

Table 114

EVAPORATION DAM 2: HUMAN RISK ASSESSMENT ♦ SEDIMENTS ♦ SAMPLE NO. 17 [INORGANIC - MICRO'S & MACRO'S]
[ISCOR VANDERBIJLPARK STEEL - MASTER PLAN]

SAMPLE NUMBER: 17										
INORGANIC COMPOUNDS Micro's and Macro's	6 RfD/ ADI/GV mg/kg/day	7 EPA RfD/ EPA DWEL/ RSA RfD/ WHO GV	RISK TO HUMAN							
			TOTAL ANALYSIS				TCLP EXTRACTION			
			8 Lab conc. in Dam water ppm	13 Conc. in groundwater (EEC) ppb	14 PDI groundwater exposure mg/kg/day	10 Margin of Safety %	8 Lab conc. in Dam water ppm	13 Conc. in groundwater (EEC) ppb	14 PDI groundwater exposure mg/kg/day	10 Margin of Safety %
Aluminium as Al	0.005	RSA RfD	11000	9075000	303	6050000	0.30	248	0.008	166
Arsenic as As	0.0003	EPA RfD	< 50	0.00	0.00	0.00	< 0.34	0.00	0.00	0.00
Barium as Ba	0.07	EPA RfD	17.0	14025	0.468	668	0.40	330	0.011	16.7
Cadmium as Cd	0.0005	EPA RfD	< 10	0.00	0.00	0.00	< 0.03	0.00	0.00	0.00
Chromium ³⁺ as Cr ³⁺	1.5	EPA RfD	49	40425	1.35	89.8	< 0.04	0.00	0.00	0.00
Cobalt as Co	0.008	RSA RfD	< 10	0.00	0.00	0.00	< 0.12	0.00	0.00	0.00
Copper as Cu	0.04	EPA RfD	< 10	0.00	0.00	0.00	< 0.02	0.00	0.00	0.00
Iron as Fe	0.003	RSA RfD	5500	4537500	151	5041667	19	15675	0.523	17417
Lead as Pb	0.002	RSA RfD	< 100	0.00	0.00	0.00	< 0.31	0.00	0.00	0.00
Manganese as Mn	0.046	EPA RfD	130	107250	3.58	7772	0.9	743	0.025	63.8
Mercury as Hg	0.0003	EPA RfD	NA	0.00	0.00	0.00	< 0.01	0.00	0.00	0.00
Nickel as Ni	0.02	EPA RfD	< 10	0.00	0.00	0.00	< 0.05	0.00	0.00	0.00
Selenium as Se	0.005	EPA RfD	NA	0.00	0.00	0.00	< 0.05	0.00	0.00	0.00
Titanium as Ti	0.003	RSA RfD	380	313500	10.5	348333	< 0.02	0.00	0.00	0.00
Vanadium as V	0.009	EPA RfD	13	10725	0.358	3972	< 0.07	0.00	0.00	0.00
Zinc as Zn	0.3	EPA RfD	19	15675	0.523	174	< 0.17	0.00	0.00	0.00
Calcium as Ca	5.0	RSA RfD	170	140250	4.68	94	57	47025	1.57	31.4
Chloride as Cl	8.3	RSA RfD	400	330000	11.0	133	90	74250	2.48	23.2
Fluoride as F	0.06	EPA RfD	0.97	800	0.027	44.4	0.3	248	0.008	16.6
Magnesium as Mg	2.3	RSA RfD	320	264000	8.8	383	5.3	4373	0.146	6.04
Potassium as K	6.7	RSA RfD	930	767250	25.6	382	24	19800	0.660	9.56
Sodium as Na	3.3	RSA RfD	1300	1072500	35.8	1083	NA	0.00	0.00	0.00
Sulphate as SO ₄	6.7	RSA RfD	400	330000	11.0	164	1.0	825	0.028	0.416
RISK / ACCEPTABLE RISK TO: HUMAN			Groundwater				Groundwater			
			R				R			

Table 115

EVAPORATION DAM 2: HUMAN RISK ASSESSMENT ♦ SEDIMENTS ♦ SAMPLE NO. 18 [INORGANIC - MICRO'S & MACRO'S]
[ISCOR VANDERBIJLPARK STEEL - MASTER PLAN]

SAMPLE NUMBER: 18												
INORGANIC COMPOUNDS Micro's and Macro's	RfD/ ADI /GV mg/kg/day	7 EPA RfD/ EPA DWEL/ RSA RfD/ WHO GV	RISK TO HUMAN									
			TOTAL ANALYSIS				TCLP EXTRACTION					
			8 Lab conc. in Dam water ppm	13 Conc. in groundwater (EEC) ppb	14 PDI groundwater exposure mg/kg/day	10 Margin of Safety %	8 Lab conc. in Dam water ppm	13 Conc. in groundwater (EEC) ppb	14 PDI groundwater exposure mg/kg/day	10 Margin of Safety %		
Aluminium as Al	0.005	RSA RfD	6600	5445000	182	3630000	0.09	74.3	0.002	50		
Arsenic as As	0.0003	EPA RfD	< 50	0.00	0.00	0.00	< 0.34	0.00	0.00	0.00		
Barium as Ba	0.07	EPA RfD	6.4	5280	0.176	251	0.44	363	0.012	17.3		
Cadmium as Cd	0.0005	EPA RfD	< 10	0.00	0.00	0.00	< 0.03	0.00	0.00	0.00		
Chromium ⁺⁺ as Cr ⁺⁺	1.50	EPA RfD	41	33825	1.13	75.2	< 0.04	0.00	0.00	0.00		
Cobalt as Co	0.008	RSA RfD	< 10	0.00	0.00	0.00	< 0.12	0.00	0.00	0.00		
Copper as Cu	0.04	EPA RfD	< 10	0.00	0.00	0.00	< 0.02	0.00	0.00	0.00		
Iron as Fe	0.003	RSA RfD	14000	11550000	385	12833333	83	68475	2.28	76083		
Lead as Pb	0.002	RSA RfD	< 100	0.00	0.00	0.00	< 0.31	0.00	0.00	0.00		
Manganese as Mn	0.046	EPA RfD	150	123750	4.13	8967	12	9900	0.330	717		
Mercury as Hg	0.0003	EPA RfD	NA	0.00	0.00	0.00	< 0.01	0.00	0.00	0.00		
Nickel as Ni	0.02	EPA RfD	< 10	0.00	0.00	0.00	< 0.05	0.00	0.00	0.00		
Selenium as Se	0.005	EPA RfD	NA	0.00	0.00	0.00	< 0.05	0.00	0.00	0.00		
Titanium as Ti	0.003	RSA RfD	440	363000	12.1	403333	< 0.02	0.00	0.00	0.00		
Vanadium as V	0.009	EPA RfD	12	9900	0.330	3667	< 0.07	0.00	0.00	0.00		
Zinc as Zn	0.3	EPA RfD	18	14850	0.495	165	< 0.17	0.00	0.00	0.00		
Calcium as Ca	5.0	RSA RfD	4800	3960000	132	2640	270	222750	7.43	149		
Chloride as Cl	8.3	RSA RfD	200	165000	5.50	86	20	16500	0.55	6.83		
Fluoride as F	0.06	EPA RfD	0.71	586	0.020	32.8	0.6	495	0.017	27.6		
Magnesium as Mg	2.3	RSA RfD	1600	1320000	44.0	1913	26	21450	0.715	31.00		
Potassium as K	6.7	RSA RfD	1300	1072500	35.8	534	42	34650	1.155	17.24		
Sodium as Na	3.3	RSA RfD	1500	1237500	41.3	1250	NA	0.00	0.00	0.00		
Sulphate as SO ₄	6.7	RSA RfD	500	412500	13.8	205	< 1.0	0.00	0.000	0.00		
RISK / ACCEPTABLE RISK TO: HUMAN			Groundwater				R	Groundwater				R

TABLES 116

EVAPORATION DAM 2: SEDIMENTS ORGANIC
ENVIRONMENTAL RISK ASSESSMENT

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Table 116

EVAPORATION DAM 2: - ENVIRONMENTAL RISK QUANTIFICATION ♦ SEDIMENTS ♦ SAMPLE NO's 16, 17 & 18 [ORGANICS - PART 2 V001]
[ISCOR VANDERBIJLPARK STEEL – MASTER PLAN]

SAMPLE NUMBERS: 16, 17 & 18																
ORGANIC COMPOUNDS Volatile & Semi-Volatile	Risk Lab MPP ppm	RISK TO ENVIRONMENT - RISK OF SEDIMENTS FOR GROUNDWATER														
		SAMPLE NO. 16					SAMPLE NO. 17					SAMPLE NO. 18				
		TOTAL ANALYSIS			PROBIT MODEL		TOTAL ANALYSIS			PROBIT MODEL		TOTAL ANALYSIS			PROBIT MODEL	
		¹ Lab Conc. ppm	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	¹ Lab Conc. ppm	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	¹ Lab Conc. ppm	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR
Benzene	3400	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR
Toluene	4600	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR
Ethylbenzene	3500	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR
m,p-Xylene	910	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR
o-Xylene	1460	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR
Styrene	4360	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR
Isopropylbenzene	2840	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR
1,3,5-Trimethylbenzene	1360	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR
1,2,4-Trimethylbenzene	770	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR
Naphthalene	460	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR
Phenol	4690	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
2-Methylphenol	1440	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
4-Methylphenol	1470	0.19	157	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
2,4-Dimethylphenol	6270	0.18	149	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
2-Methylnaphthalene	150	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Acenaphthylene	0.5	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Acenaphthene	170	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Dibenzofuran	190	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Fluorene	160	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Phenanthrene	30	0.11	90.8	R	1.07E-03	R	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Anthracene	0.5	0.11	90.8	R	1.00E+02	R	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Carbazole	130	0.29	239	R	4.71E-02	R	0.00	0.00	AR	0.00E+00	AR	0.15	124	AR	2.20E-04	AR
Fluoranthene	11	0.31	256	R	8.81E+01	R	0.00	0.00	AR	0.00E+00	AR	0.17	140	R	5.02E+01	R
Pyrene	230	0.24	198	AR	3.15E-04	AR	0.00	0.00	AR	0.00E+00	AR	0.12	99	AR	2.59E-07	AR
Benzo[a]anthracene	10	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Chrysene	100	0.11	90.8	AR	1.41E-04	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
bis(2-Ethylhexyl)phthalate	14400	0.44	363	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.32	264	AR	0.00E+00	AR
Benzo[b]+[k]fluoranthene	0.3	0.15	124	R	1.00E+02	R	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Benzo[a]pyrene	0.5	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Indeno[1,2,3-cd]pyrene	0.5	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Dibenz[a,h]anthracene	100	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Benzo[g,h,i]perylene	100	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
		RISK / ACCEPTABLE RISK TO: ENVIRONMENT														
		R					R					R				

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TABLES 117 - 118

EVAPORATION DAM 2: SEDIMENTS ORGANIC
HUMAN RISK ASSESSMENT

Table 117

EVAPORATION DAM 2: HUMAN RISK ASSESSMENT ♦ SEDIMENTS ♦ SAMPLE NO's 16&17 [ORGANIC- PAH* & VOC] IVS - MASTER PLAN

SAMPLE NUMBERS: 16 & 17			RISK TO HUMAN							
ORGANIC COMPOUNDS Volatile & Semi-Volatile	6 RfD/ ADI / GV mg/kg/day	7 EPA RfD/ EPA DWEL/ RSA RfD/ WHO GV	SAMPLE NO. 16				SAMPLE NO. 17			
			8 Lab conc. ppm	13 Conc. in groundwater (EEC) ppb	14 PDI groundwater exposure mg/kg/day	10 Margin of Safety %	8 Lab conc. ppm	13 Conc. in groundwater (EEC) ppb	14 PDI groundwater exposure mg/kg/day	10 Margin of Safety %
Benzene	0.002	EPA RfD	< 0.01	0.00	0.00	0.00	< 0.01	0.00	0.00	0.00
Toluene	0.2	EPA RfD	< 0.01	0.00	0.00	0.00	< 0.01	0.00	0.00	0.00
Ethylbenzene	0.1	EPA RfD	< 0.01	0.00	0.00	0.00	< 0.01	0.00	0.00	0.00
m,p-Xylene	0.17	WHO GV	< 0.01	0.00	0.00	0.00	< 0.01	0.00	0.00	0.00
o-Xylene	0.17	WHO GV	< 0.01	0.00	0.00	0.00	< 0.01	0.00	0.00	0.00
Styrene	0.2	EPA RfD	< 0.01	0.00	0.00	0.00	< 0.01	0.00	0.00	0.00
Isopropylbenzene	0.1	EPA RfD	< 0.01	0.00	0.00	0.00	< 0.01	0.00	0.00	0.00
1,3,5-Trimethylbenzene	0.05	EPA RfD	< 0.01	0.00	0.00	0.00	< 0.01	0.00	0.00	0.00
1,2,4-Trimethylbenzene	0.05	EPA RfD	< 0.01	0.00	0.00	0.00	< 0.01	0.00	0.00	0.00
Naphthalene	0.02	EPA RfD	< 0.01	0.00	0.00	0.00	< 0.01	0.00	0.00	0.00
Phenol	0.6	EPA RfD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Methylphenol	0.05	EPA RfD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-Methylphenol	0.005	EPA RfD	0.19	157	0.005	105	0.00	0.00	0.00	0.00
2,4-Dimethylphenol	3.02	EPA RfD	0.18	149	0.005	74.2	0.00	0.00	0.00	0.00
2-Methylnaphthalene	0.02	EPA RfD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Acenaphthylene	0.00002	WHO GV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Acenaphthene	0.1	EPA RfD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dibenzofuran	0.004	EPA RfD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fluorene	0.04	EPA RfD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phenanthrene	0.0002	WHO GV	0.11	90.8	0.0030	1513	0.00	0.00	0.00	0.00
Anthracene	0.3	EPA RfD	0.11	90.8	0.0030	1.61	0.00	0.00	0.00	0.00
Carbazole	0.000	EPA RfD	0.29	239	0.008	133	0.00	0.00	0.00	0.00
Fluoranthene	0.04	EPA RfD	0.31	256	0.009	21.3	0.00	0.00	0.00	0.00
Pyrene	0.03	EPA RfD	0.24	198	0.007	72.0	0.00	0.00	0.00	0.00
Benzo[a]anthracene	0.00002	WHO GV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chrysene	0.00002	WHO GV	0.11	90.8	0.0030	15133	0.00	0.00	0.00	0.00
bis(2-Ethylhexyl)phthalate	0.02	EPA RfD	0.44	363	0.012	60.5	0.00	0.00	0.00	0.00
Benzo[b]+[k]fluoranthene	0.00002	WHO GV	0.15	124	0.0041	20667	0.00	0.00	0.00	0.00
Benzo[a]pyrene	0.0002	WHO GV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Indeno[1,2,3-cd]pyrene	0.00002	WHO GV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dibenz[a,h]anthracene	0.0002	WHO GV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benzo[g,h,i]perylene	0.0002	WHO GV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RISK / ACCEPTABLE RISK TO: HUMAN			Groundwater				Groundwater			
			R				R			

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Table 118

EVAPORATION DAM 2: HUMAN RISK ASSESSMENT ♦ SEDIMENTS ♦ SAMPLE NO. 18 (ORGANIC - PAH⁹ & VOC⁹) - IVS - MASTER PLAN

SAMPLE NUMBER: 18			RISK TO HUMAN				NOTES
ORGANIC COMPOUNDS Volatile & Semi-Volatile	⁶ RfD/ ADI / GV mg/kg/day	⁷ EPA RfD/ EPA DWEL/ RSA RfD/ WHO GV	SAMPLE NO. 18				
			⁸ Lab conc. ppm	¹³ Conc. in groundwater (EEC) ppb	¹⁴ PDI groundwater exposure mg/kg/day	¹⁰ Margin of Safety %	
Benzene	0.002	EPA RfD	< 0.01	0.00	0.00	0.00	VOLUME = 1,250,000 kg/ha/m
Toluene	0.2	EPA RfD	< 0.01	0.00	0.00	0.00	
Ethylbenzene	0.1	EPA RfD	< 0.01	0.00	0.00	0.00	
m,p-Xylene	0.17	WHO GV	< 0.01	0.00	0.00	0.00	
o-Xylene	0.17	WHO GV	< 0.01	0.00	0.00	0.00	
Styrene	0.2	EPA RfD	< 0.01	0.00	0.00	0.00	
Isopropylbenzene	0.1	EPA RfD	< 0.01	0.00	0.00	0.00	
1,3,5-Trimethylbenzene	0.05	EPA RfD	< 0.01	0.00	0.00	0.00	
1,2,4-Trimethylbenzene	0.05	EPA RfD	< 0.01	0.00	0.00	0.00	
Naphthalene	0.02	EPA RfD	< 0.01	0.00	0.00	0.00	
Phenol	0.6	EPA RfD	0.00	0.00	0.00	0.00	
2-Methylphenol	0.05	EPA RfD	0.00	0.00	0.00	0.00	
4-Methylphenol	0.005	EPA RfD	0.00	0.00	0.00	0.00	
2,4-Dimethylphenol	0.02	EPA RfD	0.00	0.00	0.00	0.00	
2-Methylnaphthalene	0.02	EPA RfD	0.00	0.00	0.00	0.00	
Acenaphthylene	0.00002	WHO GV	0.00	0.00	0.00	0.00	
Acenaphthene	0.1	EPA RfD	0.00	0.00	0.00	0.00	
Dibenzofuran	0.004	EPA RfD	0.00	0.00	0.00	0.00	
Fluorene	0.04	EPA RfD	0.00	0.00	0.00	0.00	
Phenanthrene	0.0002	WHO GV	0.00	0.00	0.00	0.00	
Anthracene	0.3	EPA RfD	0.00	0.00	0.00	0.00	
Carbazole	0.006	EPA RfD	0.15	124	0.004	69	
Fluoranthene	0.04	EPA RfD	0.17	140	0.005	11.7	
Pyrene	0.03	EPA RfD	0.12	99	0.003	11.0	
Benzo[a]anthracene	0.00002	WHO GV	0.00	0.00	0.00	0.00	
Chrysene	0.00002	WHO GV	0.00	0.00	0.00	0.00	
bis(2-Ethylhexyl)phthalate	0.02	EPA RfD	0.32	264	0.01	44	
Benzo[b]+[k]fluoranthene	0.00002	WHO GV	0.00	0.00	0.00	0.00	
Benzo[a]pyrene	0.0002	WHO GV	0.00	0.00	0.00	0.00	
Indeno[1,2,3-cd]pyrene	0.00002	WHO GV	0.00	0.00	0.00	0.00	
Dibenz[a,h]anthracene	0.0002	WHO GV	0.00	0.00	0.00	0.00	
Benzo[g,h,i]perylene	0.0002	WHO GV	0.00	0.00	0.00	0.00	
RISK / ACCEPTABLE RISK TO: HUMAN			Groundwater		AR		

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Appendix 2 continued

EVAPORATION DAM 3 ENVIRONMENTAL RISK QUANTIFICATION AND HUMAN RISK ASSESSMENT SUMMARY TABLES

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EVAPORATION DAM 3: WATERS INORGANIC
ENVIRONMENTAL RISK QUANTIFICATION

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Table 119

EVAPORATION DAM 3: ENVIRONMENTAL RISK QUANTIFICATION ♦ DAM WATER ♦ SAMPLE NO. 8 [INORGANIC · MICRO'S & MACRO'S]
[ISCOR VANDERBIJLPARK STEEL – MASTER PLAN]

SAMPLE NUMBER: 8		EVAPORATION DAM 3: Current Volume = 28,689 kg/ha/m (Current & Total volumes are the same)																
INORGANIC COMPOUNDS Micro's and Macro's	Acc. Risk Value (MR&SA) ppb	RISK TO ENVIRONMENT																
		RISK OF DAM WATER AS IS					RISK OF DILUTED DAM WATER IN RIVER					RISK OF DAM WATER FOR GROUNDWATER						
		TOTAL ANALYSIS			PROBIT MODEL		DILUTED WATER		PROBIT MODEL		CURRENT VOLUME		PROBIT MODEL		TOTAL VOLUME		PROBIT MODEL	
		¹ Lab Conc. ppm	² EEC ppb	³ Risk R / AR	Risk Quantification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quantification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quantification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quantification %	³ Risk R / AR
Aluminium as Al	10900	< 0.100	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR				
Arsenic as As	430	0.011	11.0	AR	0.00E+00	AR	0.367	AR	0.00E+00	AR	0.208	AR	0.00E+00	AR				
Barium as Ba	7800	< 0.10	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR				
Cadmium as Cd	31	0.046	46	R	9.64E-03	R	1.53	AR	0.00E+00	AR	0.871	AR	0.00E+00	AR				
Chromium ³⁺ as Cr ³⁺	4700	0.043	43	AR	0.00E+00	AR	1.43	AR	0.00E+00	AR	0.814	AR	0.00E+00	AR				
Chromium ⁶⁺ as Cr ⁶⁺	20	< 0.025	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR				
Cobalt as Co	5900	0.144	144	AR	0.00E+00	AR	4.80	AR	0.00E+00	AR	2.73	AR	0.00E+00	AR				
Copper as Cu	100	0.033	33	AR	2.23E-09	AR	1.1	AR	0.00E+00	AR	0.625	AR	0.00E+00	AR				
Cyanide as CN	5.3	0.19	190	R	9.94E+01	R	6.33	R	1.66E-03	R	3.3	R	7.93E-06	R				
Iron as Fe	9000	0.396	396	AR	0.00E+00	AR	13.2	AR	0.00E+00	AR	7.5	AR	0.00E+00	AR				
Lead as Pb	100	0.245	245	R	2.99E-01	R	8.17	AR	0.00E+00	AR	4.64	AR	0.00E+00	AR				
Manganese as Mn	300	33	33000	R	1.00E+02	R	1100	R	2.50E+00	R	625	R	1.09E-01	R				
Mercury as Hg	22	< 0.002	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	Current & Total Volumes are the same			
Nickel as Ni	1140	0.138	138	AR	1.11E-14	AR	4.60	AR	0.00E+00	AR	2.61	AR	0.00E+00	AR				
Selenium as Se	260	0.015	15	AR	0.00E+00	AR	0.500	AR	0.00E+00	AR	0.284	AR	0.00E+00	AR				
Titanium as Ti	731	0.053	53	AR	0.00E+00	AR	1.77	AR	0.00E+00	AR	1.0	AR	0.00E+00	AR				
Vanadium as V	1300	< 0.03	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR				
Zinc as Zn	700	0.051	51	AR	0.00E+00	AR	1.7	AR	0.00E+00	AR	1.0	AR	0.00E+00	AR				
Calcium as Ca	150000	641	641000	R	4.83E+00	R	21367	AR	5.55E-14	AR	12137	AR	0.00E+00	AR				
Chloride as Cl	250000	2680	2680000	R	5.54E+01	R	89333	AR	5.84E-09	AR	50745	AR	5.10E-12	AR				
Fluoride as F	1500	10.4	10400	R	2.37E+01	R	347	AR	2.67E-11	AR	197	AR	2.22E-14	AR				
Magnesium as Mg	70000	304	304000	R	5.16E+00	R	10133	AR	6.66E-14	AR	5756	AR	0.00E+00	AR				
Potassium as K	200000	367	367000	R	4.61E-02	R	12233	AR	0.00E+00	AR	6949	AR	0.00E+00	AR				
Sodium as Na	100000	2087	2087000	R	9.25E+01	R	69567	AR	1.02E-05	AR	39517	AR	1.93E-08	AR				
Sulphate as SO ₄	200000	4778	4778000	R	9.56E+01	R	159267	AR	3.97E-05	AR	90470	AR	9.29E-08	AR				
Boron as B	17000	1.3	1300	AR	0.00E+00	AR	43.3	AR	0.00E+00	AR	24.6	AR	0.00E+00	AR				
Nitrate as N	9000	0.6	600	AR	0.00E+00	AR	20	AR	0.00E+00	AR	11.4	AR	0.00E+00	AR				
RISK / ACCEPTABLE RISK TO: ENVIRONMENT				R		R		R		R		R		R				

Table 120

EVAPORATION DAM 3: ENVIRONMENTAL RISK QUANTIFICATION ♦ DAM WATER ♦ SAMPLE NO. 13 [INORGANIC · MICRO'S & MACRO'S]
[ISCOR VANDERBIJLPARK STEEL – MASTER PLAN]

SAMPLE NUMBER: 13

INORGANIC COMPOUNDS Micro's and Macro's	Acc Risk Value (MR&SA) ppb	RISK TO ENVIRONMENT																
		RISK OF OAM WATER AS IS					RISK OF DILUTED DAM WATER IN RIVER					RISK OF OAM WATER FOR GROUNDWATER						
		TOTAL ANALYSIS			⁴ PROBIT MODEL		DILUTED WATER		⁴ PROBIT MODEL		CURRENT VOLUME		⁴ PROBIT MODEL		TOTAL VOLUME		⁴ PROBIT MODEL	
		¹ Lab Conc. ppm	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR
Aluminium as Al	10000	< 0.100	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR				
Arsenic as As	470	0.007	7.0	AR	0.00E+00	AR	0.233	AR	0.00E+00	AR	0.133	AR	0.00E+00	AR				
Barium as Ba	7800	< 0.10	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR				
Cadmium as Cd	31	0.054	54	R	3.19E-02	R	1.80	AR	0.00E+00	AR	1.02	AR	0.00E+00	AR				
Chromium ³⁺ as Cr ³⁺	1000	0.040	40	AR	0.00E+00	AR	1.33	AR	0.00E+00	AR	0.757	AR	0.00E+00	AR				
Chromium ⁶⁺ as Cr ⁶⁺	20	< 0.025	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR				
Cobalt as Co	6000	0.125	125	AR	0.00E+00	AR	4.17	AR	0.00E+00	AR	2.37	AR	0.00E+00	AR				
Copper as Cu	100	0.042	42	AR	3.94E-08	AR	1.40	AR	0.00E+00	AR	0.795	AR	0.00E+00	AR				
Cyanide as CN	5.3	< 0.05	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR				
Iron as Fe	9000	0.162	162	AR	0.00E+00	AR	5.4	AR	0.00E+00	AR	3.07	AR	0.00E+00	AR				
Lead as Pb	100	0.311	311	R	1.12E+00	R	10.4	AR	0.00E+00	AR	5.89	AR	0.00E+00	AR				
Manganese as Mn	300	0.344	344	R	1.16E-03	R	11	AR	0.00E+00	AR	6.51	AR	0.00E+00	AR				
Mercury as Hg	22	< 0.002	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	Current & Total Volumes are the same			
Nickel as Ni	1140	0.162	162	AR	5.55E-14	AR	5.40	AR	0.00E+00	AR	3.07	AR	0.00E+00	AR				
Selenium as Se	200	0.013	13	AR	0.00E+00	AR	0.433	AR	0.00E+00	AR	0.246	AR	0.00E+00	AR				
Titanium as Ti	131	0.24	240	AR	2.10E-09	AR	8.0	AR	0.00E+00	AR	4.5	AR	0.00E+00	AR				
Vanadium as V	1300	< 0.03	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR				
Zinc as Zn	740	0.047	47	AR	0.00E+00	AR	1.57	AR	0.00E+00	AR	0.890	AR	0.00E+00	AR				
Calcium as Ca	150000	491	491000	R	1.45E+00	R	16367	AR	0.00E+00	AR	9297	AR	0.00E+00	AR				
Chloride as Cl	250000	3027	3027000	R	6.40E+01	R	100900	AR	2.48E-08	AR	57315	AR	2.41E-11	AR				
Fluoride as F	1500	15.1	15100	R	5.05E+01	R	503	AR	2.74E-09	AR	286	AR	2.28E-12	AR				
Magnesium as Mg	70000	207	207000	R	8.63E-01	R	6900	AR	0.00E+00	AR	3919	AR	0.00E+00	AR				
Potassium as K	200000	648	648000	R	1.38E+00	R	21600	AR	0.00E+00	AR	12270	AR	0.00E+00	AR				
Sodium as Na	100000	3163	3163000	R	9.88E+01	R	105433	R	5.56E-04	R	59891	AR	2.10E-06	AR				
Sulphate as SO ₄	200000	6000	6000000	R	9.84E+01	R	200000	R	3.45E-04	R	113608	AR	1.19E-06	AR				
Boron as B	17000	2.1	2100	AR	1.11E-14	AR	70	AR	0.00E+00	AR	40	AR	0.00E+00	AR				
Nitrate as N	5000	0.3	300	AR	0.00E+00	AR	10	AR	0.00E+00	AR	5.7	AR	0.00E+00	AR				
		ACCEPTABLE RISK TO: ENVIRONMENT				R		R		R		R		R				

Table 121

EVAPORATION DAM 3: ENVIRONMENTAL RISK QUANTIFICATION ♦ DAM WATER ♦ SAMPLE NO. 14 [INORGANIC - MICRO'S & MACRO'S]
[ISCOR VANDERBIJLPARK STEEL – MASTER PLAN]

SAMPLE NUMBER: 14

INORGANIC COMPOUNDS Micro's and Macro's	Acc. Risk Value (MR&SA) ppb	RISK TO ENVIRONMENT																
		RISK OF DAM WATER AS IS					RISK OF DILUTED DAM WATER IN RIVER					RISK OF DAM WATER FOR GROUNDWATER						
		TOTAL ANALYSIS			PROBIT MODEL		DILUTED WATER		PROBIT MODEL		CURRENT VOLUME		PROBIT MODEL		TOTAL VOLUME		PROBIT MODEL	
		¹ Lab Conc. ppm	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR
Aluminium as Al	10000	< 0.100	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR				
Arsenic as As	430	0.007	7.0	AR	0.00E+00	AR	0.233	AR	0.00E+00	AR	0.133	AR	0.00E+00	AR				
Barium as Ba	7800	< 0.10	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR				
Cadmium as Cd	31	0.055	55	R	3.63E-02	R	1.83	AR	0.00E+00	AR	1.04	AR	0.00E+00	AR				
Chromium ³⁺ as Cr ³⁺	4700	0.035	35	AR	0.00E+00	AR	1.17	AR	0.00E+00	AR	0.663	AR	0.00E+00	AR				
Chromium ⁶⁺ as Cr ⁶⁺	20	< 0.025	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR				
Cobalt as Co	6900	0.126	126	AR	0.00E+00	AR	4.20	AR	0.00E+00	AR	2.39	AR	0.00E+00	AR				
Copper as Cu	100	0.042	42	AR	3.94E-08	AR	1.40	AR	0.00E+00	AR	0.795	AR	0.00E+00	AR				
Cyanide as CN	5.3	< 0.05	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR				
Iron as Fe	9000	0.160	160	AR	0.00E+00	AR	5.3	AR	0.00E+00	AR	3.03	AR	0.00E+00	AR				
Lead as Pb	100	0.32	320	R	1.30E+00	R	10.7	AR	0.00E+00	AR	6.06	AR	0.00E+00	AR				
Manganese as Mn	300	0.263	263	AR	1.01E-04	AR	8.8	AR	0.00E+00	AR	4.98	AR	0.00E+00	AR				
Mercury as Hg	22	< 0.002	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	Current & Total Volumes are the same			
Nickel as Ni	1140	0.162	162	AR	5.55E-14	AR	5.40	AR	0.00E+00	AR	3.07	AR	0.00E+00	AR				
Selenium as Se	260	0.011	11	AR	0.00E+00	AR	0.367	AR	0.00E+00	AR	0.208	AR	0.00E+00	AR				
Titanium as Ti	731	0.26	260	AR	5.52E-09	AR	8.7	AR	0.00E+00	AR	4.9	AR	0.00E+00	AR				
Vanadium as V	1300	< 0.03	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR				
Zinc as Zn	700	0.047	47	AR	0.00E+00	AR	1.57	AR	0.00E+00	AR	0.890	AR	0.00E+00	AR				
Calcium as Ca	15000	521	521000	R	1.94E+00	R	17367	AR	0.00E+00	AR	9865	AR	0.00E+00	AR				
Chloride as Cl	250000	3102	3102000	R	6.63E+01	R	103400	AR	3.30E-08	AR	58736	AR	3.29E-11	AR				
Fluoride as F	1500	16.1	16100	R	5.55E+01	R	537	AR	5.92E-09	AR	305	AR	5.21E-12	AR				
Magnesium as Mg	70000	219	219000	R	1.16E+00	R	7300	AR	0.00E+00	AR	4147	AR	0.00E+00	AR				
Potassium as K	200000	665	665000	R	1.57E+00	R	22167	AR	0.00E+00	AR	12592	AR	0.00E+00	AR				
Sodium as Na	100000	3188	3188000	R	9.88E+01	R	106267	R	5.97E-04	R	60364	AR	2.29E-06	AR				
Sulphate as SO ₄	200000	6000	6000000	R	9.84E+01	R	200000	R	3.45E-04	R	113608	AR	1.19E-06	AR				
Boron as B	700	2.3	2300	AR	2.22E-14	AR	77	AR	0.00E+00	AR	44	AR	0.00E+00	AR				
Nitrate as N	9000	0.3	300	AR	0.00E+00	AR	10	AR	0.00E+00	AR	5.7	AR	0.00E+00	AR				
RISK / ACCEPTABLE RISK TO: ENVIRONMENT				R		R		R		R		AR		AR				

Table 122

EVAPORATION DAM 3: ENVIRONMENTAL RISK QUANTIFICATION ♦ DAM WATER ♦ SAMPLE NO. 15 [INORGANIC · MICRO'S & MACRO'S]
[ISCOR VANDERBIJLPARK STEEL – MASTER PLAN]

SAMPLE NUMBER: 15																		
INORGANIC COMPOUNDS Micro's and Macro's	Acc. Risk Value (MR&SA) ppb	RISK TO ENVIRONMENT																
		RISK OF DAM WATER AS IS					RISK OF DILUTED DAM WATER IN RIVER					RISK OF DAM WATER FOR GROUNDWATER						
		TOTAL ANALYSIS			PROBIT MODEL		DILUTED WATER		PROBIT MODEL		CURRENT VOLUME		PROBIT MODEL		TOTAL VOLUME		PROBIT MODEL	
		¹ Lab Conc. ppm	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR
Aluminium as Al	10000	< 0.100	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR				
Arsenic as As	430	0.007	7.0	AR	0.00E+00	AR	0.233	AR	0.00E+00	AR	0.133	AR	0.00E+00	AR				
Barium as Ba	7800	< 0.10	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR				
Cadmium as Cd	31	0.056	56	R	4.13E-02	R	1.87	AR	0.00E+00	AR	1.06	AR	0.00E+00	AR				
Chromium ³⁺ as Cr ³⁺	4700	0.036	36	AR	0.00E+00	AR	1.2	AR	0.00E+00	AR	0.682	AR	0.00E+00	AR				
Chromium ⁶⁺ as Cr ⁶⁺	20	< 0.025	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR				
Cobalt as Co	6900	0.129	129	AR	0.00E+00	AR	4.3	AR	0.00E+00	AR	2.44	AR	0.00E+00	AR				
Copper as Cu	100	0.042	42	AR	3.94E-08	AR	1.40	AR	0.00E+00	AR	0.795	AR	0.00E+00	AR				
Cyanide as CN	5.3	< 0.05	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR				
Iron as Fe	9000	0.383	383	AR	0.00E+00	AR	12.8	AR	0.00E+00	AR	7.25	AR	0.00E+00	AR				
Lead as Pb	100	0.324	324	R	1.38E+00	R	10.8	AR	0.00E+00	AR	6.13	AR	0.00E+00	AR				
Manganese as Mn	300	0.204	204	AR	8.03E-06	AR	6.8	AR	0.00E+00	AR	3.86	AR	0.00E+00	AR				
Mercury as Hg	22	< 0.002	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	Current & Total Volumes are the same			
Nickel as Ni	1140	0.161	161	AR	4.44E-14	AR	5.37	AR	0.00E+00	AR	3.05	AR	0.00E+00	AR				
Selenium as Se	280	0.017	17	AR	0.00E+00	AR	0.567	AR	0.00E+00	AR	0.322	AR	0.00E+00	AR				
Titanium as Ti	731	0.29	290	AR	2.02E-08	AR	9.67	AR	0.00E+00	AR	5.5	AR	0.00E+00	AR				
Vanadium as V	1300	< 0.03	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR				
Zinc as Zn	700	0.045	45	AR	0.00E+00	AR	1.5	AR	0.00E+00	AR	0.852	AR	0.00E+00	AR				
Calcium as Ca	15000	541	541000	R	2.31E+00	R	18033	AR	1.11E-14	AR	10244	AR	0.00E+00	AR				
Chloride as Cl	250000	3102	3102000	R	6.63E+01	R	103400	AR	3.30E-08	AR	58736	AR	3.29E-11	AR				
Fluoride as F	1500	16.6	16600	R	5.79E+01	R	553	AR	8.54E-09	AR	314	AR	7.56E-12	AR				
Magnesium as Mg	75000	231	231000	R	1.51E+00	R	7700	AR	0.00E+00	AR	4374	AR	0.00E+00	AR				
Potassium as K	200000	634	634000	R	1.24E+00	R	21133	AR	0.00E+00	AR	12005	AR	0.00E+00	AR				
Sodium as Na	100000	3197	3197000	R	9.88E+01	R	106567	R	6.12E-04	R	60534	AR	2.36E-06	AR				
Sulphate as SO ₄	200000	6111	6111000	R	9.86E+01	R	203700	R	4.08E-04	R	115710	AR	1.45E-06	AR				
Boron as B	17000	1.8	1800	AR	0.00E+00	AR	60	AR	0.00E+00	AR	34	AR	0.00E+00	AR				
Nitrate as N	9000	0.4	400	AR	0.00E+00	AR	13	AR	0.00E+00	AR	7.6	AR	0.00E+00	AR				
RISK / ACCEPTABLE RISK TO: ENVIRONMENT				R		R		R		R		AR		AR				

TABLES 123 – 126

EVAPORATION DAM 3: WATERS INORGANIC
HUMAN RISK ASSESSMENT

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Table 123

EVAPORATION DAM 3: HUMAN RISK ASSESSMENT ♦ DAM WATER ♦ SAMPLE NO. 8 [INORGANIC - MICRO'S & MACRO'S]
[ISCOR VANDERBIJLPARK STEEL - MASTER PLAN]

SAMPLE NUMBER: 8											
INORGANIC COMPOUNDS Micro's and Macro's	RfD/ ADI/GV mg/kg/day	7 EPA RfD/ EPA DWEL/ RSA RfD/ WHO GV	RISK TO HUMAN								
			RISK OF DAM WATER AS IS			RISK OF DILUTED DAM WATER IN RIVER			RISK OF DAM WATER FOR GROUNDWATER		
			8 Conc. in Dam water ppm	9 PDI Dam water exposure mg/kg/day	10 Margin of Safety %	11 Conc. in River water (EEC) ppb	12 PDI river water exposure mg/kg/day	10 Margin of Safety %	13 Conc. in groundwater (EEC) ppb	14 PDI groundwater exposure mg/kg/day	10 Margin of Safety %
Aluminium as Al	0.005	RSA RfD	< 0.100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arsenic as As	0.0003	EPA RfD	0.011	0.0004	122	0.367	0.000012	4.08	0.208	0.00001	2.31
Barium as Ba	0.07	EPA RfD	< 0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cadmium as Cd	0.0005	EPA RfD	0.046	0.0015	307	1.53	0.000051	10.2	0.871	0.00003	5.6
Chromium ⁺ as Cr ⁺	1.5	EPA RfD	0.043	0.0014	0.00	1.43	0.00005	0.00	0.814	0.00003	0.00
Chromium ⁺⁺ as Cr ⁺⁺	0.003	EPA RfD	< 0.025	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cobalt as Co	0.008	RSA RfD	0.144	0.0048	0.00	4.80	0.00016	2.00	2.73	0.00009	1.14
Copper as Cu	0.04	EPA RfD	0.03	0.0011	2.0	1.10	0.00004	0.00	0.625	0.00002	0.00
Cyanide as CN	0.04	EPA RfD	0.19	0.0063	15.3	6.33	0.00	0.53	3.60	0.00012	0.3
Iron as Fe	0.003	RSA RfD	0.396	0.0132	440	13.2	0.0004	14.7	7.5	0.0003	8.33
Lead as Pb	0.002	RSA RfD	0.245	0.0082	408	8.2	0.00027	13.7	4.64	0.0002	7.73
Manganese as Mn	0.046	EPA RfD	33	1.1	2391	1100	0.037	70.7	625	0.021	45.3
Mercury as Hg	0.0003	EPA RfD	< 0.002	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nickel as Ni	0.02	EPA RfD	0.138	0.0046	23.0	4.60	0.00015	0.767	2.61	0.00009	0.416
Selenium as Se	0.005	EPA RfD	0.015	0.0005	10.0	0.500	0.00002	0.333	0.284	0.000009	0.105
Titanium as Ti	0.003	RSA RfD	0.053	0.0018	5.0	1.8	0.00006	2.0	1.0	0.00003	1.11
Vanadium as V	0.009	EPA RfD	< 0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zinc as Zn	0.3	EPA RfD	0.051	0.0017	0.567	1.70	0.00006	0.00	1.0	0.00003	0.011
Calcium as Ca	5.0	RSA RfD	641	21.4	427	21367	0.712	14.7	12137	0.405	0.08
Chloride as Cl	8.3	RSA RfD	2680	89	1076	89333	2.98	35.9	50745	1.7	20.4
Fluoride as F	0.06	EPA RfD	10.4	0.347	578	347	0.012	18.3	197	0.0066	10.9
Magnesium as Mg	2.3	RSA RfD	304	10.1	441	10133	0.338	14.7	5756	0.192	0.34
Potassium as K	6.7	RSA RfD	367	12.2	183	12233	0.408	8.03	6949	0.232	3.46
Sodium as Na	3.3	RSA RfD	2087	69.6	2108	69567	2.32	70.3	39517	1.32	39.5
Sulphate as SO ₄	6.7	RSA RfD	4778	159	2377	159267	5.31	79.2	90470	3.02	45
Boron as B	0.09	EPA RfD	1.3	0.043	48.1	43	0.0014	1.63	24.6	0.00082	0.911
Nitrate as N	1.6	EPA RfD	0.6	0.02	1.3	20	0.0007	0.042	11.4	0.00038	0.024
RISK / ACCEPTABLE RISK TO: HUMAN			Dam water			River water			Groundwater		
			R			R			R		

Table 124

EVAPORATION DAM 3: HUMAN RISK ASSESSMENT ♦ DAM WATER ♦ SAMPLE NO. 13 [INORGANIC - MICRO'S & MACRO'S]
[ISCOR VANDERBIJLPARK STEEL - MASTER PLAN]

SAMPLE NUMBER: 13											
INORGANIC COMPOUNDS Micro's and Macro's	RfD/ ADI/GV mg/kg/day	7 EPA RfD/ EPA DWEL/ RSA RfD/ WHO GV	RISK TO HUMAN								
			RISK OF DAM WATER AS IS			RISK OF DILUTED DAM WATER IN RIVER			RISK OF DAM WATER FOR GROUNDWATER		
			8 Conc. in Dam water ppm	9 PDI Dam water exposure mg/kg/day	10 Margin of Safety %	11 Conc. in River water (EEC) ppb	12 PDI river water exposure mg/kg/day	10 Margin of Safety %	13 Conc. in groundwater (EEC) ppb	14 PDI groundwater exposure mg/kg/day	10 Margin of Safety %
Aluminium as Al	0.005	RSA RfD	< 0.100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arsenic as As	0.0003	EPA RfD	0.007	0.0002	73	0.233	0.000008	2.50	0.133	0.000004	1.48
Barium as Ba	0.07	EPA RfD	< 0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cadmium as Cd	0.0005	EPA RfD	0.054	0.0018	360	1.80	0.000060	12.0	1.02	0.00003	6.9
Chromium ⁺⁺ as Cr ⁺⁺	1.5	EPA RfD	0.04	0.0013	0.083	1.33	0.00004	0.0000	0.757	0.00003	0.002
Chromium ⁺ as Cr ⁺	0.003	EPA RfD	< 0.025	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cobalt as Co	0.004	RSA RfD	0.125	0.0042	52.1	4.17	0.00014	1.74	2.37	0.00008	0.69
Copper as Cu	0.04	EPA RfD	0.04	0.0014	9.5	1.40	0.00005	0.117	0.795	0.00003	0.008
Cyanide as CN	0.04	EPA RfD	< 0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron as Fe	0.003	RSA RfD	0.162	0.0054	180	5.4	0.00018	6.0	3.07	0.00010	3.41
Lead as Pb	0.002	RSA RfD	0.311	0.010	518	10.4	0.00035	17.3	5.9	0.0002	5.92
Manganese as Mn	0.016	EPA RfD	0.344	0.011	25	11.0	0.00037	0.797	6.51	0.0002	0.472
Mercury as Hg	0.0003	EPA RfD	< 0.002	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nickel as Ni	0.02	EPA RfD	0.162	0.0054	27.0	5.40	0.00018	0.800	3.07	0.00010	0.513
Selenium as Se	0.005	EPA RfD	0.013	0.0004	0.67	0.433	0.00001	0.266	0.246	0.000008	0.164
Titanium as Ti	0.001	RSA RfD	0.24	0.0080	267	8.0	0.00027	8.2	4.5	0.00015	6.0
Vanadium as V	0.009	EPA RfD	< 0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zinc as Zn	0.3	EPA RfD	0.047	0.0016	0.522	1.57	0.00005	0.017	0.890	0.00003	0.010
Calcium as Ca	5.0	RSA RfD	491	16.4	327	16367	0.546	10.8	9297	0.310	6.2
Chloride as Cl	6.5	RSA RfD	3027	101	1216	100900	3.36	40.8	57315	1.9	23.0
Fluoride as F	0.06	EPA RfD	15.1	0.503	839	503	0.017	27.8	286	0.0095	15.8
Magnesium as Mg	2.3	RSA RfD	207	6.90	300	6900	0.230	10	3919	0.131	6.7
Potassium as K	6.7	RSA RfD	648	21.6	322	21600	0.720	70.7	12270	0.409	0.1
Sodium as Na	3.3	RSA RfD	3163	105	3195	105433	3.51	106	59891	2.0	60
Sulphate as SO ₄	6.7	RSA RfD	6000	200	2985	200000	6.67	100	113608	3.79	57
Boron as B	0.08	EPA RfD	2.1	0.070	77.8	70	0.0023	2.59	40	0.0013	1.47
Nitrate as N	1.6	EPA RfD	0.3	0.01	0.825	10	0.0003	0.021	5.7	0.0002	0.012
RISK / ACCEPTABLE RISK TO: HUMAN			Dam water	R		River water	R		Groundwater	A	

Table 125

EVAPORATION DAM 3: HUMAN RISK ASSESSMENT ♦ DAM WATER ♦ SAMPLE NO. 14 [INORGANIC - MICRO'S & MACRO'S]
[ISCOR VANDERBIJLPARK STEEL - MASTER PLAN]

SAMPLE NUMBER: 14											
INORGANIC COMPOUNDS Micro's and Macro's	RfD/ ADI/GV mg/kg/day	7 EPA RfD/ EPA DWEL/ RSA RfD/ WHO GV	RISK TO HUMAN								
			RISK OF DAM WATER AS IS			RISK OF DILUTED DAM WATER IN RIVER			RISK OF DAM WATER FOR GROUNDWATER		
			8 Conc. in Dam water ppm	9 PDI Dam water exposure mg/kg/day	10 Margin of Safety %	11 Conc. in River water (EEC) ppb	12 PDI river water exposure mg/kg/day	10 Margin of Safety %	13 Conc. in groundwater (EEC) ppb	14 PDI groundwater exposure mg/kg/day	10 Margin of Safety %
Aluminium as Al	0.005	RSA RfD	< 0.100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arsenic as As	0.0003	EPA RfD	0.007	0.0002	70	0.233	0.000008	2.58	0.133	0.000004	1.48
Barium as Ba	0.07	EPA RfD	< 0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cadmium as Cd	0.0005	EPA RfD	0.055	0.0018	367	1.83	0.000061	12.2	1.04	0.00003	8.9
Chromium ⁺⁺ as Cr ⁺⁺	1.5	EPA RfD	0.035	0.0012	0.070	1.17	0.00004	0.0026	0.663	0.00002	0.001
Chromium ⁺ as Cr ⁺	0.003	EPA RfD	< 0.025	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cobalt as Co	0.008	RSA RfD	0.126	0.0042	52.5	4.20	0.00014	1.72	2.39	0.00008	1.00
Copper as Cu	0.04	EPA RfD	0.04	0.0014	0.5	1.40	0.00005	0.117	0.795	0.00003	0.083
Cyanide as CN	0.04	EPA RfD	< 0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron as Fe	0.003	RSA RfD	0.160	0.0053	178	5.3	0.00018	5.8	3.03	0.00010	3.37
Lead as Pb	0.002	RSA RfD	0.32	0.011	533	10.7	0.00036	17.8	6.1	0.0002	10.1
Manganese as Mn	0.046	EPA RfD	0.263	0.009	19.1	8.8	0.00029	0.836	4.98	0.0002	0.361
Mercury as Hg	0.0005	EPA RfD	< 0.002	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nickel as Ni	0.02	EPA RfD	0.162	0.0054	27.3	5.40	0.00018	0.900	3.07	0.00010	0.513
Selenium as Se	0.005	EPA RfD	0.011	0.0004	7.33	0.367	0.00001	0.245	0.208	0.000007	0.129
Titanium as Ti	0.003	RSA RfD	0.26	0.0087	289	8.7	0.00029	0.7	4.9	0.00016	5.8
Vanadium as V	0.009	EPA RfD	< 0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zinc as Zn	0.3	EPA RfD	0.047	0.0016	0.522	1.57	0.00005	0.017	0.890	0.00003	0.010
Calcium as Ca	5.0	RSA RfD	521	17.4	347	17367	0.579	11.8	9865	0.329	0.9
Chloride as Cl	2.3	RSA RfD	3102	103	1246	103400	3.45	41.2	58736	2.0	23.0
Fluoride as F	0.06	EPA RfD	16.1	0.537	894	537	0.018	29.6	305	0.0102	16.4
Magnesium as Mg	2.3	RSA RfD	219	7.30	317	7300	0.243	11	4147	0.138	0.6
Potassium as K	6.2	RSA RfD	665	22.2	331	22167	0.739	11.0	12592	0.420	0.9
Sodium as Na	3.3	RSA RfD	3188	106	3220	106267	3.54	107	60364	2.0	91
Sulphate as SO ₄	0.4	RSA RfD	6000	200	2985	200000	6.67	100	113608	3.79	67
Boron as B	0.09	EPA RfD	2.3	0.077	85.3	77	0.0026	2.05	44	0.0015	1.61
Nitrate as N	1.6	EPA RfD	0.3	0.01	0.625	10	0.0003	0.021	5.7	0.0002	0.012
RISK / ACCEPTABLE RISK TO: HUMAN			Dam water	R		River water	R		Groundwater	AR	

Table 126

EVAPORATION DAM 3: HUMAN RISK ASSESSMENT ♦ DAM WATER ♦ SAMPLE NO. 15 [INORGANIC · MICRO'S & MACRO'S]
[ISCOR VANDERBIJLPARK STEEL · MASTER PLAN]

SAMPLE NUMBER: 15											
INORGANIC COMPOUNDS Micro's and Macro's	6 RfD/ ADI/GV mg/kg/day	7 EPA RfD/ EPA DWEL/ RSA RfD/ WHO GV	RISK TO HUMAN								
			RISK OF DAM WATER AS IS			RISK OF DILUTED DAM WATER IN RIVER			RISK OF DAM WATER FOR GROUNDWATER		
			8 Conc. in Dam water ppm	9 PDI Dam water exposure mg/kg/day	10 Margin of Safety %	11 Conc. in River water (EEC) ppb	12 PDI river water exposure mg/kg/day	10 Margin of Safety %	13 Conc. in groundwater (EEC) ppb	14 PDI groundwater exposure mg/kg/day	10 Margin of Safety %
Aluminium as Al	0.005	RSA RfD	< 0.100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arsenic as As	0.0003	EPA RfD	0.007	0.0002	78	0.233	0.000008	2.59	0.133	0.000004	1.48
Barium as Ba	0.07	EPA RfD	< 0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cadmium as Cd	0.0005	EPA RfD	0.056	0.0019	373	1.87	0.000062	12.3	1.06	0.00004	7.1
Chromium ³⁺ as Cr ³⁺	1.5	EPA RfD	0.036	0.0012	0.00	1.20	0.00004	0.0027	0.682	0.00002	0.002
Chromium ⁶⁺ as Cr ⁶⁺	0.003	EPA RfD	< 0.025	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cobalt as Co	0.008	RSA RfD	0.129	0.0043	53.9	4.30	0.00014	1.76	2.44	0.00008	1.02
Copper as Cu	0.04	EPA RfD	0.04	0.0014	3.6	1.40	0.00005	0.117	0.795	0.00003	0.006
Cyanide as CN	0.04	EPA RfD	< 0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron as Fe	0.003	RSA RfD	0.383	0.0128	426	12.8	0.00043	14.2	7.25	0.00024	6.96
Lead as Pb	0.002	RSA RfD	0.324	0.011	540	10.8	0.00036	10.8	6.1	0.0002	10.2
Manganese as Mn	0.048	EPA RfD	0.204	0.007	14.8	6.8	0.00023	0.492	3.86	0.0001	0.280
Mercury as Hg	0.0003	EPA RfD	< 0.002	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nickel as Ni	0.02	EPA RfD	0.161	0.0054	26.8	5.37	0.00018	0.005	3.05	0.00010	0.508
Selenium as Se	0.005	EPA RfD	0.017	0.0006	11.2	0.567	0.00002	0.378	0.322	0.000011	0.218
Titanium as Ti	0.003	RSA RfD	0.29	0.0097	322	9.7	0.00032	10.7	5.5	0.00018	9.1
Vanadium as V	0.009	EPA RfD	< 0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zinc as Zn	0.3	EPA RfD	0.045	0.0015	0.500	1.50	0.00005	0.017	0.852	0.00003	0.006
Calcium as Ca	5.0	RSA RfD	541	18.0	361	18033	0.601	12.0	10244	0.341	9.8
Chloride as Cl	8.3	RSA RfD	3102	103	1246	103400	3.45	41.5	58736	2.0	23.6
Fluoride as F	0.06	EPA RfD	16.6	0.553	922	553	0.018	50.7	314	0.0105	17.4
Magnesium as Mg	2.2	RSA RfD	231	7.70	335	7700	0.257	11	4374	0.146	6.3
Potassium as K	6.7	RSA RfD	634	21.1	315	21133	0.704	10.5	12005	0.400	6.0
Sodium as Na	3.3	RSA RfD	3197	107	3229	106567	3.55	108	60534	2.0	61
Sulphate as SO ₄	6.7	RSA RfD	6111	204	3040	203700	6.79	101	115710	3.86	58
Boron as B	0.09	EPA RfD	1.8	0.060	86.7	60	0.0020	2.22	34	0.0011	1.28
Nitrate as N	1.6	EPA RfD	0.4	0.01	0.833	13	0.0004	0.027	7.6	0.0003	0.016
RISK / ACCEPTABLE RISK TO: HUMAN			Dam water	R		River water	R		Groundwater	AR	

TABLES 127 - 128

EVAPORATION DAM 3: WATERS ORGANIC
ENVIRONMENTAL RISK QUANTIFICATION

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Table 127

EVAPORATION DAM 3: ENVIRONMENTAL RISK QUANTIFICATION ♦ DAM WATER ♦ SAMPLE NO's 80 & 130 (ORGANICS, PAH & VOC)
[ISCOR VANDERBIJLPARK STEEL – MASTER PLAN]

SAMPLE NUMBER: 80

ORGANIC COMPOUNDS PAH ^a & VOC ^a	Acc. Risk Value (MR) ppb	RISK TO ENVIRONMENT																
		RISK OF DAM WATER AS IS					RISK OF DILUTED DAM WATER IN RIVER					RISK OF DAM WATER FOR GROUNDWATER						
		TOTAL ANALYSIS			⁴ PROBIT MODEL		DILUTED WATER		⁴ PROBIT MODEL		CURRENT VOLUME		⁴ PROBIT MODEL		TOTAL VOLUME		⁴ PROBIT MODEL	
		¹ Lab Conc. ppm	² EEC ppb	³ Risk R / AR	Risk Quan- tification%	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification%	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification%	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification%	³ Risk R / AR
Butylbenzylphthalate	530	0.000	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR				
bis(2-ethylhexyl)phthalate	14400	0.002	2.00	AR	0.0E+00	AR	0.07	AR	0.0E+00	AR	0.04	AR	0.0E+00	AR				
Di-n-butylphthalate	200	0.000	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR				
Phenol	2690	0.000	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	Current & Total Volumes are the same			
2-Methylphenol	1460	0.000	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR				
4-Methylphenol	1470	0.000	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR				
2,4-Dimethylphenol	1270	0.000	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR				
RISK / ACCEPTABLE RISK TO: ENVIRONMENT				AR		AR		AR		AR		AR		AR				

SAMPLE NUMBER: 130

Butylbenzylphthalate	530	0.000	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR				
bis(2-ethylhexyl)phthalate	14400	0.000	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR				
Di-n-butylphthalate	200	0.000	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR				
Phenol	2690	0.000	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	Current & Total Volumes are the same			
2-Methylphenol	1460	0.000	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR				
4-Methylphenol	1470	0.000	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR				
2,4-Dimethylphenol	1270	0.000	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR				
RISK / ACCEPTABLE RISK TO: ENVIRONMENT		AR		AR		AR		AR		AR		AR		AR				

Table 128

EVAPORATION DAM 3: ENVIRONMENTAL RISK QUANTIFICATION ♦ DAM WATER ♦ SAMPLE NO's 14 & 15 [ORGANICS - PAHs & VOCs]
[ISCOR VANDERBIJLPARK STEEL – MASTER PLAN]

SAMPLE NUMBER: 14																		
ORGANIC COMPOUNDS PAH ⁵ & VDC ⁵	Acc. Risk Value (MR) ppb	RISK TO ENVIRONMENT																
		RISK OF DAM WATER AS IS					RISK OF DILUTED DAM WATER IN RIVER					RISK OF DAM WATER FOR GROUNDWATER						
		TOTAL ANALYSIS			PROBIT MODEL		DILUTED WATER		PROBIT MODEL		CURRENT VOLUME		PROBIT MODEL		TOTAL VOLUME		PROBIT MODEL	
		¹ Lab Conc. ppm	² EEC ppb	³ Risk R / AR	Risk Quan- tification%	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification%	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification%	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification%	³ Risk R / AR
Butylbenzylphthalate	530	0.000	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR				
bis(2-ethylhexyl)phthalate	14400	0.000	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR				
Di-n-butylphthalate	200	0.000	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR				
Phenol	2090	0.000	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	Current & Total Volumes are the same			
2-Methylphenol	1460	0.000	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR				
4-Methylphenol	1470	0.000	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR				
2,4-Dimethylphenol	1270	0.000	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR				
RISK / ACCEPTABLE RISK TO: ENVIRONMENT				AR		AR		AR		AR		AR		AR				

SAMPLE NUMBER: 15																		
Butylbenzylphthalate	530	0.007	7.00	AR	0.0E+00	AR	0.23	AR	0.0E+00	AR	0.13	AR	0.0E+00	AR				
bis(2-ethylhexyl)phthalate	14400	0.005	5.00	AR	0.0E+00	AR	0.17	AR	0.0E+00	AR	0.09	AR	0.0E+00	AR				
Di-n-butylphthalate	200	0.000	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR				
Phenol	2090	0.000	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	Current & Total Volumes are the same			
2-Methylphenol	1460	0.000	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR				
4-Methylphenol	1470	0.000	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR				
2,4-Dimethylphenol	1270	0.000	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR	0.00	AR	0.0E+00	AR				
RISK / ACCEPTABLE RISK TO: ENVIRONMENT				AR		AR		AR		AR		AR		AR				

TABLES 129 - 130

EVAPORATION DAM 3: WATERS ORGANIC
HUMAN RISK ASSESSMENT

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Table 129

EVAPORATION DAM 3: HUMAN RISK ASSESSMENT ♦ DAM WATER ♦ SAMPLE NO's 8D & 13D - (ORGANICS - PAH^a & VOC^a)
[ISCOR VANDERBIJLPARK STEEL - MASTER PLAN]

SAMPLE NUMBER: 8D											
ORGANIC COMPOUNDS PAH ^a & VOC ^a	⁶ RfD/ ADI/GV mg/kg/day	⁷ EPA RfD/ EPA DWEL/ RSA RfD/ WHO GV	RISK TO HUMAN								
			RISK OF DAM WATER AS IS			RISK OF DILUTED DAM WATER IN RIVER			RISK OF DAM WATER FOR GROUNDWATER		
			⁸ Conc. in Dam water ppm	⁹ PDI Dam water exposure mg/kg/day	¹⁰ Margin of Safety %	¹¹ Conc. in River water (EEC) ppb	¹² PDI river water exposure mg/kg/day	¹⁰ Margin of Safety %	¹³ Conc. in groundwater (EEC) ppb	¹⁴ PDI groundwater exposure mg/kg/day	¹⁰ Margin of Safety %
Butylbenzylphthalate	0.2	EPA RfD	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
bis(2-ethylhexyl)phthalate	0.02	EPA RfD	0.002	0.0001	0.333	0.067	0.000002	0.011	0.04	0.000001	0.007
Di-n-butylphthalate	0.1	EPA RfD	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phenol	0.6	EPA RfD	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Methylphenol	0.05	EPA RfD	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-Methylphenol	0.005	EPA RfD	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2,4-Dimethylphenol	0.02	EPA RfD	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RISK / ACCEPTABLE RISK TO: HUMAN			Dam water	AR		River water	AR		Groundwater	AR	
SAMPLE NUMBER: 13D											
Butylbenzylphthalate	0.2	EPA RfD	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
bis(2-ethylhexyl)phthalate	0.02	EPA RfD	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Di-n-butylphthalate	0.1	EPA RfD	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phenol	0.6	EPA RfD	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Methylphenol	0.05	EPA RfD	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-Methylphenol	0.005	EPA RfD	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2,4-Dimethylphenol	0.02	EPA RfD	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RISK / ACCEPTABLE RISK TO: HUMAN			Dam water	AR		River water	AR		Groundwater	AR	

Table 130

EVAPORATION DAM 3: HUMAN RISK ASSESSMENT ♦ DAM WATER ♦ SAMPLE NO's 14 & 15 - (ORGANICS - PAH & VOC)
[ISCOR VANDERBIJLPARK STEEL - MASTER PLAN]

SAMPLE NUMBER: 14											
ORGANIC COMPOUNDS PAH & VOC	RfD/ ADI/GV mg/kg/day	7 EPA RfD/ EPA DWEL/ RfD/ WHO GV	RISK TO HUMAN								
			RISK OF DAM WATER AS IS			RISK OF DILUTED DAM WATER IN RIVER			RISK OF DAM WATER FOR GROUNDWATER		
			8 Conc. in Dam water ppm	9 PDI Dam water exposure mg/kg/day	10 Margin of Safety %	11 Conc. in River water (EEC) ppb	12 PDI river water exposure mg/kg/day	10 Margin of Safety %	13 Conc. in groundwater (EEC) ppb	14 PDI groundwater exposure mg/kg/day	10 Margin of Safety %
Butylbenzylphthalate	0.2	EPA RfD	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
bis(2-ethylhexyl)phthalate	0.02	EPA RfD	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Di-n-butylphthalate	0.1	EPA RfD	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phenol	1.6	EPA RfD	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Methylphenol	0.03	EPA RfD	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-Methylphenol	0.001	EPA RfD	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2,4-Dimethylphenol	0.02	EPA RfD	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RISK / ACCEPTABLE RISK TO: HUMAN			Dam water	AR		River water	AR		Groundwater	AR	
SAMPLE NUMBER: 15											
Butylbenzylphthalate	0.2	EPA RfD	0.007	0.0002	0.117	0.23	0.00001	0.004	0.13	0.000004	0.002
bis(2-ethylhexyl)phthalate	0.02	EPA RfD	0.005	0.0002	0.037	0.167	0.00001	0.03	0.09	0.000003	0.02
Di-n-butylphthalate	0.1	EPA RfD	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phenol	1.6	EPA RfD	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Methylphenol	0.03	EPA RfD	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-Methylphenol	0.001	EPA RfD	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2,4-Dimethylphenol	0.02	EPA RfD	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RISK / ACCEPTABLE RISK TO: HUMAN			Dam water	AR		River water	AR		Groundwater	AR	

TABLES 131 - 132

EVAPORATION DAM 3: SEDIMENTS INORGANIC
ENVIRONMENTAL RISK QUANTIFICATION

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Table 131

EVAPORATION DAM 3: ENVIRONMENTAL RISK QUANTIFICATION ♦ SEDIMENTS ♦ SAMPLE NO's: 8 & 14 (INORGANIC - MICRO'S & MACRO'S)
[ISCOR VANDERBIJLPARK STEEL – MASTER PLAN]

SAMPLE NO.: 8 & 14		RISK TO ENVIRONMENT																			
INORGANIC COMPOUNDS Micro's and Macro's	Acc. Risk Value (MR&SA) ppb	RISK OF SEDIMENTS FOR GROUNDWATER																			
		SAMPLE NO. 8 Volume = 1,250,000 kg/ha/m										SAMPLE NO. 14 Volume = 1,250,000 kg/ha/m									
		TOTAL ANALYSIS		PROBIT MODEL		TCLP EXTRACTION		PROBIT MODEL		TOTAL ANALYSIS		PROBIT MODEL		TCLP EXTRACTION		PROBIT MODEL		TOTAL ANALYSIS		PROBIT MODEL	
		Lab Conc ppm	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	Lab Conc ppm	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	Lab Conc ppm	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	Lab Conc ppm	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR
Aluminium as Al	10000	7700	6352500	R	1.00E+02	R	1.6	1320	AR	2.22E-14	AR	3700	3052500	R	1.00E+02	R	0.94	776	AR	0.00E+00	AR
Arsenic as As	430	< 50	0.00	AR	0.00E+00	AR	< 0.34	0.00	AR	0.00E+00	AR	< 50	0.00	AR	0.00E+00	AR	< 0.34	0.00	AR	0.00E+00	AR
Barium as Ba	7800	3.6	2970	AR	1.25E-08	AR	0.33	272	AR	0.00E+00	AR	3.9	7343	AR	1.98E-04	AR	0.08	66	AR	0.00E+00	AR
Cadmium as Cd	31	< 10	0.00	AR	0.00E+00	AR	< 0.03	0.00	AR	0.00E+00	AR	< 10	0.00	AR	0.00E+00	AR	< 0.03	0.00	AR	0.00E+00	AR
Chromium ³⁺ as Cr ³⁺	4700	110	90750	R	9.01E+01	R	< 0.04	0.00	AR	0.00E+00	AR	96	79200	R	8.46E+01	R	< 0.04	0.00	AR	0.00E+00	AR
Cobalt as Co	6900	< 10	0.00	AR	0.00E+00	AR	< 0.12	0.00	AR	0.00E+00	AR	< 10	0.00	AR	0.00E+00	AR	< 0.12	0.00	AR	0.00E+00	AR
Copper as Cu	100	< 10	0.00	AR	0.00E+00	AR	< 0.02	0.00	AR	0.00E+00	AR	< 10	0.00	AR	0.00E+00	AR	< 0.02	0.00	AR	0.00E+00	AR
Iron as Fe	9000	11000	9075000	R	1.00E+02	R	84	69300	R	3.05E+01	R	15000	12375000	R	1.00E+02	R	0.13	107	AR	0.00E+00	AR
Lead as Pb	100	< 100	0.00	AR	0.00E+00	AR	< 0.31	0.00	AR	0.00E+00	AR	< 100	0.00	AR	0.00E+00	AR	< 0.31	0.00	AR	0.00E+00	AR
Manganese as Mn	300	190	156750	R	1.00E+02	R	5.1	4208	R	7.46E+01	R	490	404250	R	1.00E+02	R	2.0	1650	R	1.21E+01	R
Mercury as Hg	22	NA	0.00	AR	0.00E+00	AR	< 0.01	0.00	AR	0.00E+00	AR	NA	0.00	AR	0.00E+00	AR	< 0.01	0.00	AR	0.00E+00	AR
Nickel as Ni	1140	< 10	0.00	AR	0.00E+00	AR	< 0.05	0.00	AR	0.00E+00	AR	14	11550	R	5.10E+01	R	< 0.05	0.00	AR	0.00E+00	AR
Selenium as Se	260	NA	0.00	AR	0.00E+00	AR	< 0.05	0.00	AR	0.00E+00	AR	NA	0.00	AR	0.00E+00	AR	< 0.05	0.00	AR	0.00E+00	AR
Titanium as Ti	731	670	552750	R	1.00E+02	R	< 0.02	0.00	AR	0.00E+00	AR	380	313500	R	1.00E+02	R	< 0.02	0.00	AR	0.00E+00	AR
Vanadium as V	1300	1100	907500	R	1.00E+02	R	< 0.07	0.00	AR	0.00E+00	AR	54	44550	R	9.92E+01	R	< 0.07	0.00	AR	0.00E+00	AR
Zinc as Zn	700	250	206250	R	1.00E+02	R	< 0.17	0.00	AR	0.00E+00	AR	300	247500	R	1.00E+02	R	< 0.17	0.00	AR	0.00E+00	AR
Calcium as Ca	150000	4200	3465000	R	9.49E+01	R	48	39600	AR	1.43E-10	AR	5400	4455000	R	9.83E+01	R	42	34650	AR	2.65E-11	AR
Chloride as Cl	250000	300	247500	AR	3.15E-04	AR	70	57750	AR	2.65E-11	AR	450	371250	R	9.69E-03	R	70	57750	AR	2.65E-11	AR
Fluoride as F	1500	1.2	1023	AR	8.27E-06	AR	0.8	660	AR	6.76E-08	AR	6.4	5280	R	2.07E+00	R	0.7	578	AR	1.43E-08	AR
Magnesium as Mg	70000	510	420750	R	1.60E+01	R	14	11550	AR	3.55E-13	AR	730	602250	R	3.84E+01	R	12	9900	AR	4.44E-14	AR
Potassium as K	200000	920	759000	R	2.91E+00	R	26	21450	AR	0.00E+00	AR	1300	1072500	R	1.12E+01	R	30	32175	AR	2.55E-13	AR
Sodium as Na	100000	780	643500	R	1.95E+01	R	NA	0.00	AR	0.00E+00	AR	1900	1567500	R	8.10E+01	R	NA	0.00	AR	0.00E+00	AR
Sulphate as SO ₄	200000	400	330000	R	2.15E-02	R	< 1.0	0.00	AR	0.00E+00	AR	800	660000	R	1.51E+00	R	< 1.0	0.00	AR	0.00E+00	AR
RISK / ACCEPTABLE RISK TO: ENVIRONMENT		R		R		R		R		R		R		R		R		R		R	

Table 132

EVAPORATION DAM 3: ENVIRONMENTAL RISK QUANTIFICATION ♦ SEDIMENTS ♦ SAMPLE NO. 15 [INORGANIC - MICRO'S & MACRO'S]
[ISCOR VANDERBIJLPARK STEEL – MASTER PLAN]

SAMPLE NO.: 15		RISK TO ENVIRONMENT										NOTES
INORGANIC COMPOUNDS Micro's and Macro's	Acc. Risk Value (MR&SA) ppb	RISK OF SEDIMENTS FOR GROUNDWATER										
		SAMPLE NO. 15 Volume = 1,250,000 kg/ha/m										
		TOTAL ANALYSIS			⁴ PROBIT MODEL		TCIP EXTRACTION			⁴ PROBIT MODEL		
		¹ Lab Conc ppm	² EEC ppb	³ Risk R / AR	Risk Quantification %	³ Risk R / AR	¹ Lab Conc ppm	² EEC ppb	³ Risk R / AR	Risk Quantification %	³ Risk R / AR	
Aluminium as Al	10000	2800	2310000	R	1.00E+02	R	2.1	1733	AR	6.66E-13	AR	VOLUME = 1,250,000 kg/ha/m
Arsenic as As	400	<50	0.00	AR	0.00E+00	AR	<0.34	0.00	AR	0.00E+00	AR	
Barium as Ba	7800	3.1	6683	AR	8.10E-05	AR	0.21	173	AR	0.00E+00	AR	
Cadmium as Cd	31	<10	0.00	AR	0.00E+00	AR	<0.03	0.00	AR	0.00E+00	AR	
Chromium ³⁺ as Cr ³⁺	4700	63	51975	R	5.78E+01	R	<0.04	0.00	AR	0.00E+00	AR	
Cobalt as Co	6900	<10	0.00	AR	0.00E+00	AR	<0.12	0.00	AR	0.00E+00	AR	
Copper as Cu	100	<10	0.00	AR	0.00E+00	AR	<0.02	0.00	AR	0.00E+00	AR	
Iron as Fe	9000	5600	4620000	R	1.00E+02	R	77	63525	R	2.48E+01	R	
Lead as Pb	100	<100	0.00	AR	0.00E+00	AR	<0.31	0.00	AR	0.00E+00	AR	
Manganese as Mn	300	140	115500	R	1.00E+02	R	5.7	4703	R	8.10E+01	R	
Mercury as Hg	22	NA	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR	
Nickel as Ni	1140	14	11550	R	5.10E+01	R	<0.05	0.00	AR	0.00E+00	AR	
Selenium as Se	260	NA	0.00	AR	0.00E+00	AR	<0.05	0.00	AR	0.00E+00	AR	
Titanium as Ti	731	400	330000	R	1.00E+02	R	<0.02	0.00	AR	0.00E+00	AR	
Vanadium as V	1000	16	13200	R	5.12E+01	R	<0.07	0.00	AR	0.00E+00	AR	
Zinc as Zn	700	35	28875	R	9.97E+01	R	<0.17	0.00	AR	0.00E+00	AR	
Calcium as Ca	150000	7000	5775000	R	9.96E+01	R	74	61050	AR	2.73E-08	AR	
Chloride as Cl	250000	400	330000	R	3.80E-03	R	20	16500	AR	0.00E+00	AR	
Fluoride as F	1000	1.52	1254	AR	6.39E-05	AR	0.3	248	AR	3.55E-13	AR	
Magnesium as Mg	70000	440	363000	R	9.97E+00	R	17	14025	AR	4.31E-12	AR	
Potassium as K	200000	1200	990000	R	8.47E+00	R	45	37125	AR	1.61E-12	AR	
Sodium as Na	100000	2200	1815000	R	8.78E+01	R	NA	0.00	AR	0.00E+00	AR	
Sulphate as SO ₄	200000	900	742500	R	2.64E+00	R	<1.0	0.00	AR	0.00E+00	AR	
RISK / ACCEPTABLE RISK TO: ENVIRONMENT				R		R		R		R		

TABLES 133 - 135

EVAPORATION DAM 3: SEDIMENTS INORGANIC
HUMAN RISK ASSESSMENT

Table 133

EVAPORATION DAM 3: HUMAN RISK ASSESSMENT ♦ SEDIMENTS ♦ SAMPLE NO. 8 (INORGANIC · MICRO'S & MACRO'S)
[ISCOR VANDERBIJLPARK STEEL · MASTER PLAN]

SAMPLE NUMBER: 8

INORGANIC COMPOUNDS Micro's and Macro's	⁶ RfD/ ADI/GV mg/kg/day	⁷ EPA RfD/ EPA DWEL/ RSA RfD/ WHO GV	RISK TO HUMAN							
			TOTAL ANALYSIS				TCLP EXTRACTION			
			⁸ Lab conc. ppm	¹³ Conc. in groundwater (EEC) ppb	¹⁴ PDI groundwater exposure mg/kg/day	¹⁰ Margin of Safety %	⁸ Lab conc. ppm	¹³ Conc. in groundwater (EEC) ppb	¹⁴ PDI groundwater exposure mg/kg/day	¹⁰ Margin of Safety %
Aluminium as Al	0.005	RSA RfD	7700	6352500	212	4235000	1.6	1320	0.044	880
Arsenic as As	0.0003	EPA RfD	< 50	0.00	0.00	0.00	< 0.34	0.00	0.00	0.00
Barium as Ba	0.07	EPA RfD	3.6	2970	0.099	141	0.33	272	0.009	13.0
Cadmium as Cd	0.0005	EPA RfD	< 10	0.00	0.00	0.00	< 0.03	0.00	0.00	0.00
Chromium ³⁺ as Cr ³⁺	1.50	EPA RfD	110	90750	3.03	202	< 0.04	0.00	0.00	0.00
Cobalt as Co	0.008	RSA RfD	< 10	0.00	0.00	0.00	< 0.12	0.00	0.00	0.00
Copper as Cu	0.04	EPA RfD	< 10	0.00	0.00	0.00	< 0.02	0.00	0.00	0.90
Iron as Fe	0.003	RSA RfD	11000	9075000	303	10083333	84	69300	2.31	77000
Lead as Pb	0.002	RSA RfD	< 100	0.00	0.00	0.00	< 0.31	0.00	0.00	0.00
Manganese as Mn	0.046	EPA RfD	190	156750	5.23	11359	5.1	4208	0.140	305
Mercury as Hg	0.0003	EPA RfD	NA	0.00	0.00	0.00	< 0.01	0.00	0.00	0.00
Nickel as Ni	0.02	EPA RfD	< 10	0.00	0.000	0.00	< 0.05	0.00	0.00	0.00
Selenium as Se	0.005	EPA RfD	NA	0.00	0.00	0.00	< 0.05	0.00	0.00	0.00
Titanium as Ti	0.003	RSA RfD	670	552750	18.4	614167	< 0.02	0.00	0.00	0.00
Vanadium as V	0.009	EPA RfD	1100	907500	30.25	336111	< 0.07	0.00	0.00	0.00
Zinc as Zn	0.3	EPA RfD	250	206250	6.875	2292	< 0.17	0.00	0.00	0.00
Calcium as Ca	5.0	RSA RfD	4200	3465000	115.5	2310	48	39600	1.32	26
Chloride as Cl	8.3	RSA RfD	300	247500	8.25	29.4	70	57750	1.93	23.2
Fluoride as F	0.06	EPA RfD	1.2	1023	0.034	56.8	0.8	660	0.022	36.7
Magnesium as Mg	2.3	RSA RfD	510	420750	14.0	610	14	11550	0.385	16.7
Potassium as K	6.7	RSA RfD	920	759000	25.3	378	26	21450	0.715	10.7
Sodium as Na	3.3	RSA RfD	780	643500	21.5	650	NA	0.00	0.00	0.00
Sulphate as SO ₄	6.7	RSA RfD	400	330000	11.0	164	< 1.0	0.00	0.00	0.00
RISK / ACCEPTABLE RISK TO: HUMAN			Groundwater				R	Groundwater		

Table 134

EVAPORATION DAM 3: HUMAN RISK ASSESSMENT ♦ SEDIMENTS ♦ SAMPLE NO. 14 [INORGANIC - MICRO'S & MACRO'S]
[ISCOR VANDERBIJLPARK STEEL - MASTER PLAN]

SAMPLE NUMBER: 14

INORGANIC COMPOUNDS Micro's and Macro's	RfD/ ADI/GV mg/kg/day	7 EPA RfD/ EPA DWEL/ RSA RfD/ WHO GV	RISK TO HUMAN							
			TOTAL ANALYSIS				TCLP EXTRACTION			
			8 Lab conc. ppm	13 Conc. in groundwater (EEC) ppb	14 PDI groundwater exposure mg/kg/day	10 Margin of Safety %	8 Lab conc. ppm	13 Conc. in groundwater (EEC) ppb	14 PDI groundwater exposure mg/kg/day	10 Margin of Safety %
Aluminium as Al	0.005	RSA RfD	3700	3052500	102	2035000	0.94	776	0.026	517
Arsenic as As	0.0003	EPA RfD	< 50	0.00	0.00	0.00	< 0.34	0.00	0.00	0.00
Barium as Ba	0.07	EPA RfD	8.9	7343	0.245	350	0.08	66	0.002	3.1
Cadmium as Cd	0.0005	EPA RfD	< 10	0.00	0.00	0.00	< 0.03	0.00	0.00	0.00
Chromium ³⁺ as Cr ³⁺	1.50	EPA RfD	96	79200	2.64	176	< 0.04	0.00	0.00	0.00
Cobalt as Co	0.008	RSA RfD	< 10	0.00	0.00	0.00	< 0.12	0.00	0.00	0.00
Copper as Cu	0.01	EPA RfD	< 10	0.00	0.00	0.00	< 0.02	0.00	0.00	0.00
Iron as Fe	0.003	RSA RfD	15000	12375000	413	13750000	0.13	107	0.004	119
Lead as Pb	0.002	RSA RfD	< 100	0.00	0.00	0.00	< 0.31	0.00	0.00	0.00
Manganese as Mn	0.048	EPA RfD	490	404250	13.48	29293	2.0	1650	0.055	120
Mercury as Hg	0.0003	EPA RfD	NA	0.00	0.00	0.00	< 0.01	0.00	0.00	0.00
Nickel as Ni	0.02	EPA RfD	14	11550	0.385	1925	< 0.05	0.00	0.00	0.00
Selenium as Se	0.005	EPA RfD	NA	0.00	0.00	0.00	< 0.05	0.00	0.00	0.00
Titanium as Ti	0.003	RSA RfD	380	313500	10.5	348333	< 0.02	0.00	0.00	0.00
Vanadium as V	0.009	EPA RfD	54	44550	1.49	16500	< 0.07	0.00	0.00	0.00
Zinc as Zn	0.3	EPA RfD	300	247500	8.25	2750	< 0.17	0.00	0.00	0.00
Calcium as Ca	5.0	RSA RfD	5400	4455000	149	2970	42	34650	1.16	25.4
Chloride as Cl	8.3	RSA RfD	450	371250	12.4	149	70	57750	1.93	23.2
Fluoride as F	0.06	EPA RfD	6.4	5280	0.176	293	0.7	578	0.019	32.7
Magnesium as Mg	2.3	RSA RfD	730	602250	20.1	873	12.0	9900	0.330	14.30
Potassium as K	6.7	RSA RfD	1300	1072500	35.8	534	39	32175	1.07	18.01
Sodium as Na	3.3	RSA RfD	1900	1567500	52.3	1583	NA	0.00	0.00	0.00
Sulphate as SO ₄	6.7	RSA RfD	800	660000	22.0	328	< 1.0	0.00	0.00	0.00
RISK / ACCEPTABLE RISK TO: HUMAN			Groundwater				Groundwater			
			R				R			

Table 135

EVAPORATION DAM 3: HUMAN RISK ASSESSMENT ♦ SEDIMENTS ♦ SAMPLE NO. 15 [INORGANIC - MICRO'S & MACRO'S]
[ISCOR VANDERBIJLPARK STEEL - MASTER PLAN]

SAMPLE NUMBER: 15										
INORGANIC COMPOUNDS Micro's and Macro's	6 ADI/GV mg/kg/day	7 EPA RfD/ EPA DWEL/ RSA RfD/ WHO GV	RISK TO HUMAN							
			TOTAL ANALYSIS				TCLP EXTRACTION			
			8 Lab conc. ppm	13 Conc. in groundwater (EEC) ppb	14 PDI groundwater exposure mg/kg/day	10 Margin of Safety %	8 Lab conc. ppm	13 Conc. in groundwater (EEC) ppb	14 PDI groundwater exposure mg/kg/day	10 Margin of Safety %
Aluminium as Al	0.005	RSA RfD	2800	2310000	77	1540000	2.10	1733	0.058	1155
Arsenic as As	0.0003	EPA RfD	< 50	0.00	0.00	0.00	< 0.34	0.00	0.00	0.00
Barium as Ba	0.07	EPA RfD	9.1	6683	0.223	318	0.21	173	0.006	8.24
Cadmium as Cd	0.0005	EPA RfD	< 10	0.00	0.00	0.00	< 0.03	0.00	0.00	0.00
Chromium ³⁺ as Cr ³⁺	1.50	EPA RfD	63	51975	1.73	116	< 0.04	0.00	0.00	0.00
Cobalt as Co	0.008	RSA RfD	< 10	0.00	0.00	0.00	< 0.12	0.00	0.00	0.00
Copper as Cu	0.04	EPA RfD	< 10	0.00	0.00	0.00	< 0.02	0.00	0.00	0.00
Iron as Fe	0.003	RSA RfD	5600	4620000	154	5133333	77	63525	2.12	70583
Lead as Pb	0.002	RSA RfD	< 100	0.00	0.00	0.00	< 0.31	0.00	0.00	0.00
Manganese as Mn	0.046	EPA RfD	140	115500	3.85	8370	5.7	4703	0.157	341
Mercury as Hg	0.0003	EPA RfD	NA	0.00	0.00	0.00	< 0.01	0.00	0.00	0.00
Nickel as Ni	0.02	EPA RfD	14	11550	0.385	1925	< 0.05	0.00	0.00	0.00
Selenium as Se	0.005	EPA RfD	NA	0.00	0.00	0.00	< 0.05	0.00	0.00	0.00
Titanium as Ti	0.003	RSA RfD	400	330000	11.0	366667	< 0.02	0.00	0.00	0.00
Vanadium as V	0.009	EPA RfD	16	13200	0.440	4889	< 0.07	0.00	0.00	0.00
Zinc as Zn	0.3	EPA RfD	35	28875	0.963	321	< 0.17	0.00	0.00	0.00
Calcium as Ca	5.0	RSA RfD	7000	5775000	193	3850	74	61050	2.04	40.7
Chloride as Cl	8.3	RSA RfD	400	330000	11.0	133	20	16500	0.550	6.63
Fluoride as F	0.06	EPA RfD	152	1254	0.042	36.7	0.3	248	0.008	13.78
Magnesium as Mg	2.3	RSA RfD	440	363000	12.1	526	17	14025	0.468	20.33
Potassium as K	6.7	RSA RfD	1200	990000	33.0	493	45	37125	1.24	18.47
Sodium as Na	3.3	RSA RfD	2200	1815000	60.5	1833	NA	0.00	0.00	0.00
Sulphate as SO ₄	6.7	RSA RfD	900	742500	24.8	369	< 1.0	0.00	0.00	0.00
RISK / ACCEPTABLE RISK TO: HUMAN			Groundwater		R	Groundwater		R		

TABLE 136

**EVAPORATION DAM 3: SEDIMENTS ORGANIC
ENVIRONMENTAL RISK ASSESSMENT**

Draft for discussion
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Research for IVS

Table 136

EVAPORATION DAM 3: - ENVIRONMENTAL RISK QUANTIFICATION ♦ SEDIMENTS ♦ SAMPLE NO's 8, 14 & 15 (ORGANICS - PAH & VOC)
[ISCOR VANDERBIJLPARK STEEL – MASTER PLAN]

SAMPLE NUMBERS: 8, 14 & 15																
ORGANIC COMPOUNDS Volatile & Semi-Volatile	Acc Risk Value (MR) ppb	RISK TO ENVIRONMENT - RISK OF SEDIMENTS FOR GROUNDWATER														
		SAMPLE NO. 8 Volume = 1,250,000 kg/ha/m					SAMPLE NO. 14 Volume = 1,250,000 kg/ha/m					SAMPLE NO. 15 Volume = 1,250,000 kg/ha/m				
		TOTAL ANALYSIS			PROBIT MODEL		TOTAL ANALYSIS			PROBIT MODEL		TOTAL ANALYSIS			PROBIT MODEL	
		¹ Lab Conc. ppm	² EEC ppb	³ Risk R / AR	Risk Quantification	³ Risk R / AR	¹ Lab Conc. ppm	² EEC ppb	³ Risk R / AR	Risk Quantification	³ Risk R / AR	¹ Lab Conc. ppm	² EEC ppb	³ Risk R / AR	Risk Quantification	³ Risk R / AR
Benzene	3000	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR
Toluene	4000	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR
Ethylbenzene	6570	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR
m,p-Xylene	379	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR
o-Xylene	1150	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR
Styrene	4350	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR
Isopropylbenzene	2340	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR
1,3,5-Trimethylbenzene	1250	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR
1,2,4-Trimethylbenzene	770	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR
Naphthalene	200	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR	<0.01	0.00	AR	0.00E+00	AR
Phenol	2600	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
2-Methylphenol	1450	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
4-Methylphenol	1470	0.00	0.00	AR	0.00E+00	AR	0.10	85	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
2,4-Dimethylphenol	1370	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
2-Methylnaphthalene	150	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Acenaphthylene	0.5	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Acenaphthene	170	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Dibenzofuran	190	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Fluorene	190	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Phenanthrene	80	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Anthracene	0.5	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Carbazole	130	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Fluoranthene	14	0.18	149	R	5.49E+01	R	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Pyrene	200	0.12	99	AR	2.59E-07	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Benzo[a]anthracene	1.0	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Chrysene	100	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
bis(2-Ethylhexyl)phthalate	14400	0.27	223	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Benzo[b]+[k]fluoranthene	0.5	0.14	116	R	1.00E+02	R	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Benzo[a]pyrene	0.5	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Indeno[1,2,3-cd]pyrene	0.5	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Dibenz[a,h]anthracene	180	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
Benzo[g,h,i]perylene	730	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR	0.00	0.00	AR	0.00E+00	AR
RISK / ACCEPTABLE RISK TO: ENVIRONMENT		R			R		AR			AR		AR			AR	

TABLES 137 - 138

EVAPORATION DAM 3: SEDIMENTS ORGANIC
HUMAN RISK ASSESSMENT

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Table 137

EVAPORATION DAM 3: HUMAN RISK ASSESSMENT ♦ SEDIMENTS ♦ SAMPLE NO's 8&14 (ORGANIC - PAH & VOC) IVS - MASTER PLAN

SAMPLE NUMBERS: 8 & 14			RISK TO HUMAN							
ORGANICS COMPOUNDS Volatile & Semi-Volatile	⁶ RfD/ ADI/GV mg/kg/day	⁷ EPA RfD/ EPA DWEL/ RSA RfD/ WHO GV	SAMPLE NO. 8				SAMPLE NO. 14			
			⁸ Lab conc. ppm	¹³ Conc. in groundwater (EEC) ppb	¹⁴ PDI groundwater exposure mg/kg/day	¹⁰ Margin of Safety %	⁸ Lab conc. ppm	¹³ Conc. in groundwater (EEC) ppb	¹⁴ PDI groundwater exposure mg/kg/day	¹⁰ Margin of Safety %
Benzene	0.002	EPA RfD	< 0.01	0.00	0.00	0.00	< 0.01	0.00	0.00	0.00
Toluene	1.2	EPA RfD	< 0.01	0.00	0.00	0.00	< 0.01	0.00	0.00	0.00
Ethylbenzene	0.1	EPA RfD	< 0.01	0.00	0.00	0.00	< 0.01	0.00	0.00	0.00
m,p-Xylene	0.17	WHO GV	< 0.01	0.00	0.00	0.00	< 0.01	0.00	0.00	0.00
o-Xylene	0.17	WHO GV	< 0.01	0.00	0.00	0.00	< 0.01	0.00	0.00	0.00
Styrene	0.2	EPA RfD	< 0.01	0.00	0.00	0.00	< 0.01	0.00	0.00	0.00
Isopropylbenzene	0.1	EPA RfD	< 0.01	0.00	0.00	0.00	< 0.01	0.00	0.00	0.00
1,3,5-Trimethylbenzene	0.05	EPA RfD	< 0.01	0.00	0.00	0.00	< 0.01	0.00	0.00	0.00
1,2,4-Trimethylbenzene	0.05	EPA RfD	< 0.01	0.00	0.00	0.00	< 0.01	0.00	0.00	0.00
Naphthalene	0.02	EPA RfD	< 0.01	0.00	0.00	0.00	< 0.01	0.00	0.00	0.00
Phenol	0.6	EPA RfD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Methylphenol	0.05	EPA RfD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-Methylphenol	0.005	EPA RfD	0.00	0.00	0.00	0.00	0.10	85	0.003	56.67
2,4-Dimethylphenol	0.02	EPA RfD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Methylnaphthalene	0.02	EPA RfD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Acenaphthylene	0.00002	WHO GV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Acenaphthene	0.1	EPA RfD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dibenzofuran	0.001	EPA RfD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fluorene	0.04	EPA RfD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phenanthrene	0.0002	WHO GV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Anthracene	0.3	EPA RfD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Carbazole	0.006	EPA RfD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fluoranthene	0.04	EPA RfD	0.13	149	0.005	12.4	0.00	0.00	0.00	0.00
Pyrene	0.001	EPA RfD	0.12	99	0.003	11.0	0.00	0.00	0.00	0.00
Benzo[a]anthracene	0.00002	WHO GV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chrysene	0.00002	WHO GV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
bis(2-Ethylhexyl)phthalate	0.02	EPA RfD	0.27	223	0.007	37.2	0.00	0.00	0.00	0.00
Benzo[b]+[k]fluoranthene	0.00002	WHO GV	0.14	116	0.004	19333	0.00	0.00	0.00	0.00
Benzo[a]pyrene	0.0002	WHO GV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Indeno[1,2,3-cd]pyrene	0.00002	WHO GV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dibenz[a,h]anthracene	0.0002	WHO GV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benzo[ghi]perylene	0.0002	WHO GV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RISK / ACCEPTABLE RISK TO: HUMAN			Groundwater				Groundwater			
			R				AR			

Table 138

EVAPORATION DAM 3: HUMAN RISK ASSESSMENT ♦ SEDIMENTS ♦ SAMPLE NO. 15 (ORGANIC - PAH* & VOC*) - IVS - MASTER PLAN

SAMPLE NUMBER: 15			RISK TO HUMAN				NOTES
ORGANICS COMPOUNDS Volatile & Semi-Volatile	⁶ RfD/ ADI/GV mg/kg/day	⁷ EPA RfD/ EPA DWEL/ RSA RfD/ WHO GV	SAMPLE NO. 15				
			⁸ Lab conc. ppm	¹³ Conc. in groundwater (EEC) ppb	¹⁴ PDI groundwater exposure mg/kg/day	¹⁰ Margin of Safety %	
Benzene	0.002	EPA RfD	< 0.01	0.00	0.00	0.00	VOLUME = 1,250,000 kg/ha/m
Toluene	0.2	EPA RfD	< 0.01	0.00	0.00	0.00	
Ethylbenzene	0.1	EPA RfD	< 0.01	0.00	0.00	0.00	
m,p-Xylene	0.17	WHO GV	< 0.01	0.00	0.00	0.00	
o-Xylene	0.17	WHO GV	< 0.01	0.00	0.00	0.00	
Styrene	0.2	EPA RfD	< 0.01	0.00	0.00	0.00	
Isopropylbenzene	0.1	EPA RfD	< 0.01	0.00	0.00	0.00	
1,3,5-Trimethylbenzene	0.05	EPA RfD	< 0.01	0.00	0.00	0.00	
1,2,4-Trimethylbenzene	0.05	EPA RfD	< 0.01	0.00	0.00	0.00	
Naphthalene	0.02	EPA RfD	< 0.01	0.00	0.00	0.00	
Phenol	0.6	EPA RfD	0.00	0.00	0.00	0.00	
2-Methylphenol	0.05	EPA RfD	0.00	0.00	0.00	0.00	
4-Methylphenol	0.005	EPA RfD	0.00	0.00	0.00	0.00	
2,4-Dimethylphenol	0.02	EPA RfD	0.00	0.00	0.00	0.00	
2-Methylnaphthalene	0.02	EPA RfD	0.00	0.00	0.00	0.00	
Acenaphthylene	0.00002	WHO GV	0.00	0.00	0.00	0.00	
Acenaphthene	0.1	EPA RfD	0.00	0.00	0.00	0.00	
Dibenzofuran	0.004	EPA RfD	0.00	0.00	0.00	0.00	
Fluorene	0.04	EPA RfD	0.00	0.00	0.00	0.00	
Phenanthrene	0.0002	WHO GV	0.00	0.00	0.00	0.00	
Anthracene	0.3	EPA RfD	0.00	0.00	0.00	0.00	
Carbazole	0.006	EPA RfD	0.00	0.00	0.00	0.00	
Fluoranthene	0.04	EPA RfD	0.00	0.00	0.00	0.00	
Pyrene	0.03	EPA RfD	0.00	0.00	0.00	0.00	
Benzo[a]anthracene	0.00002	WHO GV	0.00	0.00	0.00	0.00	
Chrysene	0.00002	WHO GV	0.00	0.00	0.00	0.00	
bis(2-Ethylhexyl)phthalate	0.02	EPA RfD	0.00	0.00	0.00	0.00	
Benzo[b]+[k]fluoranthene	0.00002	WHO GV	0.00	0.00	0.00	0.00	
Benzo[a]pyrene	0.0002	WHO GV	0.00	0.00	0.00	0.00	
Indeno[1,2,3-cd]pyrene	0.00002	WHO GV	0.00	0.00	0.00	0.00	
Dibenz[a,h]anthracene	0.0002	WHO GV	0.00	0.00	0.00	0.00	
Benzo[e,h,i]perylene	0.0002	WHO GV	0.00	0.00	0.00	0.00	
RISK / ACCEPTABLE RISK TO: HUMAN			Groundwater		AR		

Appendix 2 continued

EVAPORATION DAM 4 ENVIRONMENTAL RISK QUANTIFICATION AND HUMAN RISK ASSESSMENT SUMMARY TABLES

2.13	Evaporation Dam 4: Waters Inorganic		
2.13.1	Environment	Tables	139 – 145
2.13.2	Human.....	Tables	146 – 152
2.14	Evaporation Dam 4: Waters Organic		
2.14.1	Environment	Tables	153 – 159
2.14.2	Human.....	Tables	160 – 166
2.15	Evaporation Dam 4: Sediments Inorganic		
2.15.1	Environment	Tables	167 – 169
2.15.2	Human.....	Tables	170 – 175
2.16	Evaporation Dam 4: Sediments Organic		
2.16.1	Environment	Tables	176 – 177
2.16.2	Human.....	Tables	178 – 180

TABLES 139 - 145

EVAPORATION DAM 4: WATERS INORGANIC
ENVIRONMENTAL RISK QUANTIFICATION

Draft for discussion
CONFIDENTIAL
Research for IVS

Table 139

EVAPORATION DAM 4: ENVIRONMENTAL RISK QUANTIFICATION ♦ DAM WATER ♦ SAMPLE NO. 1 [INORGANIC · MICRO'S & MACRO'S]
[ISCOR VANDERBIJLPARK STEEL – MASTER PLAN]

SAMPLE NUMBER: 1		EVAPORATION DAM 4: Current Volume = 791,898 kg/ha/m										Total Volume = 1,939,876 kg/ha/m							
INORGANIC COMPOUNDS Micro's and Macro's	Acc. Risk Value (MR&SA) ppb	RISK TO ENVIRONMENT																	
		RISK OF DAM WATER AS IS					RISK OF DILUTED DAM WATER IN RIVER					RISK OF DAM WATER FOR GROUNDWATER							
		TOTAL ANALYSIS			PROBIT MODEL		DILUTED WATER			PROBIT MODEL		CURRENT VOLUME		PROBIT MODEL		TOTAL VOLUME		PROBIT MODEL	
		¹ Lab Conc. ppm	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	
Aluminium as Al	10000	< 0.100	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	
Arsenic as As	430	0.010	10	AR	0.00E+00	AR	0.333	AR	0.00E+00	AR	5.2	AR	0.00E+00	AR	12.8	AR	0.00E+00	AR	
Barium as Ba	7800	< 0.10	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	
Cadmium as Cd	31	0.053	53	R	2.78E-02	R	1.77	AR	0.00E+00	AR	27.7	R*	1.21E-04	R*	67.9	R	1.50E-01	R	
Chromium ³⁺ as Cr ³⁺	4700	0.039	39	AR	0.00E+00	AR	1.30	AR	0.00E+00	AR	20.4	AR	0.00E+00	AR	50	AR	0.00E+00	AR	
Chromium ⁶⁺ as Cr ⁶⁺	20	< 0.025	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	
Cobalt as Co	3900	0.184	184	AR	0.00E+00	AR	6.13	AR	0.00E+00	AR	96.2	AR	0.00E+00	AR	236	AR	0.00E+00	AR	
Copper as Cu	100	0.037	37	AR	8.85E-09	AR	1.23	AR	0.00E+00	AR	19.3	AR	2.67E-12	AR	47.4	AR	1.59E-07	AR	
Cyanide as CN	3	< 0.05	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	
Iron as Fe	9000	0.435	435	AR	0.00E+00	AR	14.5	AR	0.00E+00	AR	227	AR	0.00E+00	AR	557	AR	0.00E+00	AR	
Lead as Pb	100	0.313	313	R	1.16E+00	R	10.4	AR	0.00E+00	AR	164	R	2.05E-02	R	401	R	3.71E+00	R	
Manganese as Mn	300	39	39000	R	1.00E+02	R	1300	R	5.11E+00	R	20383	R	1.00E+02	R	49932	R	1.00E+02	R	
Mercury as Hg	33	< 0.002	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	
Nickel as Ni	1140	0.157	157	AR	3.33E-14	AR	5.23	AR	0.00E+00	AR	82	AR	0.00E+00	AR	201	AR	8.33E-13	AR	
Selenium as Se	260	0.014	14	AR	0.00E+00	AR	0.467	AR	0.00E+00	AR	7.30	AR	0.00E+00	AR	17.9	AR	0.00E+00	AR	
Titanium as Ti	760	0.31	310	AR	4.41E-08	AR	10.3	AR	0.00E+00	AR	162	AR	1.57E-11	AR	397	AR	7.26E-07	AR	
Vanadium as V	1000	< 0.03	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	
Zinc as Zn	700	0.053	53	AR	0.00E+00	AR	1.77	AR	0.00E+00	AR	28	AR	0.00E+00	AR	68	AR	0.00E+00	AR	
Calcium as Ca	150000	621	621000	R	4.24E+00	R	20700	AR	3.33E-14	AR	324567	R	1.39E-01	R	795078	R	1.07E+01	R	
Chloride as Cl	250000	3499	3499000	R	7.44E+01	R	116633	AR	1.32E-07	AR	1828762	R	2.71E+01	R	4479833	R	8.73E+01	R	
Fluoride as F	1500	14.2	14200	R	4.57E+01	R	473	AR	1.30E-09	AR	7422	R	8.46E+00	R	18181	R	6.47E+01	R	
Magnesium as Mg	70000	383	383000	R	1.19E+01	R	12767	AR	1.29E-12	AR	200176	R	7.21E-01	R	490362	R	2.43E+01	R	
Potassium as K	200000	522	522000	R	4.33E-01	R	17400	AR	0.00E+00	AR	272825	R	4.96E-03	R	668326	R	1.61E+00	R	
Sodium as Na	100000	2460	2460000	R	9.61E+01	R	82000	AR	5.29E-05	AR	1285726	R	6.88E+01	R	3149583	R	9.88E+01	R	
Sulphate as SO ₄	200000	5389	5389000	R	9.74E+01	R	179633	AR	1.27E-04	AR	2816575	R	7.48E+01	R	6899635	R	9.92E+01	R	
Boron as B	17000	1.9	1900	AR	0.00E+00	AR	63.3	AR	0.00E+00	AR	993	AR	0.00E+00	AR	2433	AR	5.55E-14	AR	
Nitrate as N	9000	0.6	600	AR	0.00E+00	AR	20.0	AR	0.00E+00	AR	314	AR	0.00E+00	AR	768	AR	0.00E+00	AR	
		RISK / ACCEPTABLE RISK TO: ENVIRONMENT																	
		R					R					R							

Table 140

EVAPORATION DAM 4: ENVIRONMENTAL RISK QUANTIFICATION ♦ DAM WATER ♦ SAMPLE NO. 2 [INORGANIC - MICRO'S & MACRO'S]
[ISCOR VANDERBIJLPARK STEEL – MASTER PLAN]

SAMPLE NUMBER: 2																					
INORGANIC COMPOUNDS Micro's and Macro's	Avg Risk Value (MR&SA) ppb	RISK TO ENVIRONMENT																			
		RISK OF DAM WATER AS IS					RISK OF DILUTED DAM WATER IN RIVER					RISK OF DAM WATER FOR GROUNDWATER									
		TOTAL ANALYSIS			PROBIT MODEL		DILUTED WATER		PROBIT MODEL		CURRENT VOLUME		PROBIT MODEL		TOTAL VOLUME		PROBIT MODEL				
		¹ Lab Conc. ppm	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR			
Aluminium as Al	10000	< 0.100	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR			
Arsenic as As	330	0.013	13	AR	0.00E+00	AR	0.433	AR	0.00E+00	AR	6.80	AR	0.00E+00	AR	16.6	AR	0.00E+00	AR			
Barium as Ba	7000	< 0.10	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR			
Cadmium as Cd	100	0.053	53	R	2.78E-02	R	1.77	AR	0.00E+00	AR	27.7	R*	1.21E-04	R*	67.9	R	1.50E-01	R			
Chromium ³⁺ as Cr ³⁺	4700	0.033	33	AR	0.00E+00	AR	1.10	AR	0.00E+00	AR	17.2	AR	0.00E+00	AR	42	AR	0.00E+00	AR			
Chromium ⁶⁺ as Cr ⁶⁺	100	< 0.025	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR			
Cobalt as Co	9400	0.179	179	AR	0.00E+00	AR	5.97	AR	0.00E+00	AR	93.6	AR	0.00E+00	AR	229	AR	0.00E+00	AR			
Copper as Cu	160	0.036	36	AR	6.38E-09	AR	1.20	AR	0.00E+00	AR	18.8	AR	1.90E-12	AR	46.1	AR	1.15E-07	AR			
Cyanide as CN	500	< 0.05	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR			
Iron as Fe	90000	0.393	393	AR	0.00E+00	AR	13.1	AR	0.00E+00	AR	205	AR	0.00E+00	AR	503	AR	0.00E+00	AR			
Lead as Pb	100	0.320	320	R	1.30E+00	R	10.7	AR	0.00E+00	AR	167	R	2.35E-02	R	410	R	4.07E+00	R			
Manganese as Mn	1000	30	39000	R	1.00E+02	R	1300	R	5.11E+00	R	20383	R	1.00E+02	R	49932	R	1.00E+02	R			
Mercury as Hg	100	< 0.002	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR			
Nickel as Ni	1140	0.157	157	AR	3.33E-14	AR	5.23	AR	0.00E+00	AR	82	AR	0.00E+00	AR	201	AR	8.33E-13	AR			
Selenium as Se	260	0.013	13	AR	0.00E+00	AR	0.433	AR	0.00E+00	AR	6.80	AR	0.00E+00	AR	16.6	AR	0.00E+00	AR			
Titanium as Ti	1000	0.32	320	AR	6.37E-08	AR	10.7	AR	0.00E+00	AR	167	AR	2.30E-11	AR	410	AR	1.03E-06	AR			
Vanadium as V	1000	< 0.03	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR			
Zinc as Zn	100	0.059	59	AR	0.00E+00	AR	1.97	AR	0.00E+00	AR	31	AR	0.00E+00	AR	76	AR	0.00E+00	AR			
Calcium as Ca	150000	641	641000	R	4.83E+00	R	21367	AR	5.55E-14	AR	335020	R	1.70E-01	R	820684	R	1.19E+01	R			
Chloride as Cl	250000	3499	3499000	R	7.44E+01	R	116633	AR	1.32E-07	AR	1828762	R	2.71E+01	R	4479833	R	8.73E+01	R			
Fluoride as F	1000	13.5	13500	R	4.18E+01	R	450	AR	6.97E-10	AR	7056	R	7.03E+00	R	17284	R	6.09E+01	R			
Magnesium as Mg	70000	371	371000	R	1.07E+01	R	12367	AR	8.55E-13	AR	193904	R	6.06E-01	R	474998	R	2.24E+01	R			
Potassium as K	200000	529	529000	R	4.67E-01	R	17633	AR	0.00E+00	AR	276483	R	5.52E-03	R	677288	R	1.72E+00	R			
Sodium as Na	100000	2489	2489000	R	9.63E+01	R	82967	AR	5.93E-05	AR	1300883	R	6.96E+01	R	3186712	R	9.88E+01	R			
Sulphate as SO ₄	200000	5389	5389000	R	9.74E+01	R	179633	AR	1.27E-04	AR	2816575	R	7.48E+01	R	6899635	R	9.92E+01	R			
Boron as B	17000	1.5	1500	AR	0.00E+00	AR	50	AR	0.00E+00	AR	784	AR	0.00E+00	AR	1920	AR	0.00E+00	AR			
Nitrate as N	9000	0.6	600	AR	0.00E+00	AR	20	AR	0.00E+00	AR	314	AR	0.00E+00	AR	768	AR	0.00E+00	AR			
		RISK / ACCEPTABLE RISK TO: ENVIRONMENT					R					R					R				
							R					R					R				

Table 141

EVAPORATION DAM 4: ENVIRONMENTAL RISK QUANTIFICATION ♦ DAM WATER ♦ SAMPLE NO. 3 [INORGANIC - MICRO'S & MACRO'S]
[ISCOR VANDERBIJLPARK STEEL – MASTER PLAN]

SAMPLE NUMBER: 3

INDRGANIC CDMPDUNDS Micro's and Macro's	Acc. Risk Value (MR&SA) ppb	RISK TO ENVIRONMENT																
		RISK OF DAM WATER AS IS					RISK OF DILUTED DAM WATER IN RIVER					RISK OF DAM WATER FOR GRUNDWATER						
		TOTAL ANALYSIS			PROBIT MODEL		DILUTED WATER		PROBIT MODEL		CURRENT VOLUME		PROBIT MODEL		TOTAL VOLUME		PROBIT MODEL	
		¹ Lab Conc. ppm	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR
Aluminium as Al	10000	< 0.100	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR
Arsenic as As	430	0.011	11	AR	0.00E+00	AR	0.367	AR	0.00E+00	AR	5.70	AR	0.00E+00	AR	14.1	AR	0.00E+00	AR
Barium as Ba	7360	< 0.10	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR
Cadmium as Cd	51	0.055	55	R	3.63E-02	R	1.83	AR	0.00E+00	AR	28.7	R*	1.69E-04	R*	70.4	R	1.88E-01	R
Chromium ³⁺ as Cr ³⁺	4700	0.044	44	AR	0.00E+00	AR	1.47	AR	0.00E+00	AR	23.0	AR	0.00E+00	AR	56	AR	0.00E+00	AR
Chromium ⁶⁺ as Cr ⁶⁺	20	< 0.025	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR
Cobalt as Co	6360	0.183	183	AR	0.00E+00	AR	6.10	AR	0.00E+00	AR	95.6	AR	0.00E+00	AR	234	AR	0.00E+00	AR
Copper as Cu	100	0.034	34	AR	3.21E-09	AR	1.13	AR	0.00E+00	AR	17.8	AR	9.44E-13	AR	43.5	AR	5.92E-08	AR
Cyanide as CN	1.2	< 0.05	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR
Iron as Fe	9000	0.428	428	AR	0.00E+00	AR	14.3	AR	0.00E+00	AR	224	AR	0.00E+00	AR	548	AR	0.00E+00	AR
Lead as Pb	100	0.311	311	R	1.12E+00	R	10.4	AR	0.00E+00	AR	163	R	1.96E-02	R	398	R	3.59E+00	R
Manganese as Mn	390	39	39000	R	1.00E+02	R	1300	R	5.11E+00	R	20383	R	1.00E+02	R	49932	R	1.00E+02	R
Mercury as Hg	22	< 0.002	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR
Nickel as Ni	1140	0.162	162	AR	5.55E-14	AR	5.40	AR	0.00E+00	AR	85	AR	0.00E+00	AR	207	AR	1.21E-12	AR
Selenium as Se	360	0.015	15	AR	0.00E+00	AR	0.500	AR	0.00E+00	AR	7.80	AR	0.00E+00	AR	19.2	AR	0.00E+00	AR
Titanium as Ti	731	0.34	340	AR	1.28E-07	AR	11.3	AR	0.00E+00	AR	178	AR	5.16E-11	AR	435	AR	1.96E-06	AR
Vanadium as V	1380	< 0.03	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR
Zinc as Zn	700	0.058	58	AR	0.00E+00	AR	1.93	AR	0.00E+00	AR	30	AR	0.00E+00	AR	74	AR	0.00E+00	AR
Calcium as Ca	150000	631	631000	R	4.53E+00	R	21033	AR	4.44E-14	AR	329794	R	1.54E-01	R	807881	R	1.13E+01	R
Chloride as Cl	349900	3499	3499000	R	7.44E+01	R	116633	AR	1.32E-07	AR	1828762	R	2.71E+01	R	4479833	R	8.73E+01	R
Fluoride as F	1800	13.4	13400	R	4.13E+01	R	447	AR	6.36E-10	AR	7004	R	6.83E+00	R	17156	R	6.04E+01	R
Magnesium as Mg	70000	371	371000	R	1.07E+01	R	12367	AR	8.55E-13	AR	193904	R	6.06E-01	R	474998	R	2.24E+01	R
Potassium as K	515000	515	515000	R	4.01E-01	R	17167	AR	0.00E+00	AR	269166	R	4.45E-03	R	659364	R	1.51E+00	R
Sodium as Na	250300	2503	2503000	R	9.64E+01	R	83433	AR	6.26E-05	AR	1308200	R	7.00E+01	R	3204636	R	9.89E+01	R
Sulphate as SD ₄	550000	5500	5500000	R	9.76E+01	R	183333	AR	1.54E-04	AR	2874590	R	7.61E+01	R	7041750	R	9.93E+01	R
Boron as B	17000	1.6	1600	AR	0.00E+00	AR	53.3	AR	0.00E+00	AR	836	AR	0.00E+00	AR	2049	AR	1.11E-14	AR
Nitrate as N	9000	0.6	600	AR	0.00E+00	AR	20.0	AR	0.00E+00	AR	314	AR	0.00E+00	AR	768	AR	0.00E+00	AR
		RISK / ACCEPTABLE RISK TD: ENVIRONMENT					R			R				R			R	

Table 142

EVAPORATION DAM 4: ENVIRONMENTAL RISK QUANTIFICATION ♦ DAM WATER ♦ SAMPLE NO. 4 [INORGANIC · MICRO'S & MACRO'S]
[ISCOR VANDERBIJLPARK STEEL – MASTER PLAN]

SAMPLE NUMBER: 4																		
INORGANIC COMPOUNDS Micro's and Macro's	Acc. Tik mg/L	RISK TO ENVIRONMENT																
		RISK OF DAM WATER AS IS					RISK OF DILUTED DAM WATER IN RIVER				RISK OF DAM WATER FOR GROUNDWATER							
		TOTAL ANALYSIS			⁴ PROBIT MODEL		DILUTED WATER		⁴ PROBIT MODEL		CURRENT VOLUME		⁴ PROBIT MODEL		TOTAL VOLUME		⁴ PROBIT MODEL	
		¹ Lab Conc. ppm	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR
Aluminium as Al	10000	< 0.100	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR
Arsenic as As	130	0.013	13	AR	0.00E+00	AR	0.433	AR	0.00E+00	AR	6.80	AR	0.00E+00	AR	16.6	AR	0.00E+00	AR
Barium as Ba	7000	< 0.10	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR
Cadmium as Cd	31	0.055	55	R	3.63E-02	R	1.83	AR	0.00E+00	AR	28.7	R*	1.69E-04	R*	70.4	R	1.98E-01	R
Chromium ³⁺ as Cr ³⁺	150	0.041	41	AR	0.00E+00	AR	1.37	AR	0.00E+00	AR	21.4	AR	0.00E+00	AR	53	AR	0.00E+00	AR
Chromium ⁶⁺ as Cr ⁶⁺	20	< 0.025	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR
Cobalt as Co	6000	0.181	181	AR	0.00E+00	AR	6.03	AR	0.00E+00	AR	94.6	AR	0.00E+00	AR	232	AR	0.00E+00	AR
Copper as Cu	100	0.033	33	AR	2.23E-09	AR	1.10	AR	0.00E+00	AR	17.2	AR	6.00E-13	AR	42.3	AR	4.28E-08	AR
Cyanide as CN	5.4	< 0.05	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR
Iron as Fe	9000	0.399	399	AR	0.00E+00	AR	13.3	AR	0.00E+00	AR	209	AR	0.00E+00	AR	511	AR	0.00E+00	AR
Lead as Pb	100	0.313	313	R	1.16E+00	R	10.4	AR	0.00E+00	AR	164	R	2.05E-02	R	401	R	3.71E+00	R
Manganese as Mn	300	38	38000	R	1.00E+02	R	1267	R	4.60E+00	R	19861	R	1.00E+02	R	48652	R	1.00E+02	R
Mercury as Hg	32	< 0.002	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR
Nickel as Ni	1140	0.162	162	AR	5.55E-14	AR	5.40	AR	0.00E+00	AR	85	AR	0.00E+00	AR	207	AR	1.21E-12	AR
Selenium as Se	200	0.020	20	AR	0.00E+00	AR	0.667	AR	0.00E+00	AR	10.50	AR	0.00E+00	AR	25.6	AR	0.00E+00	AR
Titanium as Ti	7.34	0.37	370	AR	3.32E-07	AR	12.3	AR	0.00E+00	AR	193	AR	1.43E-10	AR	474	AR	4.89E-06	AR
Vanadium as V	1300	< 0.03	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR
Zinc as Zn	700	0.055	55	AR	0.00E+00	AR	1.83	AR	0.00E+00	AR	29	AR	0.00E+00	AR	70	AR	0.00E+00	AR
Calcium as Ca	150000	661	661000	R	5.46E+00	R	22033	AR	7.77E-14	AR	345473	R	2.06E-01	R	846290	R	1.32E+01	R
Chloride as Cl	250000	3499	3499000	R	7.44E+01	R	116633	AR	1.32E-07	AR	1828762	R	2.71E+01	R	4479833	R	8.73E+01	R
Fluoride as F	1500	13.3	13300	R	4.07E+01	R	443	AR	5.80E-10	AR	6951	R	6.64E+00	R	17028	R	5.98E+01	R
Magnesium as Mg	70000	365	365000	R	1.02E+01	R	12167	AR	6.88E-13	AR	190768	R	5.53E-01	R	467316	R	2.15E+01	R
Potassium as K	200000	518	518000	R	4.14E-01	R	17267	AR	0.00E+00	AR	270734	R	4.66E-03	R	663205	R	1.55E+00	R
Sodium as Na	100000	2486	2486000	R	9.62E+01	R	82867	AR	5.86E-05	AR	1299315	R	6.96E+01	R	3182871	R	9.88E+01	R
Sulphate as SO ₄	200000	5500	5500000	R	9.76E+01	R	183333	AR	1.54E-04	AR	2874590	R	7.61E+01	R	7041750	R	9.93E+01	R
Boron as B	17500	1.4	1400	AR	0.00E+00	AR	46.7	AR	0.00E+00	AR	732	AR	0.00E+00	AR	1792	AR	0.00E+00	AR
Nitrate as N	3000	0.6	600	AR	0.00E+00	AR	20.0	AR	0.00E+00	AR	314	AR	0.00E+00	AR	768	AR	0.00E+00	AR
		RISK / ACCEPTABLE RISK TO: ENVIRONMENT				R			R			R			R			R

Table 143

EVAPORATION DAM 4: ENVIRONMENTAL RISK QUANTIFICATION ♦ DAM WATER ♦ SAMPLE NO. 5 [INORGANIC · MICRO'S & MACRO'S]
[ISCOR VANDERBIJLPARK STEEL – MASTER PLAN]

SAMPLE NUMBER: 5

INORGANIC COMPOUNDS Micro's and Macro's	Risk Factor [mg/L or µg/L] ppm	RISK TO ENVIRONMENT																
		RISK OF DAM WATER AS IS				RISK OF DILUTED DAM WATER IN RIVER				RISK OF DAM WATER FOR GROUNDWATER								
		TOTAL ANALYSIS		⁴ PROBIT MODEL		DILUTED WATER		⁴ PROBIT MODEL		CURRENT VOLUME		⁴ PROBIT MODEL		TOTAL VOLUME		⁴ PROBIT MODEL		
		¹ Lab Conc. ppm	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR
Aluminium as Al	10000	< 0.100	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR
Arsenic as As	430	0.011	11	AR	0.00E+00	AR	0.367	AR	0.00E+00	AR	5.7	AR	0.00E+00	AR	14.1	AR	0.00E+00	AR
Barium as Ba	7000	< 0.10	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR
Cadmium as Cd	31	0.053	53	R	2.78E-02	R	1.77	AR	0.00E+00	AR	27.7	R*	1.21E-04	R*	67.9	R	1.50E-01	R
Chromium ³⁺ as Cr ³⁺	4700	0.029	29	AR	0.00E+00	AR	0.97	AR	0.00E+00	AR	15.2	AR	0.00E+00	AR	37	AR	0.00E+00	AR
Chromium ⁶⁺ as Cr ⁶⁺	20	< 0.025	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR
Cobalt as Co	6000	0.184	184	AR	0.00E+00	AR	6.13	AR	0.00E+00	AR	96.2	AR	0.00E+00	AR	236	AR	0.00E+00	AR
Copper as Cu	100	0.037	37	AR	8.85E-09	AR	1.23	AR	0.00E+00	AR	19.3	AR	2.67E-12	AR	47.4	AR	1.59E-07	AR
Cyanide as CN	4.3	< 0.05	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR
Iron as Fe	300	0.403	403	AR	0.00E+00	AR	13.4	AR	0.00E+00	AR	211	AR	0.00E+00	AR	516	AR	0.00E+00	AR
Lead as Pb	100	0.302	302	R	9.64E-01	R	10.1	AR	0.00E+00	AR	158	R	1.56E-02	R	387	R	3.18E+00	R
Manganese as Mn	300	38	38000	R	1.00E+02	R	1267	R	4.60E+00	R	19861	R	1.00E+02	R	48652	R	1.00E+02	R
Mercury as Hg	12	< 0.002	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR
Nickel as Ni	1140	0.159	159	AR	4.44E-14	AR	5.3	AR	0.00E+00	AR	83	AR	0.00E+00	AR	204	AR	1.01E-12	AR
Selenium as Se	200	0.016	16	AR	0.00E+00	AR	0.533	AR	0.00E+00	AR	8.4	AR	0.00E+00	AR	20.5	AR	0.00E+00	AR
Titanium as Ti	7300	0.41	410	AR	1.03E-06	AR	13.7	AR	0.00E+00	AR	214	AR	5.15E-10	AR	525	AR	1.41E-05	AR
Vanadium as V	1300	< 0.03	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR
Zinc as Zn	700	0.054	54	AR	0.00E+00	AR	1.80	AR	0.00E+00	AR	28	AR	0.00E+00	AR	69	AR	0.00E+00	AR
Calcium as Ca	15000	621	621000	R	4.24E+00	R	20700	AR	3.33E-14	AR	324567	R	1.39E-01	R	795078	R	1.07E+01	R
Chloride as Cl	250000	3499	3499000	R	7.44E+01	R	116633	AR	1.32E-07	AR	1828762	R	2.71E+01	R	4479833	R	8.73E+01	R
Fluoride as F	1500	13.3	13300	R	4.07E+01	R	443	AR	5.80E-10	AR	6951	R	6.64E+00	R	17028	R	5.98E+01	R
Magnesium as Mg	70000	389	389000	R	1.25E+01	R	12967	AR	1.57E-12	AR	203312	R	7.84E-01	R	498044	R	2.53E+01	R
Potassium as K	200000	511	511000	R	3.83E-01	R	17033	AR	0.00E+00	AR	267076	R	4.18E-03	R	654243	R	1.45E+00	R
Sodium as Na	100000	2464	2464000	R	9.61E+01	R	82133	AR	5.37E-05	AR	1287816	R	6.90E+01	R	3154704	R	9.88E+01	R
Sulphate as SO ₄	200000	5556	5556000	R	9.77E+01	R	185200	AR	1.70E-04	AR	2903858	R	7.67E+01	R	7113448	R	9.93E+01	R
Boron as B	10000	1.9	1900	AR	0.00E+00	AR	63.3	AR	0.00E+00	AR	993	AR	0.00E+00	AR	2433	AR	5.55E-14	AR
Nitrate as N	5000	0.6	600	AR	0.00E+00	AR	20.0	AR	0.00E+00	AR	314	AR	0.00E+00	AR	768	AR	0.00E+00	AR
RISK / ACCEPTABLE RISK TO: ENVIRONMENT		R				R				R				R				

Table 144

EVAPORATION DAM 4: ENVIRONMENTAL RISK QUANTIFICATION ♦ DAM WATER ♦ SAMPLE NO. 6 [INORGANIC · MICRO'S & MACRO'S]
[ISCOR VANDERBIJLPARK STEEL – MASTER PLAN]

SAMPLE NUMBER: 6

INORGANIC COMPOUNDS Micro's and Macro's	Ave. Risk Value MARSA ppb	RISK TO ENVIRONMENT																	
		RISK OF DAM WATER AS IS					RISK OF DILUTED DAM WATER IN RIVER					RISK OF DAM WATER FOR GROUNDWATER							
		TOTAL ANALYSIS			PROBIT MODEL		DILUTED WATER		PROBIT MODEL		CURRENT VOLUME		PROBIT MODEL		TOTAL VOLUME		PROBIT MODEL		
		¹ Lab Conc. ppm	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quan- tification %	³ Risk R / AR	
Aluminium as Al	10000	< 0.100	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	
Arsenic as As	430	0.009	9.0	AR	0.00E+00	AR	0.3	AR	0.00E+00	AR	4.70	AR	0.00E+00	AR	11.5	AR	0.00E+00	AR	
Barium as Ba	7800	< 0.10	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	
Cadmium as Cd	31	0.053	53	R	2.78E-02	R	1.77	AR	0.00E+00	AR	27.7	R*	1.21E-04	R	67.9	R	1.50E-01	R	
Chromium ³⁺ as Cr ³⁺	4700	0.038	38	AR	0.00E+00	AR	1.27	AR	0.00E+00	AR	19.9	AR	0.00E+00	AR	49	AR	0.00E+00	AR	
Chromium ⁶⁺ as Cr ⁶⁺	29	< 0.025	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	
Cobalt as Co	6800	0.178	178	AR	0.00E+00	AR	5.93	AR	0.00E+00	AR	93.0	AR	0.00E+00	AR	228	AR	0.00E+00	AR	
Copper as Cu	160	0.036	36	AR	6.38E-09	AR	1.20	AR	0.00E+00	AR	18.8	AR	1.90E-12	AR	46.1	AR	1.15E-07	AR	
Cyanide as CN	5.4	< 0.05	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	
Iron as Fe	9000	0.430	430	AR	0.00E+00	AR	14.3	AR	0.00E+00	AR	225	AR	0.00E+00	AR	551	AR	0.00E+00	AR	
Lead as Pb	10.1	0.312	312	R	1.14E+00	R	10.4	AR	0.00E+00	AR	163	R	1.96E-02	R	399	R	3.63E+00	R	
Manganese as Mn	300	39	39000	R	1.00E+02	R	1300	R	5.11E+00	R	20383	R	1.00E+02	R	49932	R	1.00E+02	R	
Mercury as Hg	22	< 0.002	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	
Nickel as Ni	1140	0.164	164	AR	5.55E-14	AR	5.47	AR	0.00E+00	AR	86	AR	0.00E+00	AR	210	AR	1.47E-12	AR	
Selenium as Se	260	0.019	19	AR	0.00E+00	AR	0.633	AR	0.00E+00	AR	9.90	AR	0.00E+00	AR	24.3	AR	0.00E+00	AR	
Titanium as Ti	731	0.42	420	AR	1.34E-06	AR	14.0	AR	0.00E+00	AR	220	AR	7.25E-10	AR	538	AR	1.80E-05	AR	
Vanadium as V	1300	< 0.03	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	
Zinc as Zn	700	0.053	53	AR	0.00E+00	AR	1.77	AR	0.00E+00	AR	28	AR	0.00E+00	AR	68	AR	0.00E+00	AR	
Calcium as Ca	150000	651	651000	R	5.14E+00	R	21700	AR	6.66E-14	AR	340247	R	1.87E-01	R	833487	R	1.25E+01	R	
Chloride as Cl	250000	3474	3474000	R	7.40E+01	R	115800	AR	1.22E-07	AR	1815695	R	2.66E+01	R	4447825	R	8.70E+01	R	
Fluoride as F	150.1	13.2	13200	R	4.01E+01	R	440	AR	5.28E-10	AR	6899	R	6.45E+00	R	16900	R	5.92E+01	R	
Magnesium as Mg	71000	359	359000	R	9.59E+00	R	11967	AR	5.55E-13	AR	187632	R	5.04E-01	R	459634	R	2.06E+01	R	
Potassium as K	283000	508	508000	R	3.70E-01	R	16933	AR	0.00E+00	AR	265508	R	3.98E-03	R	650402	R	1.41E+00	R	
Sodium as Na	160000	2484	2484000	R	9.62E+01	R	82800	AR	5.82E-05	AR	1298269	R	6.95E+01	R	3180310	R	9.88E+01	R	
Sulphate as SO ₄	200000	5556	5556000	R	9.77E+01	R	185200	AR	1.70E-04	AR	2903858	R	7.67E+01	R	7113448	R	9.93E+01	R	
Boron as B	17000	1.9	1900	AR	0.00E+00	AR	63.3	AR	0.00E+00	AR	993	AR	0.00E+00	AR	2433	AR	5.55E-14	AR	
Nitrate as N	9000	0.5	500	AR	0.00E+00	AR	16.7	AR	0.00E+00	AR	261	AR	0.00E+00	AR	640	AR	0.00E+00	AR	
RISK / ACCEPTABLE RISK TO: ENVIRONMENT		R		R		R		R		R		R		R		R		R	

Table 145

EVAPORATION DAM 4: ENVIRONMENTAL RISK QUANTIFICATION ♦ DAM WATER ♦ SAMPLE NO. 7 [INORGANIC - MICRO'S & MACRO'S]
[ISCOR VANDERBIJLPARK STEEL – MASTER PLAN]

SAMPLE NUMBER: 7																				
INORGANIC COMPOUNDS Micro's and Macro's	Add. Value (MRS SA) ppb	RISK TO ENVIRONMENT																		
		RISK OF DAM WATER AS IS					RISK OF DILUTED DAM WATER IN RIVER					RISK OF DAM WATER FOR GROUNDWATER								
		TOTAL ANALYSIS			PROBIT MODEL		DILUTED WATER		PROBIT MODEL			CURRENT VOLUME		PROBIT MODEL			TOTAL VOLUME		PROBIT MODEL	
		¹ Lab Conc. ppm	² EEC ppb	³ Risk R / AR	Risk Quantification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quantification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quantification %	³ Risk R / AR	² EEC ppb	³ Risk R / AR	Risk Quantification %	³ Risk R / AR		
Aluminium as Al	1000	< 0.100	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR		
Arsenic as As	430	0.010	10	AR	0.00E+00	AR	0.333	AR	0.00E+00	AR	5.20	AR	0.00E+00	AR	12.8	AR	0.00E+00	AR		
Barium as Ba	7800	< 0.10	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR		
Cadmium as Cd	31	0.052	52	R	2.42E-02	R	1.73	AR	0.00E+00	AR	27.2	R*	1.02E-04	R*	66.6	R	1.33E-01	R		
Chromium ⁺⁺ as Cr ⁺⁺	4700	0.031	31	AR	0.00E+00	AR	1.03	AR	0.00E+00	AR	16.2	AR	0.00E+00	AR	40	AR	0.00E+00	AR		
Chromium ⁺⁺ as Cr ⁺⁺	20	< 0.025	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR		
Cobalt as Co	6900	0.173	173	AR	0.00E+00	AR	5.77	AR	0.00E+00	AR	90.4	AR	0.00E+00	AR	222	AR	0.00E+00	AR		
Copper as Cu	100	0.036	36	AR	6.38E-09	AR	1.20	AR	0.00E+00	AR	18.8	AR	1.90E-12	AR	46.1	AR	1.15E-07	AR		
Cyanide as CN	5.3	< 0.05	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR		
Iron as Fe	9000	0.498	498	AR	0.00E+00	AR	16.6	AR	0.00E+00	AR	260	AR	0.00E+00	AR	638	AR	0.00E+00	AR		
Lead as Pb	100	0.298	298	R	8.99E-01	R	9.9	AR	0.00E+00	AR	156	R	1.41E-02	R	382	R	3.00E+00	R		
Manganese as Mn	300	39	39000	R	1.00E+02	R	1300	R	5.11E+00	R	20383	R	1.00E+02	R	49932	R	1.00E+02	R		
Mercury as Hg	22	< 0.002	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR		
Nickel as Ni	1140	0.161	161	AR	4.44E-14	AR	5.37	AR	0.00E+00	AR	84	AR	0.00E+00	AR	206	AR	1.14E-12	AR		
Selenium as Se	260	0.025	25	AR	0.00E+00	AR	0.833	AR	0.00E+00	AR	13.1	AR	0.00E+00	AR	32	AR	1.11E-14	AR		
Titanium as Ti	731	0.55	550	AR	2.25E-05	AR	18.3	AR	0.00E+00	AR	287	AR	1.79E-08	AR	704	AR	2.44E-04	AR		
Vanadium as V	1300	< 0.03	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR	0.00	AR	0.00E+00	AR		
Zinc as Zn	700	0.052	52	AR	0.00E+00	AR	1.73	AR	0.00E+00	AR	27	AR	0.00E+00	AR	67	AR	0.00E+00	AR		
Calcium as Ca	150000	641	641000	R	4.83E+00	R	21367	AR	5.55E-14	AR	335020	R	1.70E-01	R	820684	R	1.19E+01	R		
Chloride as Cl	250000	3524	3524000	R	7.49E+01	R	117467	AR	1.44E-07	AR	1841828	R	2.75E+01	R	4511841	R	8.76E+01	R		
Fluoride as F	1500	13.2	13200	R	4.01E+01	R	440	AR	5.28E-10	AR	6899	R	6.45E+00	R	16900	R	5.92E+01	R		
Magnesium as Mg	70000	365	365000	R	1.02E+01	R	12167	AR	6.88E-13	AR	190768	R	5.53E-01	R	467316	R	2.15E+01	R		
Potassium as K	200000	502	502000	R	3.45E-01	R	16733	AR	0.00E+00	AR	262372	R	3.61E-03	R	642720	R	1.33E+00	R		
Sodium as Na	100000	2501	2501000	R	9.63E+01	R	83367	AR	6.21E-05	AR	1307154	R	7.00E+01	R	3202076	R	9.89E+01	R		
Sulphate as SO ₄	200000	5500	5500000	R	9.76E+01	R	183333	AR	1.54E-04	AR	2874590	R	7.61E+01	R	7041750	R	9.93E+01	R		
Boron as B	17000	1.8	1800	AR	0.00E+00	AR	60.0	AR	0.00E+00	AR	941	AR	0.00E+00	AR	2305	AR	2.22E-14	AR		
Nitrate as N	9000	0.5	500	AR	0.00E+00	AR	16.7	AR	0.00E+00	AR	261	AR	0.00E+00	AR	640	AR	0.00E+00	AR		
RISK / ACCEPTABLE RISK TO ENVIRONMENT				R		R		R		R		R		R		R		R		

TABLES 146 – 152

EVAPORATION DAM 4: WATERS INORGANIC
HUMAN RISK ASSESSMENT

Draft for discussion
CONFIDENTIAL
Research for IVS

Table 146

EVAPORATION DAM 4: HUMAN RISK ASSESSMENT ♦ DAM WATER ♦ SAMPLE NO. 1 [INORGANIC - MICRO'S & MACRO'S]
[ISCOR VANDERBIJLPARK STEEL - MASTER PLAN]

SAMPLE NUMBER: 1											
ORGANIC COMPOUNDS Micro's and Macro's	6 RfD/ ADI/GV mg/kg/day	7 EPA RfD/ EPA DWEL/ RSA RfD/ WHO GV	RISK TO HUMAN								
			RISK OF DAM WATER AS IS			RISK OF DILUTED DAM WATER IN RIVER			RISK OF DAM WATER FOR GROUNDWATER		
			8 Conc. in Dam water ppm	9 PDI Dam water exposure mg/kg/day	10 Margin of Safety %	11 Conc. in River water (EEC) ppb	12 PDI river water exposure mg/kg/day	10 Margin of Safety %	13 Conc. in groundwater (EEC) ppb	14 PDI groundwater exposure mg/kg/day	10 Margin of Safety %
Aluminium as Al	0.005	RSA RfD	< 0.100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arsenic as As	0.003	EPA RfD	0.010	0.0003	111	0.333	0.00001	3.33	5.20	0.00017	57.8
Barium as Ba	0.07	EPA RfD	< 0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cadmium as Cd	0.0005	EPA RfD	0.053	0.0018	353	1.77	0.00006	11.0	27.7	0.0009	185
Chromium ³⁺ as Cr ³⁺	1.90	EPA RfD	0.039	0.0013	0.037	1.3	0.00004	0.0029	20	0.0007	0.045
Chromium ⁶⁺ as Cr ⁶⁺	0.003	EPA RfD	< 0.025	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cobalt as Co	0.004	RSA RfD	0.184	0.0061	78.7	6.1	0.00020	2.86	96	0.0032	40.1
Copper as Cu	0.04	EPA RfD	0.04	0.0012	3.1	1.23	0.00004	0.103	19.3	0.0006	1.51
Cyanide as CN	0.04	EPA RfD	< 0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron as Fe	0.003	RSA RfD	0.435	0.0145	483	14.5	0.0005	18.1	227	0.0076	252
Lead as Pb	0.002	RSA RfD	0.313	0.010	522	10.4	0.00035	17.3	164	0.0055	273
Manganese as Mn	1.440	EPA RfD	39	1.3	2826	1300	0.0433	94.2	20383	0.679	1477
Mercury as Hg	0.0003	EPA RfD	< 0.002	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nickel as Ni	0.02	EPA RfD	0.157	0.0052	28.2	5.2	0.00017	0.872	82	0.0027	13.7
Selenium as Se	0.005	EPA RfD	0.014	0.0005	3.0	0.467	0.00002	0.311	7.3	0.0002	4.9
Titanium as Ti	0.003	RSA RfD	0.31	0.0103	344	10.3	0.00034	11.4	162	0.0054	180
Vanadium as V	0.004	EPA RfD	< 0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zinc as Zn	0.3	EPA RfD	0.053	0.0018	0.663	1.8	0.00006	0.02	28	0.0009	0.311
Calcium as Ca	1.0	RSA RfD	621	20.7	414	20700	0.690	12.8	324567	10.8	216
Chloride as Cl	0.3	RSA RfD	3499	116.6	1405	116633	3.89	46.8	1828762	61.0	734
Fluoride as F	0.06	EPA RfD	14.2	0.473	789	473	0.016	26.3	7422	0.247	412
Magnesium as Mg	2.3	RSA RfD	383	12.8	555	12767	0.426	18.5	200176	6.67	290
Potassium as K	0.7	RSA RfD	522	17.4	260	17400	0.580	8.86	272825	9.09	136
Sodium as Na	1.3	RSA RfD	2460	82.0	2485	82000	2.73	82.8	1285726	42.9	1299
Sulphate as SO ₄	0.7	RSA RfD	5389	180	2681	179633	5.99	89.4	2816575	93.9	1401
Boron as B	0.09	EPA RfD	1.9	0.063	70.4	63.3	0.0021	2.34	993	0.033	36.3
Nitrate as N	1.0	EPA RfD	0.6	0.02	1.3	20	0.0007	0.042	314	0.010	0.06
RISK / ACCEPTABLE RISK TO: HUMAN			Dam water	R		River water	40		Groundwater	R	

Table 147

EVAPORATION DAM 4: HUMAN RISK ASSESSMENT ♦ DAM WATER ♦ SAMPLE NO. 2 (INORGANIC - MICRO'S & MACRO'S)
[ISCOR VANDERBIJLPARK STEEL - MASTER PLAN]

SAMPLE NUMBER: 2											
ORGANIC CDMPDUNDS Micro's and Macro's	RfD/ ADI/GV mg/kg/day	7 EPA RfD/ EPA DWEL/ RSA RfD/ WHO GV	RISK TO HUMAN								
			RISK OF DAM WATER AS IS			RISK OF DILUTED DAM WATER IN RIVER			RISK OF DAM WATER FOR GROUNDWATER		
			8 Conc. in Dam water ppm	9 PDI Dam water exposure mg/kg/day	10 Margin of Safety %	11 Conc. in River water (EEC) ppb	12 PDI river water exposure mg/kg/day	10 Margin of Safety %	13 Conc. in groundwater (EEC) ppb	14 PDI groundwater exposure mg/kg/day	10 Margin of Safety %
Aluminium as Al	0.005	RSA RfD	< 0.100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arsenic as As	0.0003	EPA RfD	0.013	0.0004	144	0.433	0.000014	4.81	6.80	0.00023	75.5
Barium as Ba	0.07	EPA RfD	< 0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cadmium as Cd	0.0005	EPA RfD	0.053	0.0018	353	1.77	0.000059	11.8	27.7	0.0009	185
Chromium ³⁺ as Cr ³⁺	1.50	EPA RfD	0.033	0.0011	0.073	1.10	0.00004	0.0024	17	0.0006	0.033
Chromium ⁶⁺ as Cr ⁶⁺	0.003	EPA RfD	< 0.025	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cobalt as Co	0.008	RSA RfD	0.179	0.0060	74.2	5.97	0.00020	2.43	94	0.0031	28.0
Copper as Cu	0.04	EPA RfD	0.04	0.0012	3.0	1.20	0.00004	0.100	18.8	0.0006	1.57
Cyanide as CN	0.04	EPA RfD	< 0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron as Fe	0.603	RSA RfD	0.393	0.0131	437	13.1	0.0004	14.5	205	0.0068	223
Lead as Pb	0.002	RSA RfD	0.32	0.011	533	10.7	0.00036	17.0	167	0.0056	278
Manganese as Mn	0.046	EPA RfD	39	1.3	2826	1300	0.043	94.2	20383	0.679	1477
Mercury as Hg	0.0003	EPA RfD	< 0.002	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nickel as Ni	0.02	EPA RfD	0.157	0.0052	26.2	5.23	0.00017	0.872	82	0.0027	13.7
Selenium as Se	0.005	EPA RfD	0.013	0.0004	9.7	0.433	0.00001	0.298	6.8	0.0002	4.5
Titanium as Ti	0.003	RSA RfD	0.32	0.0107	358	10.7	0.00036	11.3	167	0.0056	188
Vanadium as V	0.009	EPA RfD	< 0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zinc as Zn	0.3	EPA RfD	0.059	0.0020	8.658	1.97	0.00007	0.82	31	0.0010	0.342
Calcium as Ca	5.0	RSA RfD	641	21.4	427	21367	0.712	14.2	335020	11.2	223
Chloride as Cl	8.3	RSA RfD	3499	116.6	1405	116633	3.89	40.6	1828762	61.0	734
Fluoride as F	0.80	EPA RfD	13.5	0.450	750	450	0.015	28.0	7056	0.235	392
Magnesium as Mg	2.3	RSA RfD	371	12.4	538	12367	0.412	17.9	193904	6.46	281
Potassium as K	6.7	RSA RfD	529	17.6	263	17633	0.588	8.77	276483	9.22	138
Sodium as Na	3.3	RSA RfD	2489	83.0	2514	82967	2.77	93.8	1300883	43.4	1314
Sulphate as SO ₄	6.7	RSA RfD	5389	180	2681	179633	5.99	88.4	2816575	93.9	1401
Boron as B	0.03	EPA RfD	1.5	0.050	55.9	50	0.0017	1.06	784	0.026	20.0
Nitrate as N	1.6	EPA RfD	0.8	0.02	1.3	20	0.0007	0.042	314	0.010	0.45
RISK / ACCEPTABLE RISK TO: HUMAN			Dam water			River water			Groundwater		
			R			AR			R		

Table 148

EVAPORATION DAM 4: HUMAN RISK ASSESSMENT ♦ DAM WATER ♦ SAMPLE NO. 3 (INORGANIC - MICRO'S & MACRO'S)
[ISCOR VANDERBIJLPARK STEEL - MASTER PLAN]

SAMPLE NUMBER: 3											
ORGANIC COMPOUNDS Micro's and Macro's	6 RfD/ ADI/GV mg/kg/day	7 EPA RfD/ EPA DWEL/ RSA RfD/ WHO GV	RISK TO HUMAN								
			RISK OF DAM WATER AS IS			RISK OF DILUTED DAM WATER IN RIVER			RISK OF DAM WATER FOR GROUNDWATER		
			8 Conc. in Dam water ppm	9 PDI Dam water exposure mg/kg/day	10 Margin of Safety %	11 Conc. in River water (EEC) ppb	12 PDI river water exposure mg/kg/day	10 Margin of Safety %	13 Conc. in groundwater (EEC) ppb	14 PDI groundwater exposure mg/kg/day	10 Margin of Safety %
Aluminium as Al	0.005	RSA RfD	< 0.100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arsenic as As	0.0003	EPA RfD	0.011	0.0004	122	0.367	0.000012	4.07	5.70	0.00019	83.2
Barium as Ba	0.07	EPA RfD	< 0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cadmium as Cd	0.0005	EPA RfD	0.055	0.0018	367	1.83	0.000061	12.2	28.7	0.0010	191
Chromium ⁺⁺ as Cr ⁺⁺	1.5	EPA RfD	0.044	0.0015	0.098	1.47	0.00005	0.0032	23	0.0008	0.001
Chromium ⁺ as Cr ⁺	0.003	EPA RfD	< 0.025	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cobalt as Co	0.001	RSA RfD	0.133	0.0061	76.2	6.10	0.00020	2.54	96	0.0032	39.6
Copper as Cu	0.04	EPA RfD	0.03	0.0011	2.8	1.13	0.00004	0.094	17.8	0.0006	1.46
Cyanide as CN	0.01	EPA RfD	< 0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron as Fe	0.003	RSA RfD	0.428	0.0143	476	14.3	0.0005	16.3	224	0.0075	249
Lead as Pb	0.002	RSA RfD	0.311	0.010	518	10.4	0.00035	17.3	163	0.0054	272
Manganese as Mn	0.046	EPA RfD	39	1.3	2826	1300	0.043	94.2	20383	0.679	1477
Mercury as Hg	0.0003	EPA RfD	< 0.002	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nickel as Ni	0.02	EPA RfD	0.162	0.0054	27.0	5.40	0.00018	0.900	85	0.0028	14.1
Selenium as Se	0.005	EPA RfD	0.015	0.0005	10.0	0.500	0.00002	0.333	7.8	0.0003	5.2
Titanium as Ti	0.003	RSA RfD	0.34	0.0113	378	11.3	0.00038	12.6	178	0.0059	199
Vanadium as V	0.009	EPA RfD	< 0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zinc as Zn	0.3	EPA RfD	0.058	0.0019	0.044	1.93	0.00006	0.02	30	0.0010	0.337
Calcium as Ca	0.0	RSA RfD	631	21.0	421	21033	0.701	14.0	329794	11.0	220
Chloride as Cl	0.3	RSA RfD	3499	117	1405	116633	3.89	48.8	1828762	61.0	734
Fluoride as F	0.06	EPA RfD	13.4	0.447	744	447	0.015	24.8	7004	0.233	389
Magnesium as Mg	0.3	RSA RfD	371	12.4	538	12367	0.412	17.5	193904	6.46	281
Potassium as K	0.7	RSA RfD	515	17.2	256	17167	0.572	8.54	269166	8.97	134
Sodium as Na	0.3	RSA RfD	2503	83.4	2528	83433	2.78	84.3	1308200	43.6	1321
Sulphate as SO ₄	0.7	RSA RfD	5500	183	2736	183333	6.11	01.2	2874590	95.8	1430
Boron as B	0.09	EPA RfD	1.6	0.053	59.2	53	0.0018	1.08	836	0.028	31.0
Nitrate as N	1.6	EPA RfD	0.6	0.02	1.3	20	0.0007	0.042	314	0.010	0.00
RISK / ACCEPTABLE RISK TO: HUMAN			Dam water	R		River water	AR		Groundwater	R	

Table 149

EVAPORATION DAM 4: HUMAN RISK ASSESSMENT ♦ DAM WATER ♦ SAMPLE NO. 4 [INORGANIC - MICRO'S & MACRO'S]
[ISCOR VANDERBIJLPARK STEEL - MASTER PLAN]

SAMPLE NUMBER: 4											
ORGANIC COMPOUNDS Micro's and Macro's	6 RfD/ ADI/GV mg/kg/day	7 EPA RfD/ EPA DWEL/ RSA RfD/ WHO GV	RISK TO HUMAN								
			RISK OF DAM WATER AS IS			RISK OF DILUTED DAM WATER IN RIVER			RISK OF DAM WATER FOR GROUNDWATER		
			8 Conc. in Dam water ppm	9 PDI Dam water exposure mg/kg/day	10 Margin of Safety %	11 Conc. in River water (EEC) ppb	12 PDI river water exposure mg/kg/day	10 Margin of Safety %	13 Conc. in groundwater (EEC) ppb	14 PDI groundwater exposure mg/kg/day	10 Margin of Safety %
Aluminium as Al	0.003	RSA RfD	< 0.100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arsenic as As	0.0003	EPA RfD	0.013	0.0004	144	0.433	0.000014	4.81	6.80	0.00023	75.5
Barium as Ba	0.6	EPA RfD	< 0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cadmium as Cd	0.0003	EPA RfD	0.055	0.0018	367	1.83	0.000061	12.2	28.7	0.0010	191
Chromium ⁺⁺ as Cr ⁺⁺	1.50	EPA RfD	0.041	0.0014	0.091	1.37	0.00005	0.0330	21	0.0007	2.045
Chromium ⁺ as Cr ⁺	0.003	EPA RfD	< 0.025	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cobalt as Co	0.000	RSA RfD	0.181	0.0060	76.4	6.03	0.00020	2.50	95	0.0032	25.4
Copper as Cu	0.04	EPA RfD	0.03	0.0011	2.5	1.10	0.00004	0.082	17.2	0.0006	1.43
Cyanide as CN	0.04	EPA RfD	< 0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron as Fe	0.003	RSA RfD	0.399	0.0133	443	13.3	0.0004	14.3	209	0.0070	232
Lead as Pb	0.002	RSA RfD	0.313	0.010	522	10.4	0.00035	17.4	164	0.0055	273
Manganese as Mn	2.000	EPA RfD	38	1.3	2754	1267	0.042	91.8	19861	0.662	1439
Mercury as Hg	0.0003	EPA RfD	< 0.002	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nickel as Ni	0.02	EPA RfD	0.162	0.0054	27.0	5.40	0.00018	0.900	85	0.0028	14.1
Selenium as Se	0.003	EPA RfD	0.02	0.0007	13.3	0.667	0.00002	0.444	10.5	0.0004	2.0
Titanium as Ti	0.003	RSA RfD	0.37	0.0123	411	12.3	0.00041	13.7	193	0.0064	214
Vanadium as V	0.009	EPA RfD	< 0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zinc as Zn	0.3	EPA RfD	0.055	0.0018	0.011	1.83	0.00006	0.02	29	0.0010	0.318
Calcium as Ca	2.0	RSA RfD	661	22.0	441	22033	0.734	14.7	345473	11.5	230
Chloride as Cl	2.0	RSA RfD	3499	117	1405	116633	3.89	46.3	1828762	61.0	734
Fluoride as F	0.6	EPA RfD	13.3	0.443	739	443	0.015	24.5	6951	0.232	386
Magnesium as Mg	2.3	RSA RfD	365	12.2	529	12167	0.406	17.6	190768	6.36	276
Potassium as K	6.7	RSA RfD	518	17.3	258	17267	0.576	8.55	270734	9.02	135
Sodium as Na	3.3	RSA RfD	2486	82.9	2511	82867	2.76	63.7	1299315	43.3	1312
Sulphate as SO ₄	0.3	RSA RfD	5500	183	2736	183333	6.11	91.2	2874590	95.8	1430
Boron as B	0.09	EPA RfD	1.4	0.047	51.9	47	0.0016	1.79	732	0.024	23.1
Nitrate as N	1.6	EPA RfD	0.6	0.02	1.3	20	0.0007	0.042	314	0.010	0.55
RISK / ACCEPTABLE RISK TO: HUMAN			Dam water			River water			Groundwater		
			R			AT			R		

Table 150

EVAPORATION DAM 4: HUMAN RISK ASSESSMENT ♦ DAM WATER ♦ SAMPLE NO. 5 [INORGANIC - MICRO'S & MACRO'S]
[ISCOR VANDERBIJLPARK STEEL - MASTER PLAN]

SAMPLE NUMBER: 5											
ORGANIC COMPOUNDS Micro's and Macro's	RfD/ ADI/GV mg/kg/day	7 EPA RfD/ EPA DWEL/ RSA RfD/ WHO GV	RISK TO HUMAN								
			RISK OF DAM WATER AS IS			RISK OF DILUTED DAM WATER IN RIVER			RISK OF DAM WATER FOR GROUNDWATER		
			8 Conc. in Dam water ppm	9 PDI Dam water exposure mg/kg/day	10 Margin of Safety %	11 Conc. in River water (EEC) ppb	12 PDI river water exposure mg/kg/day	10 Margin of Safety %	13 Conc. in groundwater (EEC) ppb	14 PDI groundwater exposure mg/kg/day	10 Margin of Safety %
Aluminium as Al	0.003	RSA RfD	< 0.100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arsenic as As	0.0003	EPA RfD	0.011	0.0004	122	0.367	0.000012	4.37	5.70	0.00019	83.3
Barium as Ba	0.4	EPA RfD	< 0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cadmium as Cd	0.0005	EPA RfD	0.053	0.0018	353	1.77	0.00006	11.2	27.7	0.0009	185
Chromium ³⁺ as Cr ³⁺	1.5	EPA RfD	0.029	0.0010	0.064	0.97	0.00003	0.0021	15	0.0005	0.004
Chromium ⁶⁺ as Cr ⁶⁺	0.004	EPA RfD	< 0.025	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cobalt as Co	0.003	RSA RfD	0.184	0.0061	76.7	6.13	0.00020	2.52	96	0.0032	40.1
Copper as Cu	0.04	EPA RfD	0.04	0.0012	3.1	1.23	0.00004	0.103	19.3	0.0006	1.61
Cyanide as CN	0.04	EPA RfD	< 0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron as Fe	0.003	RSA RfD	0.403	0.0134	448	13.4	0.0004	14.5	211	0.0070	234
Lead as Pb	0.002	RSA RfD	0.302	0.010	503	10.1	0.00034	16.3	158	0.0053	263
Manganese as Mn	0.043	EPA RfD	38	1.3	2754	1267	0.042	81.2	19861	0.662	1439
Mercury as Hg	0.0004	EPA RfD	< 0.002	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nickel as Ni	0.02	EPA RfD	0.159	0.0053	28.6	5.30	0.00018	0.883	83	0.0028	13.5
Selenium as Se	0.006	EPA RfD	0.016	0.0005	16.7	0.533	0.00002	0.355	8.4	0.0003	5.5
Titanium as Ti	0.003	RSA RfD	0.41	0.0137	456	13.7	0.00046	15.2	214	0.0071	238
Vanadium as V	0.009	EPA RfD	< 0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zinc as Zn	0.3	EPA RfD	0.054	0.0018	0.600	1.80	0.00006	0.02	28	0.0009	0.313
Calcium as Ca	5.3	RSA RfD	621	20.7	41	20700	0.690	13.8	324567	10.8	216
Chloride as Cl	0.3	RSA RfD	3499	117	1405	116633	3.89	46.9	1828762	61.0	734
Fluoride as F	0.06	EPA RfD	13.3	0.443	739	443	0.015	24.2	6951	0.232	386
Magnesium as Mg	2.3	RSA RfD	389	13.0	564	12967	0.432	19.8	203312	6.78	295
Potassium as K	6.7	RSA RfD	511	17.0	254	17033	0.568	8.47	267076	8.90	133
Sodium as Na	3.3	RSA RfD	2464	82.1	2489	82133	2.74	80.0	1287816	42.9	1301
Sulphate as SO ₄	0.7	RSA RfD	5556	185	2764	185200	6.17	82.1	2903858	96.8	1445
Boron as B	0.09	EPA RfD	1.9	0.063	70.4	63	0.0021	2.35	993	0.033	36.8
Nitrate as N	1.6	EPA RfD	0.6	0.02	1.3	20	0.0007	0.042	314	0.010	0.65
RISK / ACCEPTABLE RISK TO HUMAN			Dam water	R		River water	AR		Groundwater	R	

Table 151

EVAPORATION DAM 4: HUMAN RISK ASSESSMENT ♦ DAM WATER ♦ SAMPLE NO. 6 [INORGANIC - MICRO'S & MACRO'S]
[ISCOR VANDERBIJLPARK STEEL - MASTER PLAN]

SAMPLE NUMBER: 6											
ORGANIC COMPOUNDS Micro's and Macro's	6 RfD/ ADI/GV mg/kg/day	7 EPA RfD/ EPA DWEL/ RSA RfD/ WHO GV	RISK TO HUMAN								
			RISK OF DAM WATER AS IS			RISK OF DILUTED DAM WATER IN RIVER			RISK OF DAM WATER FOR GROUNDWATER		
			8 Conc. in Dam water ppm	9 PDI Dam water exposure mg/kg/day	10 Margin of Safety %	11 Conc. in River water (EEC) ppb	12 PDI river water exposure mg/kg/day	10 Margin of Safety %	13 Conc. in groundwater (EEC) ppb	14 PDI groundwater exposure mg/kg/day	10 Margin of Safety %
Aluminium as Al	0.005	RSA RfD	< 0.100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arsenic as As	0.0003	EPA RfD	0.009	0.0003	100	0.300	0.00001	3.33	4.70	0.00016	52.2
Barium as Ba	0.07	EPA RfD	< 0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cadmium as Cd	0.0005	EPA RfD	0.053	0.0018	353	1.77	0.00006	11.9	27.7	0.0009	185
Chromium ⁺⁺ as Cr ⁺⁺	1.5	EPA RfD	0.038	0.0013	0.04	1.27	0.00004	0.012	20	0.0007	0.04
Chromium ⁺ as Cr ⁺	0.001	EPA RfD	< 0.025	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cobalt as Co	0.008	RSA RfD	0.178	0.0059	74.2	5.93	0.00020	2.47	93	0.0031	38.5
Copper as Cu	0.04	EPA RfD	0.04	0.0012	3.3	1.20	0.00004	0.100	18.8	0.0006	1.57
Cyanide as CN	0.01	EPA RfD	< 0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron as Fe	0.001	RSA RfD	0.430	0.0143	478	14.3	0.0005	15.3	225	0.0075	250
Lead as Pb	0.05	RSA RfD	0.312	0.010	520	10.4	0.00035	17.3	163	0.0054	272
Manganese as Mn	0.046	EPA RfD	39	1.3	2826	1300	0.043	34.2	20383	0.679	1477
Mercury as Hg	0.0003	EPA RfD	< 0.002	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nickel as Ni	0.02	EPA RfD	0.164	0.0055	27.3	5.47	0.00018	0.811	86	0.0029	14.3
Selenium as Se	0.003	EPA RfD	0.019	0.0006	12.7	0.633	0.00002	0.422	9.9	0.0003	0.6
Titanium as Ti	0.001	RSA RfD	0.42	0.0140	467	14.0	0.00047	15.0	220	0.0073	244
Vanadium as V	0.001	EPA RfD	< 0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zinc as Zn	0.3	EPA RfD	0.053	0.0018	0.588	1.77	0.00006	0.02	28	0.0009	0.388
Calcium as Ca	5.0	RSA RfD	651	21.7	434	21700	0.723	14.5	340247	11.3	227
Chloride as Cl	8.3	RSA RfD	3474	116	1395	115800	3.86	48.5	1815695	60.5	729
Fluoride as F	0.06	EPA RfD	13.2	0.440	733	440	0.015	24.4	6899	0.230	383
Magnesium as Mg	2.0	RSA RfD	359	12.0	520	11967	0.399	17.3	187632	6.25	272
Potassium as K	0.7	RSA RfD	508	16.9	253	16933	0.564	9.42	265508	8.85	132
Sodium as Na	3.3	RSA RfD	2484	82.8	2509	82800	2.76	83.0	1298269	43.3	1311
Sulphate as SO ₄	0.7	RSA RfD	5556	185	2764	185200	6.17	92.1	2903858	96.8	1445
Boron as B	0.09	EPA RfD	1.9	0.063	79.4	63	0.0021	2.35	993	0.033	56.8
Nitrate as N	1.6	EPA RfD	0.5	0.02	1.0	17	0.0006	0.035	261	0.009	0.54
RISK / ACCEPTABLE RISK TO: HUMAN			Dam water	R		River water	AR		Groundwater	R	

Table 152

EVAPORATION DAM 4: HUMAN RISK ASSESSMENT ♦ DAM WATER ♦ SAMPLE NO. 7 [INORGANIC - MICRO'S & MACRO'S]
[ISCOR VANDERBIJLPARK STEEL - MASTER PLAN]

SAMPLE NUMBER: 7											
ORGANIC COMPOUNDS Micro's and Macro's	8 RfD/ ADI/GV mg/kg/day	7 EPA RfD/ EPA DWEL/ RSA RfD/ WHO GV	RISK TO HUMAN								
			RISK OF DAM WATER AS IS			RISK OF DILUTED DAM WATER IN RIVER			RISK OF DAM WATER FOR GROUNDWATER		
			8 Conc. in Dam water ppm	9 PDI Dam water exposure mg/kg/day	10 Margin of Safety %	11 Conc. in River water (EEC) ppb	12 PDI river water exposure mg/kg/day	10 Margin of Safety %	13 Conc. in groundwater (EEC) ppb	14 PDI groundwater exposure mg/kg/day	10 Margin of Safety %
Aluminium as Al	0.005	RSA RfD	< 0.100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arsenic as As	0.0003	EPA RfD	0.010	0.0003	111	0.333	0.000011	3.79	5.20	0.00017	57.8
Barium as Ba	0.07	EPA RfD	< 0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cadmium as Cd	0.0005	EPA RfD	0.052	0.0017	347	1.73	0.000058	11.5	27.2	0.0009	181
Chromium ⁺⁺ as Cr ⁺⁺	1.5	EPA RfD	0.031	0.0010	0.069	1.03	0.00003	0.0023	16	0.0005	0.038
Chromium ⁺ as Cr ⁺	0.003	EPA RfD	< 0.025	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cobalt as Co	0.008	RSA RfD	0.173	0.0058	72.1	5.77	0.00019	2.40	90	0.0030	37.7
Copper as Cu	0.04	EPA RfD	0.04	0.0012	3.8	1.20	0.00004	0.100	18.8	0.0006	1.67
Cyanide as CN	0.04	EPA RfD	< 0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron as Fe	0.003	RSA RfD	0.498	0.0166	553	16.6	0.0006	18.4	260	0.0087	289
Lead as Pb	0.002	RSA RfD	0.298	0.010	497	9.9	0.00033	16.5	156	0.0052	260
Manganese as Mn	0.040	EPA RfD	39	1.3	2826	1300	0.043	94.2	20383	0.679	1477
Mercury as Hg	0.0003	EPA RfD	< 0.002	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nickel as Ni	0.02	EPA RfD	0.161	0.0054	26.8	5.37	0.00018	0.364	84	0.0028	14.5
Selenium as Se	0.004	EPA RfD	0.025	0.0008	16.7	0.833	0.00003	0.555	13.1	0.0004	8.7
Titanium as Ti	0.003	RSA RfD	0.55	0.0183	611	18.3	0.00061	20.4	287	0.0096	319
Vanadium as V	0.004	EPA RfD	< 0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zinc as Zn	0.3	EPA RfD	0.052	0.0017	0.578	1.73	0.00006	0.92	27	0.0009	0.902
Calcium as Ca	5.0	RSA RfD	641	21.4	427	21367	0.712	14.2	335020	11.2	223
Chloride as Cl	8.3	RSA RfD	3524	117	1415	117467	3.92	47.2	1841828	61.4	740
Fluoride as F	0.04	EPA RfD	13.2	0.440	733	440	0.015	24.4	6899	0.230	383
Magnesium as Mg	2.3	RSA RfD	365	12.2	529	12167	0.406	17.6	190768	6.36	276
Potassium as K	0.7	RSA RfD	502	16.7	250	16733	0.558	8.33	262372	8.75	131
Sodium as Na	3.3	RSA RfD	2501	83.4	2526	83367	2.78	84.2	1307154	43.6	1320
Sulphate as SO ₄	6.7	RSA RfD	5500	183	2736	183333	6.11	91.2	2874590	95.8	1430
Boron as B	0.08	EPA RfD	1.8	0.060	66.7	60	0.0020	2.22	941	0.031	34.8
Nitrate as N	1.6	EPA RfD	0.5	0.02	1.0	17	0.0006	0.035	261	0.009	0.54
RISK / ACCEPTABLE RISK TO: HUMAN			Dam water	R		River water	AR		Groundwater	R	