Basic Remediation COMPANY

TECHNICAL MEMORANDUM

To: Brian Rakvica (NDEP)

From: Ranajit Sahu (BRC)

cc: Jim Najima (NDEP)
Mark Jones (ERM)

Date: May 20, 2009

Subject: Technical Memorandum – Development of Recreational Risk-Based Screening Levels (RBSLs), BMI Common Areas (Eastside) Site, Clark County, Nevada

Introduction

The Nevada Division of Environmental Protection (NDEP) has developed Basic Comparison Levels (BCLs) that address common human receptors and exposure pathways (NDEP 2009). These receptors include residential, and indoor and outdoor workers. Basic Remediation Company (BRC) has used these BCLs at the BMI Common Areas (Eastside) Site for the comparison of historical Site data in the development of Sampling and Analysis Plans (SAPs) for the project. However, one of the questions asked in the BCL User's Guide is whether there is potential for land use other than those covered by the BCLs. The objective of this technical memorandum is to address this issue. That is, there are portions of the project that will not be developed for unrestricted residential uses. Rather these areas will be developed for recreational purposes only (specifically, the Western Hook-Open Space sub-area of the project).

Therefore, this technical memorandum presents risk-based screening levels (RBSLs) developed for a recreational exposure scenario; an exposure scenario not covered by NDEP's BCLs. It is important to note that these recreational RBSLs were not developed to represent action levels or final cleanup levels but rather as a simple screening tool to assist in site characterization activities only. Risk assessments will be conducted at all areas of the Site, which will be used for decision-making purposes.

Similar to NDEP's BCLs, the recreational RBSLs contain current human health toxicity values that are combined with standard exposure factors to estimate contaminant concentrations in environmental soil that are considered to be protective of human exposures (including sensitive sub-groups) over a lifetime for typical recreational activities. The methodology, input factors, and equations used in the development of these recreational RBSLs are from the human health risk assessment methodology chapter of the BRC Closure Plan (BRC *et al*. 2007). For each of the chemicals on BRC's site-related chemical (SRC) list, recreational RBSLs are back-calculated

from target risk levels. Target risk levels for soil exposures are set at a cumulative one-in-a-million (1×10^{-6}) incremental lifetime cancer risk for the cancer endpoint and a hazard quotient (HQ) of one (1) for the non-cancer endpoint.

Conceptual Site Model

The conceptual site model (CSM) is a tool used in risk assessment to describe relationships between chemicals and potentially exposed human receptor populations, thereby delineating the relationships between the suspected sources of chemicals identified at the site, the mechanisms by which the chemicals might be released and transported in the environment, and the means by which the receptors could come in contact with the chemicals.

Under the current, prospective redevelopment plan, the Site will be used for a variety of purposes, including residential housing, parks, schools, places of worship, commercial and/or light industrial development, and streets. Many potential human receptors are possible at the Site in the period during and after redevelopment. Because the background general water quality (*i.e.*, high salt concentrations) of the groundwater beneath the Site and in the surrounding area is poor and because BRC will place institutional controls in the form of a deed restriction to prevent future users from utilizing groundwater beneath the Site, the use of private water wells by residents, businesses, or parks for drinking water, irrigation water, or other non-potable uses (*e.g.*, washing cars, filling swimming pools) will not occur in the post-redevelopment phase. Therefore, exposure pathways relating to this type of use are incomplete and are not included in the development of recreational RBSLs. That is, recreational RBSLs have been developed for soil exposures only.

The following presents the primary exposure pathways to soil for potential recreational receptors at the Site.

- incidental soil ingestion
- external exposure from soil (radionuclides only)
- dermal contact with soil
- outdoor inhalation of dust

Exposure Parameters and Equations

As discussed above, all input factors and equations used in the development of these recreational RBSLs are from the human health risk assessment methodology chapter of the BRC Closure Plan (BRC *et al*. 2007). The exposure factors used are:

Parameter	Abbrev.	Value	Units	Reference
Dermal absorption fraction	ABS	---chemical-specific---		NDEP 2009
Dermal adherence factor	AF	0.2	mg/cm^2	USEPA 2002
Averaging time, carcinogenic	AT_c	70	years	USEPA 2002
Averaging time, non-carcinogenic	AT_{nc}	6	years	Based on ED_{mw}
Body weight	BW_t	31	kg	USEPA 1997a
Exposure time	ET	4	hrs/day	Professional judgment
Exposure frequency	EF_t	50	days/year	Professional judgment
Exposure duration	ED_t	6	years	USEPA 1997a
Inhalation rate	$IR_{a,t}$	1.2	m^3/hr	USEPA 1997a
Available skin surface area	SA_t	3,200	cm^2/day	USEPA 2004
Soil ingestion rate	$IR_{s,t}$	100	mg/day	USEPA 1997
Radionuclide-specific factors				
Exposure time fraction, outdoors	$ET_{t,o}$	0.17	based on 4 hr/d	
Area correction factor	ACF_t	0.9	unitless	USEPA 2000, 2009a
Gamma shielding factor	GSF	0.4	unitless	USEPA 2000, 2009a

The equations for calculating the carcinogenic risk or non-cancer hazard by exposure pathway, as well as the combined risk from all exposures for the scenario, are provided electronically in Attachment A. Volatilization factors, particulate emission factors, and dermal absorption factors were obtained from NDEP's BCL table. These recreational RBSLs do not incorporate soil saturation concentrations.

Toxicity Values

U.S. Environmental Protection Agency (USEPA) toxicity values, known as non-carcinogenic reference doses (RfDs) and cancer slope factors (CSFs) were obtained from USEPA's Integrated Risk Information System (IRIS) on-line database (USEPA, 2009b), EPA's Provisional Peer-Reviewed Toxicity Values Database (PPRTV) (USEPA, 2009c), USEPA's National Center for Environmental Assessment (NCEA), USEPA's Health Effects Assessment Summary Table (HEAST) (USEPA, 1997b), and other sources (from NDEP's BCL table). The hierarchy for the sources of the toxicity values used to develop the recreational RBSLs was from USEPA (2003).

Special Considerations

There are several analytes for which there are special circumstances that were considered in the development of recreational RBSLs. These are as followings:

- Asbestos – Recreational RBSLs have not been developed for asbestos.
- Lead – The residential BCL for lead of 400 mg/kg is used as the recreational RBSL.
- Dioxins/Furans – The Agency for Toxic Substances and Disease Registry (ATSDR) screening value of 50 parts per trillion (ppt) is used as the recreational RBSL for the dioxins/furans toxic equivalency (TEQ).
- Total Petroleum Hydrocarbons (TPH) – Recreational RBSLs have not been developed for TPH.
- Polycyclic Aromatic Hydrocarbons (PAHs) – USEPA potency factors were used for the development of recreational RBSLs for PAHs.
- Radionuclides - Recreational RBSLs have only been developed for the eight radionuclides on the current project analyte list (radium-226, radium-228, thorium-228, thorium-230, thorium-232, uranium-233/234, uranium-235/236, and uranium-238).
- Vinyl Chloride – USEPA (2009a) presents two CSFs for vinyl chloride—one for adult exposures and a second for young children. The more CSF for children is applied for the development of a recreational RBSL for vinyl chloride.

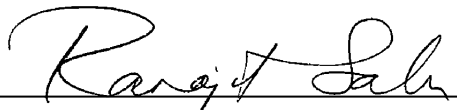
For several chemicals which do not have available toxicity criteria, a toxicological surrogate approach is used for the development of recreational RBSLs, consistent with those used in NDEP's BCLs.

Summary

In summary, this technical memorandum presents RBSLs developed for a recreational exposure scenario; an exposure scenario not covered by NDEP's BCLs. These recreational RBSLs were developed as a simple screening tool to assist in historical site characterization activities only. Table 1 presents the recreational RBSLs that have been development for the project. Attachment A is an electronic version of the recreational RBSL calculation spreadsheet.

Attachments: Table 1 – Preliminary Recreational Risk-Based Screening Levels (RBSLs)
Attachment A – Recreational RBSL Calculation Spreadsheet

I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been provided in a manner consistent with the current standards of the profession and to the best of my knowledge comply with all applicable federal, state and local statutes, regulations and ordinances. I hereby certify that all laboratory analytical data was generated by a laboratory certified by the NDEP for each constituent and media presented herein.



May 20, 2009

Dr. Ranajit Sahu, C.E.M. (No. EM-1699, Exp. 10/07/2009) Date
BRC Project Manager

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TABLE 1
PRELIMINARY RECREATIONAL RISK-BASED SCREENING LEVELS (RBSLs)
(Page 1 of 8)

Parameter of Interest	Compound List	CAS Number	Recreational RBSL	
			mg/kg or pCi/g	Basis
Ions	Bromide	24959-67-9	NE	--
	Bromine	7726-95-6	NE	--
	Chlorate	14866-68-3	NE	--
	Chloride	16887-00-6	NE	--
	Chlorine (soluble)	7782-50-5	NE	--
	Chlorite	14998-27-7	NE	--
	Fluoride	16984-48-8	83,000	N
	Nitrate (as N)	14797-55-8	NE	--
	Nitrite (as N)	14797-65-0	NE	--
	Orthophosphate	14265-44-2	NE	--
	Sulfate	14808-79-8	NE	--
	Sulfite	14265-45-3	NE	--
	Perchlorate	14797-73-0	1,600	N
Chlorinated Compounds	Chloral	75-87-6	>100,000	N
	Dichloroacetaldehyde	79-02-7	NE	--
PCDDs/PCDFs	OCDF (see 2,3,7,8-TCDD TEQ)	39001-02-0	NE	--
	OCDD (see 2,3,7,8-TCDD TEQ)	3268-87-9	NE	--
	1,2,3,4,6,7,8-HpCDF (see 2,3,7,8-TCDD TEQ)	67562-39-4	NE	--
	1,2,3,4,6,7,8-HpCDD (see 2,3,7,8-TCDD TEQ)	35822-46-9	NE	--
	1,2,3,4,7,8,9-HpCDF (see 2,3,7,8-TCDD TEQ)	55673-89-7	NE	--
	1,2,3,4,7,8-HxCDF (see 2,3,7,8-TCDD TEQ)	70648-26-9	NE	--
	1,2,3,4,7,8-HxCDD (see 2,3,7,8-TCDD TEQ)	39227-28-6	NE	--
	1,2,3,6,7,8-HxCDF (see 2,3,7,8-TCDD TEQ)	57117-44-9	NE	--
	1,2,3,6,7,8-HxCDD (see 2,3,7,8-TCDD TEQ)	57653-85-7	NE	--
	1,2,3,7,8,9-HxCDF (see 2,3,7,8-TCDD TEQ)	72918-21-9	NE	--
	1,2,3,7,8,9-HxCDD (see 2,3,7,8-TCDD TEQ)	19408-74-3	NE	--
	1,2,3,7,8-PeCDF (see 2,3,7,8-TCDD TEQ)	57117-41-6	NE	--
	1,2,3,7,8-PeCDD (see 2,3,7,8-TCDD TEQ)	40321-76-4	NE	--
	2,3,4,6,7,8-HxCDF (see 2,3,7,8-TCDD TEQ)	60851-34-5	NE	--
	2,3,4,7,8-PeCDF (see 2,3,7,8-TCDD TEQ)	57117-31-4	NE	--
	2,3,7,8-TCDF (see 2,3,7,8-TCDD TEQ)	51207-31-9	NE	--
	2,3,7,8-TCDD (TEQ)	1746-01-6	50 ppt	--
Asbestos	Asbestos	1332-21-4	NE	--
General Chemistry Parameters	Ammonia (as N)	7664-41-7	>100,000	N
	Cyanide (Total)	57-12-5	28,000	N
	Iodine	7553-56-2	NE	--
	pH in soil	pH	NE	--
	Percent moisture	%MOISTURE	NE	--
	Sulfide	18496-25-8	NE	--
	Total inorganic carbon	7440-44-0	NE	--
	Total Kjeldahl nitrogen (TKN)	TKN	NE	--
	Total organic carbon (TOC)	7440-44-0	NE	--
Metals	Aluminum	7429-90-5	>100,000	N
	Antimony	7440-36-0	910	N
	Arsenic	7440-38-2	36	C
	Barium	7440-39-3	>100,000	N
	Beryllium	7440-41-7	4,500	N
	Boron	7440-42-8	>100,000	N
	Cadmium	7440-43-9	1,100	N
	Calcium	7440-70-2	NE	--
	Chromium	7440-47-3	>100,000	N
	Cobalt	7440-48-4	40,000	N

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Parameter of Interest	Compound List	CAS Number	Recreational RBSL	
			mg/kg or pCi/g	Basis
Metals (Continued)	Copper	7440-50-8	84,000	N
	Iron	7439-89-6	>100,000	N
	Lead	7439-92-1	400	--
	Lithium	1313-13-9	4,500	N
	Magnesium	7439-95-4	NE	--
	Manganese	7439-96-5	93,000	N
	Molybdenum	7439-98-7	11,000	N
	Nickel	7440-02-0	45,000	N
	Niobium	7440-03-1	NE	--
	Palladium	7440-05-3	NE	--
	Phosphorus	7723-14-0	NE	--
	Platinum	7440-06-4	NE	--
	Potassium	7440-09-7	NE	--
	Selenium	7782-49-2	11,000	N
	Silicon	7440-21-3	NE	--
	Silver	7440-22-4	11,000	N
	Sodium	7440-23-5	NE	--
	Strontium	7440-24-6	>100,000	N
	Sulfur	7704-34-9	NE	--
	Thallium	7440-28-0	160	N
	Tin	7440-31-5	>100,000	N
	Titanium	7440-32-6	>100,000	N
	Tungsten	7440-33-7	17,000	N
	Uranium	7440-61-1	6,800	N
	Vanadium	7440-62-2	11,000	N
	Zinc	7440-66-6	>100,000	N
	Zirconium	7440-67-7	NE	--
	Chromium (VI)	18540-29-9	2,200	C
	Mercury	7439-97-6	680	N
Organo-phosphorous Pesticides	Azinphos-ethyl	264-27-19	NE	--
	Azinphos-methyl	86-50-0	NE	--
	Carbophenothion	786-19-6	NE	--
	Chlorpyrifos	2921-88-2	4,100	N
	Coumaphos	56-72-4	NE	--
	Demeton-O	298-03-3	NE	--
	Demeton-S	126-75-0	NE	--
	Diazinon	333-41-5	1,200	N
	Dichlorvos	62-73-7	56	C
	Dimethoate	60-51-5	NE	--
	Disulfoton	298-04-4	55	N
	EPN	2104-64-5	NE	--
	Ethoprop	13194-48-4	NE	--
	Ethyl parathion	56-38-2	8,300	N
	Fampphur	52-85-7	NE	--
	Fenthion	55-38-9	NE	--
	Malathion	121-75-5	28,000	N
	Methyl carbophenothion	953-17-3	NE	--
	Methyl parathion	298-00-0	340	N
	Mevinphos	7786-34-7	NE	--
	Naled	300-76-5	2,800	N

TABLE 1
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Parameter of Interest	Compound List	CAS Number	Recreational RBSL	
			mg/kg or pCi/g	Basis
Organo-phosphorous Pesticides (Continued)	O,O,O-Triethyl phosphorothioate (TEPP)	297-97-2	NE	--
	Phorate	298-02-2	NE	--
	Phosmet	732-11-6	NE	--
	Ronnel	299-84-3	69,000	N
	Stirophos (Tetrachlorovinphos)	22248-79-9	670	C
	Sulfotep	3689-24-5	NE	--
Chlorinated Herbicides	2,4,5-T	93-76-5	14,000	N
	2,4,5-TP (Silvex)	93-72-1	11,000	N
	2,4-D	94-75-7	17,000	N
	2,4-DB	94-82-6	11,000	N
	Dalapon	75-99-0	41,000	N
	Dicamba	1918-00-9	41,000	N
	Dichloroprop	120-36-5	NE	--
	Dinoseb	88-85-7	1,400	N
	MCPA	94-74-6	690	N
	MCPP	93-65-2	1,400	N
Organic Acids	4-Chlorobenzene sulfonic acid	98-66-8	>100,000	N
	Benzenesulfonic acid	98-11-3	>100,000	N
	O,O-Diethylphosphorodithioic acid	298-06-6	>100,000	N
	O,O-Dimethylphosphorodithioic acid	756-80-9	>100,000	N
Nonhalogenated Organics	Ethylene glycol	107-21-1	>100,000	N
	Ethylene glycol monobutyl ether	111-76-2	>100,000	N
	Methanol	67-56-1	>100,000	N
	Propylene glycol	57-55-6	>100,000	N
Organochlorine Pesticides	2,4-DDD	53-19-0	92	C
	2,4-DDE	3424-82-6	65	C
	4,4-DDD	72-54-8	92	C
	4,4-DDE	72-55-9	65	C
	4,4-DDT	50-29-3	65	C
	Aldrin	309-00-2	0.95	C
	alpha-BHC	319-84-6	3.3	C
	alpha-Chlordane	5103-71-9	NE	--
	beta-BHC	319-85-7	12	C
	Chlordane	57-74-9	60	C
	delta-BHC	319-86-8	NE	--
	Dieldrin	60-57-1	1.0	C
	Endosulfan I	959-98-8	8,300	N
	Endosulfan II	33213-65-9	8,300	N
	Endosulfan sulfate	1031-07-8	NE	--
	Endrin	72-20-8	410	N
	Endrin aldehyde	7421-93-4	NE	--
	Endrin ketone	53494-70-5	NE	--
	gamma-BHC (Lindane)	58-89-9	16	C
	gamma-Chlordane	5103-74-2	NE	--
	Heptachlor	76-44-8	3.6	C
	Heptachlor epoxide	1024-57-3	1.8	C
	Methoxychlor	72-43-5	6,900	N
	Toxaphene	8001-35-2	15	C
Polychlorinated Biphenyls	Aroclor 1016	12674-11-2	84	N
	Aroclor 1221	11104-28-2	7.0	C
	Aroclor 1232	11141-16-5	7.0	C
	Aroclor 1242	53469-21-9	7.0	C

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PRELIMINARY RECREATIONAL RISK-BASED SCREENING LEVELS (RBSLs)
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Parameter of Interest	Compound List	CAS Number	Recreational RBSL	
			mg/kg or pCi/g	Basis
Polychlorinated Biphenyls (Continued)	Aroclor 1248	12672-29-6	7.0	C
	Aroclor 1254	11097-69-1	7.0	C
	Aroclor 1260	11096-82-5	7.0	C
	PCB-77 (see 2,3,7,8-TCDD TEQ)	32598-13-3	NE	--
	PCB-81 (see 2,3,7,8-TCDD TEQ)	70362-50-4	NE	--
	PCB-105 (see 2,3,7,8-TCDD TEQ)	32598-14-4	NE	--
	PCB-114 (see 2,3,7,8-TCDD TEQ)	74472-37-0	NE	--
	PCB-118 (see 2,3,7,8-TCDD TEQ)	31508-00-6	NE	--
	PCB-123 (see 2,3,7,8-TCDD TEQ)	65510-44-3	NE	--
	PCB-126 (see 2,3,7,8-TCDD TEQ)	57465-28-8	NE	--
	PCB-156 (see 2,3,7,8-TCDD TEQ)	38380-08-4	NE	--
	PCB-157 (see 2,3,7,8-TCDD TEQ)	69782-90-7	NE	--
	PCB-167 (see 2,3,7,8-TCDD TEQ)	52663-72-6	NE	--
	PCB-169 (see 2,3,7,8-TCDD TEQ)	32774-16-6	NE	--
	PCB-189 (see 2,3,7,8-TCDD TEQ)	39635-31-9	NE	--
	PCB-209	2051-24-3	NE	--
Polynuclear Aromatic Hydrocarbons	Acenaphthene	83-32-9	>100,000	N
	Acenaphthylene	208-96-8	68,000	N
	Anthracene	120-12-7	>100,000	N
	Benzo(a)anthracene	56-55-3	20	C
	Benzo(a)pyrene	50-32-8	2.0	C
	Benzo(b)fluoranthene	205-99-2	20	C
	Benzo(g,h,i)perylene	191-24-2	68,000	N
	Benzo(k)fluoranthene	207-08-9	200	C
	Chrysene	218-01-9	2,000	C
	Dibenzo(a,h)anthracene	53-70-3	2.0	C
	Indeno(1,2,3-cd)pyrene	193-39-5	20	C
	Phenanthrene	85-01-8	68,000	N
	Pyrene	129-00-0	67,000	N
Radionuclides	Gross alpha	G_Alpha	NE	--
	Gross beta	G_Beta	NE	--
	Radium-226	13982-63-3	0.77	C
	Radium-228	15262-20-1	1.3	C
	Thorium-228	14274-82-9	0.84	C
	Thorium-230	14269-63-7	160	C
	Thorium-232	7440-29-1	140	C
	Uranium-233/234	U-233/234	12	C
	Uranium-235/236	U-235/236	200	C
	Uranium-238	7440-61-1	43	C
	Actinium-228	14331-83-0	NE	--
	Bismuth-212	14913-49-6	NE	--
	Bismuth-214	14733-03-0	NE	--
	Cobalt-57	13981-50-5	NE	--
	Cobalt-60	10198-40-0	NE	--
	Lead-210	14255-04-0	NE	--
	Lead-211	015816-77-0	NE	--
	Lead-212	15092-94-1	NE	--
	Lead-214	15067-28-4	NE	--
	Potassium-40	13966-00-2	NE	--
	Thallium-208	14913-50-9	NE	--
	Thorium-227	15623-47-9	NE	--
	Thorium-234	15065-10-8	NE	--

TABLE 1
PRELIMINARY RECREATIONAL RISK-BASED SCREENING LEVELS (RBSLs)

Parameter of Interest	Compound List	CAS Number	Recreational RBSL	
			mg/kg or pCi/g	Basis
Radionuclides (Continued)	Actinium-227 (from Th-227)	14952-40-0	NE	--
	Bismuth-210 (from Pb-210)	14331-79-4	NE	--
	Bismuth-211 (from Pb-211)	15229-37-5	NE	--
	Polonium-210 (from Pb-210)	13981-52-7	NE	--
	Polonium-212 (from Bi-212)	13981-52-7	NE	--
	Polonium-214 (from Bi-214)	15735-67-8	NE	--
	Polonium-216 (from Pb-212)	15756-58-8	NE	--
	Polonium-218 (from Pb-214)	15422-74-9	NE	--
	Protactinium-231 (from U-235)	14331-85-2	NE	--
	Protactinium-234 (from Th-234)	15100-28-4	NE	--
	Radium-223 (from Th-227)	15623-45-7	NE	--
	Radium-224 (from Pb-212)	13233-32-4	NE	--
	Thallium-207 (from Pb-211)	14133-67-6	NE	--
	Thorium-231 (from U-235)	14932-40-2	NE	--
Radon	Radon-220	22481-48-7	NE	--
	Radon-222	14859-67-7	NE	--
Aldehydes	Acetaldehyde	75-07-0	930	C
	Chloroacetaldehyde	107-20-0	NE	--
	Dichloroacetaldehyde	79-02-7	NE	--
	Formaldehyde	50-00-0	260	C
	Trichloroacetaldehyde	75-87-6	NE	--
Dissolved Gases	Ethane	74-84-0	NE	--
	Ethylene	74-85-1	NE	--
	Methane	74-82-8	NE	--
Semivolatile Organic Compounds	1,2,4,5-Tetrachlorobenzene	95-94-3	410	N
	1,2-Diphenylhydrazine	122-66-7	20	C
	1,4-Dioxane	123-91-1	1,500	C
	2,4,5-Trichlorophenol	95-95-4	>100,000	N
	2,4,6-Trichlorophenol	88-06-2	1,400	N
	2,4-Dichlorophenol	120-83-2	4,100	N
	2,4-Dimethylphenol	105-67-9	28,000	N
	2,4-Dinitrophenol	51-28-5	2,800	N
	2,4-Dinitrotoluene	121-14-2	2,800	N
	2,6-Dinitrotoluene	606-20-2	1,400	N
	2-Chloronaphthalene	91-58-7	>100,000	N
	2-Chlorophenol	95-57-8	1,900	N
	2-Methylnaphthalene	91-57-6	NE	--
	2-Nitroaniline	88-74-4	4,100	N
	2-Nitrophenol	88-75-5	NE	--
	3,3-Dichlorobenzidine	91-94-1	36	C
	3-Nitroaniline	99-09-2	NE	--
	4,4'-Dichlorobenzil	3457-46-3	NE	--
	4-Bromophenyl phenyl ether	101-55-3	NE	--
	4-Chloro-3-methylphenol	59-50-7	NE	--
	4-Chlorophenyl phenyl ether	7005-72-3	NE	--
	4-Chlorothioanisole	123-09-1	NE	--
	4-Chlorothiophenol	106-54-7	NE	--
	4-Nitroaniline	100-01-6	NE	--
	4-Nitrophenol	100-02-7	11,000	N
	Acetophenone	98-86-2	>100,000	N
	Aniline	62-53-3	2,800	C
	Azobenzene	103-33-3	150	C

TABLE 1
PRELIMINARY RECREATIONAL RISK-BASED SCREENING LEVELS (RBSLs)
(Page 6 of 8)

Parameter of Interest	Compound List	CAS Number	Recreational RBSL	
			mg/kg or pCi/g	Basis
Semivolatile Organic Compounds (Continued)	Benzoic acid	65-85-0	>100,000	N
	Benzyl alcohol	100-51-6	>100,000	N
	bis(2-Chloroethoxy)methane	111-91-1	NE	--
	bis(2-Chloroethyl) ether	111-44-4	13	C
	bis(2-Chloroisopropyl) ether	108-60-1	180	C
	bis(2-Ethylhexyl) phthalate	117-81-7	1,100	C
	bis(Chloromethyl) ether	542-88-1	2.8	C
	bis(p-Chlorophenyl) sulfone	80-07-9	NE	--
	bis(p-Chlorophenyl)disulfide	1142-19-4	NE	--
	Butylbenzyl phthalate	85-68-7	>100,000	N
	Carbazole	86-74-8	800	C
	Dibenzofuran	132-64-9	4,200	N
	Dichloromethyl ether	542-88-1	0.015	C
	Diethyl phthalate	84-66-2	>100,000	N
	Dimethyl phthalate	131-11-3	>100,000	N
	Di-n-butyl phthalate	84-74-2	>100,000	N
	Di-n-octyl phthalate	117-84-0	NE	--
	Diphenyl disulfide	882-33-7	NE	--
	Diphenyl sulfide	139-66-2	NE	--
	Diphenyl sulfone	127-63-9	4,100	N
	Fluoranthene	206-44-0	49,000	N
	Fluorene	86-73-7	77,000	N
	Hexachlorobenzene	118-74-1	10	C
	Hexachlorobutadiene	87-68-3	210	C
	Hexachlorocyclopentadiene	77-47-4	8,300	N
	Hexachloroethane	67-72-1	1,100	C
	Hydroxymethyl phthalimide	118-29-6	NE	--
	Isophorone	78-59-1	17,000	C
	m,p-Cresol	106-44-5	6,900	N
	Naphthalene	91-20-3	1,700	N
	Nitrobenzene	98-95-3	580	N
	N-nitrosodi-n-propylamine	621-64-7	2.3	C
	N-nitrosodiphenylamine	86-30-6	3,300	C
	o-Cresol	95-48-7	69,000	N
	Octachlorostyrene	29082-74-4	NE	--
	p-Chloroaniline (4-Chloroaniline)	106-47-8	5,500	N
	Pentachlorobenzene	608-93-5	1,100	N
	Pentachlorophenol	87-86-5	85	C
	Phenol	108-95-2	>100,000	N
	Phthalic acid	88-99-3	>100,000	N
	Pyridine	110-86-1	1,400	N
	Thiophenol	108-98-5	NE	--
	Tentatively Identified Compounds (TICs)		NE	--
Volatile Organic Compounds	1,1,1,2-Tetrachloroethane	630-20-6	220	C
	1,1,1-Trichloroethane	71-55-6	>100,000	N
	1,1,2,2-Tetrachloroethane	79-34-5	28	C
	1,1,2-Trichloroethane	79-00-5	64	C
	1,1-Dichloroethane	75-34-3	26,000	N
	1,1-Dichloroethene	75-35-4	3,900	N
	1,1-Dichloropropene	563-58-6	NE	--
	1,2,3-Trichlorobenzene	87-61-6	NE	--
	1,2,3-Trichloropropane	96-18-4	13	C

TABLE 1
PRELIMINARY RECREATIONAL RISK-BASED SCREENING LEVELS (RBSLs)
(Page 7 of 8)

Parameter of Interest	Compound List	CAS Number	Recreational RBSL	
			mg/kg or pCi/g	Basis
Volatile Organic Compounds (Continued)	1,2,4-Trichlorobenzene	120-82-1	2,100	N
	1,2,4-Trimethylbenzene	95-63-6	270	N
	1,2-Dichlorobenzene	95-50-1	3,800	N
	1,2-Dichloroethane	107-06-2	27	C
	1,2-Dichloropropane	78-87-5	28	C
	1,3,5-Trichlorobenzene	108-70-3	NE	--
	1,3,5-Trimethylbenzene	108-67-8	650	N
	1,3-Dichlorobenzene	541-73-1	1,100	N
	1,3-Dichloropropane	142-28-9	3,200	N
	1,4-Dichlorobenzene	106-46-7	230	C
	2,2-Dichloropropane	594-20-7	NE	--
	2,2-Dimethylpentane	590-35-2	NE	--
	2,2,3-Trimethylbutane	464-06-2	NE	--
	2,3-Dimethylpentane	565-59-3	NE	--
	2,4-Dimethylpentane	108-08-7	NE	--
	2-Chlorotoluene	95-49-8	4,700	N
	2-Hexanone	591-78-6	NE	--
	2-Methylhexane	591-76-4	NE	--
	2-Nitropropane	79-46-9	2.8	C
	3,3-Dimethylpentane	562-49-2	NE	--
	3-Ethylpentane	617-78-7	NE	--
	3-Methylhexane	589-34-4	NE	--
	4-Chlorotoluene	106-43-4	NE	--
	4-Methyl-2-pentanone (MIBK)	108-10-1	>100,000	N
	Acetone	67-64-1	>100,000	N
	Acetonitrile	75-05-8	18,000	N
	Benzene	71-43-2	51	C
	Bromobenzene	108-86-1	960	N
	Bromodichloromethane	75-27-4	79	C
	Bromoform	75-25-2	2,000	C
	Bromomethane	74-83-9	120	N
	Carbon disulfide	75-15-0	11,000	N
	Carbon tetrachloride	56-23-5	19	C
	Chlorobenzene	108-90-7	3,800	N
	Chlorobromomethane	74-97-5	NE	--
	Chlorodibromomethane	124-48-1	73	C
	Chloroethane	75-00-3	240	C
	Chloroform	67-66-3	20	C
	Chloromethane	74-87-3	1,500	N
	cis-1,2-Dichloroethene	156-59-2	1,300	N
	cis-1,3-Dichloropropene	10061-01-5	51	C
	Cymene (Isopropyltoluene)	99-87-6	NE	--
	Dibromochloroethane	73506-94-2	NE	--
	Dibromochloropropane	96-12-8	0.67	C
	Dibromomethane	74-95-3	4,200	N
	Dichloromethane (Methylene chloride)	75-09-2	650	C
	Dimethyldisulfide	624-92-0	NE	--
	Ethanol	64-17-5	NE	--
	Ethylbenzene	100-41-4	46,000	N
	Freon-11 (Trichlorofluoromethane)	75-69-4	12,000	N
	Freon-113 (1,1,2-Trifluoro-1,2,2-trichloroethane)	76-13-1	>100,000	N
	Freon-12 (Dichlorodifluoromethane)	75-71-8	2,900	N

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Parameter of Interest	Compound List	CAS Number	Recreational RBSL	
			mg/kg or pCi/g	Basis
Volatile Organic Compounds (Continued)	Heptane	142-82-5	NE	--
	Isoheptane	31394-54-4	NE	--
	Isopropylbenzene	98-82-8	4,700	N
	m,p-Xylene	mp-XYL	5,800	N
	Methyl ethyl ketone (2-Butanone)	78-93-3	>100,000	N
	Methyl iodide	74-88-4	NE	--
	MTBE (Methyl tert-butyl ether)	1634-04-4	2,400	C
	n-Butylbenzene	104-51-8	4,200	N
	n-Propylbenzene	103-65-1	4,200	N
	Nonanal	124-19-6	NE	--
	o-Xylene	95-47-6	>100,000	N
	sec-Butylbenzene	135-98-8	3,300	N
	Styrene	100-42-5	>100,000	N
	tert-Butylbenzene	98-06-6	3,900	N
	Tetrachloroethene	127-18-4	31	C
	Toluene	108-88-3	>100,000	N
	trans-1,2-Dichloroethene	156-60-5	1,600	N
	trans-1,3-Dichloropropene	10061-02-6	51	C
	Trichloroethene	79-01-6	190	C
	Vinyl acetate	108-05-4	13,000	N
	Vinyl chloride	75-01-4	18	C
	Xylenes (total)	1330-20-7	5,800	N
	Tentatively Identified Compounds (TICs)		NE	--
Water Quality Parameters	Conductivity	COND	NE	--
	Hardness, total	Hardness	NE	--
	Total dissolved solids	TDS	NE	--
	Total suspended solids	TSS	NE	--
	Alkalinity, Total (as $CACO_3$)	ALK	NE	--
	Bicarbonate alkalinity	71-52-3	NE	--
	Carbonate alkalinity	3812-32-6	NE	--
	Hydroxide alkalinity	OH-ALK	NE	--
Flashpoint	Flammables	NA	NE	--
Total Petroleum Hydrocarbons	Diesel	64742-46-7	NE	--
	Mineral Spirits	8006-61-9	NE	--
	Gasoline	68153-81-1	NE	--
	Oil/Grease	NA	NE	--
White Phosphorus	White phosphorus	12185-10-3	45	N
Methyl Mercury	Methyl mercury	22967-92-6	140	N

Note: RBSLs are based methods and exposure factors in Chapter 9 of the BRC Closure Plan (BRC *et al* . 2007), using the most recent toxicity criteria. RBSLs are the lower of either non-cancer (HI equals 1.0) or cancer (1×10^{-6}) risks for each receptor and each compound (see text).

Basis: C = carcinogenicity; N = non-carcinogenicity.

NE = Not established (no toxicity criteria available or see text).