-10	5.0E-11	3.8E-10	4.0E-01	9.6E-10
Di-n-octylphthalate	1.92E-09	1.35E-08	7.51E-13	1.3E-12	3.9E-09	5.1E-14	3.9E-09	7.5E+03	5.3E-13
Dioxane, 1,4-	1.67E-14	1.26E-14	1.83E-15	1.2E-17	3.7E-15	1.2E-16	3.8E-15	1.1E+02	3.6E-17
Ethylhexyl phthalate, bis-2-	5.92E-09	2.18E-08	1.91E-11	4.2E-12	6.4E-09	1.3E-12	6.4E-09	6.0E+01	1.1E-10
gamma-BHC (Lindane)	1.69E-10	5.90E-12	5.28E-12	1.2E-13	1.7E-12	3.6E-13	2.2E-12	8.0E+00	2.8E-13
Heptachlor	1.28E-11	1.46E-13	6.88E-14	9.0E-15	4.3E-14	4.7E-15	5.6E-14	2.5E-03	2.3E-11
Hexachlorobenzene	2.90E-08	8.79E-11	4.20E-12	2.0E-11	2.6E-11	2.9E-13	4.6E-11	1.6E+00	2.9E-11
Hexachlorocyclopentadiene	1.14E-08	4.87E-11	3.53E-11	8.0E-12	1.4E-11	2.4E-12	2.5E-11	3.8E+00	6.5E-12
Lead	6.53E-06	2.43E-06	3.36E-10	4.6E-09	7.1E-07	2.3E-11	7.2E-07	3.8E-02	1.9E-05
Manganese	7.13E-08	3.61E-07	4.83E-11	5.0E-11	1.1E-07	3.3E-12	1.1E-07	8.8E+01	1.2E-09
Mercuric chloride	8.22E-06	9.67E-08	1.47E-09	5.8E-09	2.8E-08	1.0E-10	3.4E-08	1.0E+00	3.4E-08
Methyl mercury	1.67E-07	2.51E-08	1.75E-10	1.2E-10	7.3E-09	1.2E-11	7.5E-09	3.2E-02	2.3E-07
Nickel	1.50E-08	7.69E-08	1.04E-11	1.0E-11	2.2E-08	7.1E-13	2.2E-08	5.0E+01	4.5E-10
Pentachlorobenzene	1.64E-08	5.94E-11	7.80E-12	1.1E-11	1.7E-11	5.3E-13	2.9E-11	7.3E+00	4.1E-12
Pentachloronitrobenzene (PCNB)	3.95E-08	2.86E-10	8.60E-11	2.8E-11	8.4E-11	5.8E-12	1.2E-10	4.6E+02	2.6E-13
Pentachlorophenol	7.31E-08	3.04E-07	1.02E-08	5.1E-11	8.9E-08	6.9E-10	9.0E-08	3.0E-01	3.0E-07
Selenium	1.13E-09	2.94E-08	4.68E-12	7.9E-13	8.6E-09	3.2E-13	8.6E-09	7.6E-02	1.1E-07
Silver	2.71E-07	2.45E-08	1.68E-09	1.9E-10	7.2E-09	1.1E-10	7.5E-09	3.8E-01	2.0E-08
Dioxin - TEQM	5.79E-11	7.83E-13	2.27E-14	4.1E-14	2.3E-13	1.5E-15	2.7E-13	1.0E-06	2.7E-07
Thallium (I)	4.45E-06	7.20E-08	5.85E-09	3.1E-09	2.1E-08	4.0E-10	2.5E-08	1.3E-02	1.9E-06
Vanadium	1.70E-06	1.94E-08	9.68E-10	1.2E-09	5.7E-09	6.6E-11	6.9E-09	2.1E-01	3.3E-08
Vinyl Chloride	2.28E-13	1.23E-13	9.18E-13	1.6E-16	3.6E-14	6.2E-14	9.8E-14	1.7E-01	5.8E-13
Xylene, m-	2.32E-11	1.18E-12	1.04E-12	1.6E-14	3.5E-13	7.1E-14	4.3E-13	2.1E+00	2.1E-13

Table 16
Calculation of Hazard Quotients for Mule Deer - Main Drain Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg WW) (c)	Maximum Annual Total Surface Water Concentration (mg/L) (d)	Daily Dose from Soil (mg/kg BW-d) (e)	Daily Dose from Diet (mg/kg BW-d) (f)	Daily Dose from Surface Water (mg/kg BW-d) (g)	Total Daily Dose (mg/kg BW-d) (h)	TRV (Mammal) (mg/kg BW-d) (i)	Hazard Quotient (j)
Xylene, o-	1.51E-11	8.72E-13	6.48E-13	1.1E-14	2.5E-13	4.4E-14	3.1E-13	2.1E+00	1.5E-13
Xylene, p-	1.94E-11	1.12E-12	1.00E-12	1.4E-14	3.3E-13	6.8E-14	4.1E-13	2.1E+00	1.9E-13
Zinc	2.17E-07	1.17E-06	1.58E-10	1.5E-10	3.4E-07	1.1E-11	3.4E-07	1.0E+01	3.3E-08
								Cumulative HI (k) :	**5E-05**

(a) Only those compounds with TRVs are listed in this table.
(b) Soil concentrations (Csoil) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program. Soil concentrations in the main drain area were based on those calculated for the agricultural area.
(c) Plant concentrations (Cplant) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program. Wet weight plant concentrations were calculated from the IRAP outputs dry weight concentrations using a moisture content of 88% as specified in USEPA's 1999 Screening Ecological Risk Assessment Protocol. Plant concentrations in the main drain area were based on those calculated for the agricultural area.
(d) Surface water concentrations (Csw) were calculated using USEPA's 2005 HHRAP fate and transport equations, using the IRAP software program.
(e) DDsoil = Csoil x Soil IR; assumes 100% of soil is potentially contaminated
(f) DDdiet = Cplant x Food IR; assumes 100% of plant material is potentially contaminated
(g) DDsw = Csw x Water IR; assumes 100% of surface water is potentially contaminated
(h) Total Daily Dose = DDdiet + DDsoil + DDsw
(i) Toxicity Reference Values (TRVs) are discussed in the text.
(j) Hazard Quotients (HQ) are calculated by dividing the daily dose by the TRV.
(k) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQM is the Toxic Equivalents (TEQ) for mammals calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results. This calculation is presented elsewhere in this appendix.
Food IR - Food ingestion rate as shown in Table 5.2-2
Soil IR - Soil ingestion rate as shown in Table 5.2-2
Water IR - Water ingestion rate as shown in Table 5.2-2

mg - milligrams
kg - kilograms
BW - body weight
d - day
WW - wet weight
L - liters

Table 17
Calculation of Hazard Quotients for Surface Water - Main Drain Area

CAS No	Compound (a)	Maximum Annual Dissolved Surface Water Concentration (mg/L) (b)	TRV (mg/L) (c)	Hazard Quotient (d)
95-63-6	1,2,4-Trimethylbenzene	1.22E-12	7.7E-02	1.6E-11
142-28-9	1,3-Dichloropropane	1.40E-12	1.3E+00	1.1E-12
110-54-3	1-Hexane (n-hexane)	1.19E-15	2.5E-02	4.8E-14
594-20-7	2,2-Dichloropropane	4.37E-13	3.9E-01	1.1E-12
625-86-5	2,5-Dimethylfuran	1.39E-12	7.1E-01	2.0E-12
95-49-8	2-Chlorotoluene	1.67E-12	1.4E-01	1.2E-11
591-78-6	2-Hexanone	3.78E-11	4.3E+00	8.8E-12
91-57-6	2-Methylnaphthalene	9.57E-13	1.5E-02	6.6E-11
534-52-1	4,6-Dinitro-2-methylphenol	3.07E-09	2.4E-02	1.3E-07
106-43-4	4-Chlorotoluene	9.16E-13	3.4E+00	2.7E-13
67-64-1	Acetone	1.41E-09	1.5E+00	9.4E-10
79-10-7	Acrylic Acid	5.19E-16	3.8E+00	1.4E-16
107-13-1	Acrylonitrile	5.80E-11	2.5E-01	2.3E-10
7429-90-5	Aluminum	7.12E-08	8.7E-02	8.2E-07
7440-36-0	Antimony	5.88E-12	3.0E-02	2.0E-10
11097-69-1	Aroclor 1254	1.47E-12	2.0E-05	7.3E-08
7440-38-2	Arsenic	1.16E-10	1.9E-01	6.1E-10
7440-39-3	Barium	5.63E-09	4.0E-03	1.4E-06
92-87-5	Benzidine	9.09E-09	8.9E-02	1.0E-07
56-55-3	Benzo(a)Anthracene	5.37E-14	2.7E-05	2.0E-09
50-32-8	Benzo(a)pyrene	2.25E-14	1.4E-05	1.6E-09
205-99-2	Benzo(b)fluoranthene	4.72E-13	2.7E-05	1.7E-08
207-08-9	Benzo(k)fluoranthene	1.18E-13	2.7E-05	4.4E-09
7440-41-7	Beryllium	1.49E-10	5.3E-03	2.8E-08
111-91-1	Bis(2-chloroethoxy) methane	5.89E-10	1.8E+00	3.2E-10
108-86-1	Bromobenzene	1.31E-12	5.6E-02	2.3E-11
98-06-6	Butylbenzene, tert	9.92E-13	6.5E-01	1.5E-12
7440-43-9	Cadmium	3.19E-10	5.3E-03	6.0E-08
86-74-8	Carbazole	8.20E-10	1.5E-02	5.5E-08
67-66-3	Chloroform (Trichloromethane)	1.37E-11	2.8E-02	4.9E-10
18540-29-9	Chromium, hexavalent	3.24E-09	1.1E-02	2.9E-07
218-01-9	Chrysene	3.58E-13	2.7E-05	1.3E-08
7440-48-4	Cobalt	3.66E-10	3.0E-03	1.2E-07
7440-50-8	Copper	1.26E-10	2.5E-02	5.0E-09
72-55-9	DDE, 4,4'-	1.24E-11	2.0E-05	6.2E-07
319-86-8	delta-BHC	3.67E-11	1.3E-01	2.8E-10
53-70-3	Dibenz(a,h)anthracene	1.28E-14	2.7E-05	4.8E-10
132-64-9	Dibenzofuran	6.25E-10	2.0E-02	3.1E-08
99-65-0	Dinitrobenzene, 1,3-	5.98E-10	2.6E-02	2.3E-08
121-14-2	Dinitrotoluene, 2,4-	8.48E-10	2.3E-02	3.7E-08
606-20-2	Dinitrotoluene, 2,6-	7.32E-10	6.0E-02	1.2E-08
117-84-0	Di-n-octylphthalate	3.98E-14	3.2E-01	1.2E-13
123-91-1	Dioxane, 1,4-	1.83E-15	6.2E+01	2.9E-17
122-39-4	Diphenylamine	8.72E-10	3.8E-02	2.3E-08
33213-65-9	Endosulfan II	8.39E-12	5.6E-05	1.5E-07
1031-07-8	Endosulfan sulfate	1.09E-11	6.0E-05	1.8E-07
7421-93-4	Endrin aldehyde	3.05E-11	8.0E-05	3.8E-07
107-21-1	Ethylene Glycol	8.42E-11	1.0E+03	8.4E-14
117-81-7	Ethylhexyl phthalate, bis-2-	1.87E-11	3.0E-03	6.2E-09
58-89-9	gamma-BHC (Lindane)	5.28E-12	2.8E-04	1.9E-08
76-44-8	Heptachlor	6.87E-14	4.0E-06	1.7E-08
87-68-3	Hexachloro-1,3-butadiene (Perchlorobutadiene)	4.69E-12	8.2E-03	5.7E-10
118-74-1	Hexachlorobenzene	4.14E-12	3.7E-03	1.1E-09
77-47-4	Hexachlorocyclopentadiene	3.53E-11	3.0E-04	1.2E-07
193-39-5	Indeno(1,2,3-cd) pyrene	7.08E-14	2.7E-05	2.6E-09
99-87-6	Isopropyl toluene, p-	9.15E-13	4.6E-02	2.0E-11
7439-92-1	Lead	3.35E-10	8.7E-03	3.8E-08
7439-96-5	Manganese	4.83E-11	8.0E-02	6.0E-10
7487-94-7	Mercuric chloride	9.90E-10	7.7E-04	1.3E-06
22967-92-6	Methyl mercury	1.75E-10	2.8E-06	6.2E-05
80-62-6	Methyl methacrylate	3.72E-14	3.4E+00	1.1E-14
1634-04-4	methyl tert-butyl ether	4.32E-13	1.0E+02	4.3E-15

Table 17
Calculation of Hazard Quotients for Surface Water - Main Drain Area

CAS No	Compound (a)	Maximum Annual Dissolved Surface Water Concentration (mg/L) (b)	TRV (mg/L) (c)	Hazard Quotient (d)
7440-02-0	Nickel	1.04E-11	1.4E-01	7.5E-11
98-95-3	Nitrobenzene	8.65E-11	8.5E-01	1.0E-10
608-93-5	Pentachlorobenzene	7.62E-12	4.7E-04	1.6E-08
82-68-8	Pentachloronitrobenzene (PCNB)	8.54E-11	1.0E-02	8.5E-09
87-86-5	Pentachlorophenol	1.02E-08	1.6E-02	6.6E-07
103-65-1	Propylbenzene, n-	6.36E-13	1.6E-02	4.1E-11
7782-49-2	Selenium (e)	4.68E-12	2.0E-03	2.3E-09
7440-22-4	Silver	1.68E-09	1.2E-04	1.4E-05
TEQF	Dioxin - TEQF	1.35E-14	5.0E-06	2.7E-09
7440-28-0	Thallium	5.85E-09	1.5E-01	3.9E-08
7440-62-2	Vanadium	9.65E-10	1.9E-02	5.1E-08
75-01-4	Vinyl Chloride	9.18E-13	3.9E+00	2.4E-13
7440-66-6	Zinc	1.58E-10	3.2E-01	5.0E-10
			Cumulative HI (f):	**8E-05**

(a) Only those compounds with TRVs are listed in this table.
(b) Surface water concentrations were calculated using USEPA's 2005 HHRAP fate and transport equations, using the IRAP software program.
(c) Toxicity Reference Values (TRVs) are discussed in the text.
(d) Maximum Hazard Quotient (HQ) is calculated by dividing the maximum annual surface water concentration by the TRV.
(e) The water concentration and the TRV for selenium is for total selenium.
(f) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQF is the Toxic Equivalents (TEQ) for fish calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results. This calculation is presented elsewhere in this appendix.

mg/L - milligrams per liter

Table 18
Calculation of Hazard Quotients for Sediment - Main Drain Area

CAS No	Compound (a)	Maximum Annual Sediment Concentration (mg/kg) (b)	Toxicity Reference Value (TRV) (mg/kg) (c)	Hazard Quotient (d)
67-64-1	Acetone	2.83E-11	5.7E-02	5.0E-10
107-13-1	Acrylonitrile	4.06E-12	2.3E-02	1.8E-10
7429-90-5	Aluminum	7.05E-07	1.4E+04	5.0E-11
7440-36-0	Antimony	2.64E-10	6.4E+01	4.1E-12
11097-69-1	Aroclor 1254	1.44E-07	5.0E-02	2.9E-06
7440-38-2	Arsenic	3.36E-09	6.0E+00	5.6E-10
7440-39-3	Barium	2.31E-07	2.0E+01	1.2E-08
56-55-3	Benzo(a)Anthracene	7.70E-10	1.9E-02	4.1E-08
50-32-8	Benzo(a)pyrene	8.74E-10	8.4E-02	1.0E-08
205-99-2	Benzo(b)fluoranthene	1.98E-08	3.7E-02	5.3E-07
207-08-9	Benzo(k)fluoranthene	4.69E-09	3.7E-02	1.3E-07
7440-43-9	Cadmium	2.40E-08	6.0E-01	4.0E-08
67-66-3	Chloroform (Trichloromethane)	2.88E-11	5.9E-02	4.8E-10
7440-47-3	Chromium	6.16E-08	2.6E+01	2.4E-09
218-01-9	Chrysene	5.75E-09	3.0E-02	1.9E-07
7440-50-8	Copper	5.40E-08	1.6E+01	3.4E-09
72-55-9	DDE, 4,4'-	4.28E-08	5.0E-03	8.6E-06
53-70-3	Dibenz(a,h)anthracene	9.18E-10	1.0E-02	9.2E-08
99-65-0	Dinitrobenzene, 1,3-	7.12E-10	2.1E-02	3.3E-08
121-14-2	Dinitrotoluene, 2,4-	3.00E-09	4.7E-02	6.4E-08
606-20-2	Dinitrotoluene, 2,6-	1.44E-09	1.0E-01	1.4E-08
117-84-0	Di-n-octylphthalate	1.46E-07	1.2E+07	1.3E-14
123-91-1	Dioxane, 1,4-	3.65E-17	2.2E+00	1.7E-17
117-81-7	Ethylhexyl phthalate, bis-2-	8.28E-08	1.3E+01	6.2E-09
58-89-9	gamma-BHC (Lindane)	2.85E-10	3.2E-04	8.9E-07
76-44-8	Heptachlor	2.62E-11	3.0E-04	8.7E-08
87-68-3	Hexachloro-1,3-butadiene (Perchlorobutadiene)	1.42E-09	2.6E-01	5.5E-09
118-74-1	Hexachlorobenzene	1.32E-08	2.0E-02	6.6E-07
77-47-4	Hexachlorocyclopentadiene	1.66E-08	2.0E-01	8.4E-08
193-39-5	Indeno(1,2,3-cd) pyrene	8.71E-09	3.0E-02	2.9E-07
7439-92-1	Lead	3.01E-07	3.1E+01	9.7E-09
7487-94-7	Mercuric chloride	5.83E-05	2.0E-01	2.9E-04
22967-92-6	Methyl mercury	5.58E-07	2.0E-01	2.8E-06
7440-02-0	Nickel	6.76E-10	1.6E+01	4.2E-11
98-95-3	Nitrobenzene	4.12E-10	1.3E+00	3.2E-10
608-93-5	Pentachlorobenzene	3.69E-08	6.0E-01	6.1E-08
87-86-5	Pentachlorophenol	2.42E-07	7.0E+00	3.5E-08
7782-49-2	Selenium	2.34E-11	1.0E-01	2.3E-10
7440-22-4	Silver	1.40E-08	4.5E+00	3.1E-09
TEQF	Dioxin - TEQF	1.29E-09	4.1E-04	3.1E-06
75-01-4	Vinyl Chloride	5.69E-13	1.7E+00	3.3E-13
7440-66-6	Zinc	9.82E-09	1.1E+02	8.9E-11
			Cumulative HI (e) =	**3E-04**

(a) Only those compounds with TRVs are listed in this table.
(b) Sediment concentrations were calculated using USEPA's 2005 HHRAP fate and transport equations, using the IRAP software program.
(c) Toxicity Reference Values (TRVs) are discussed in the text.
(d) Maximum Hazard Quotient (HQ) is calculated by dividing the maximum annual sediment concentration by the TRV.
(e) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted.
A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQF is the Toxic Equivalents (TEQ) for fish calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results. This calculation is presented elsewhere in this appendix.

mg/kg - milligrams per kilogram