



TABLES



TABLE 1 SEPP PREVENTION AND MANAGEMENT OF CONTAMINATION OF LAND – PROTECTED BENEFICIAL USES OF LAND

Beneficial use	Land Use						
	Parks & Reserves	Agricultural	Sensitive Use		Recreation / Open space	Commercial	Industrial
			High density	Other			
Maintenance of ecosystems							
Natural ecosystems	<input type="checkbox"/>						
Modified ecosystems	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		
Highly modified ecosystems		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Human Health	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Buildings & structures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Aesthetics	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Production of food, flora and fibre	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>			

TABLE 2 BASIS FOR ASSESSMENT OF LAND

Beneficial use	Indicators	Relevant Guidelines
Maintenance of modified Ecosystems	Concentration of contaminants of concern	Interim Urban Ecological Investigation levels (EILs) nominated in Schedule B(1) of the NEPM (1999) Assessment of Site Contamination Guidelines act as Tier 1 criteria.
Human Health	Concentration of contaminants of concern	Health Based Investigation Levels (HILs) for the relevant land use as nominated in Schedule B(1) of the NEPM (1999) Assessment of Site Contamination Guidelines act as Tier 1 criteria.
Buildings and Structures	pH, sulfate, redox potential, salinity or other substance	Contamination must not cause the land to be corrosive to or adversely affect the integrity of structures or building materials (AS3600;2009)
Aesthetics	Any contaminant that may be offensive to the senses	Contamination must not cause the land to be offensive to the senses of human beings
Production of food, flora and fibre	Concentration of contaminants of concern	Interim Urban Ecological Investigation levels (EILs) nominated in Schedule B(1) of the NEPM (1999) Assessment of Site Contamination Guidelines act as Tier 1 criteria. Contamination must not adversely affect produce quality or yield, affect the level of any indicator in food, flora or fibre such that the level is greater than that specified by the <i>Australian and New Zealand Food Authority Food Standards Code</i>



TABLE 3 SOIL SAMPLING RATIONALE

Sampling Location	Strategy	Sampling rationale
TP1	Grid-based /Targeted	Existing capping layer investigation and historic location of tanks.
TP2-4	Grid-based	Existing capping layer investigation.
TP5-6	Grid-based	Existing capping layer investigation.
TP7	Grid-based /Targeted	Existing capping layer investigation and historic location of tar tank
TP8-10	Grid-based	Existing capping layer investigation
TP11	Grid-based /Targeted	Existing capping layer investigation and historic location of liquor well.
TP12	Grid-based	Existing capping layer investigation
TP13-16	Grid-based	Existing capping layer investigation.
TP17-19	Grid-based /Targeted	Existing capping layer investigation and groundwater wells in this area suggest NAPL may be present (i.e. potential source of contamination for GW24 and GW42) and previous reports of tar and tar staining noted during installation of GW17 (TP18).
TP20-TP26	Grid-based	Existing capping layer investigation.
BH1	Grid-based	Existing capping layer investigation.
BH2	Grid-based /Targeted	Existing capping layer investigation and historic location of separation tank (i.e. tar).
BH3-BH4	Grid-based	Existing capping layer investigation
BH5	Grid-based /Targeted	Existing capping layer investigation and historic location of tar tank, potential source of GW contamination in GW44
BH6	Grid-based	Existing capping layer investigation
BH7	Grid-based /Targeted	Existing capping layer investigation and historic location of liquor tank, potential source of GW contamination in GW44.
BH8-BH11. BH13	Grid-based	Existing capping layer investigation, borehole used due to access constraints
BH14	Grid-based /Targeted	Existing capping layer investigation and reports of tar and tar staining noted at groundwater wells GW17 and GW23 (based on previous assessments).
BH15	Grid-based /Targeted	Existing capping layer investigation and potential of NAPL below buildings.
BH16	Grid-based	Existing capping layer investigation

TABLE 4 SOUTH PORT COMMUNITY NURSING HOME SOIL RESULTS

Analyte	Units	LOR	BH1	BH1	BH1	BH2	BH2	BH2	BH3	BH3	BH3	BH4	BH4	BH4	BH5	BH5	Guidelines	
																	NEPM [A] HIL	NEPM EIL
Depth	m	-	0.0 - 0.1	0.3-0.4	1-1.1	0.0 - 0.1	0.2-0.3	0.9-1	0.0 - 0.1	0.2-0.3	0.6-0.7	0.0 - 0.1	0.2-0.3	0.6-0.7	0.0 - 0.1	0.2-0.3		
Cap/Gasworks/Natural	-	-	Cap	Cap	Gasworks	Cap	Gasworks	Gasworks	Cap	Gasworks	Gasworks	Cap	Gasworks	Gasworks	Cap	Gasworks		
Field pH Value	pH Unit	0.1	6.5	8.0	8.0	7.0	6.5	6.0	6.0	6.0	6.5	6	6.5	6.0	6.5	8.0		
Field PID Reading			-	-	-	-	26	13	-	-	-	-	27	12	-	18		
Heavy Metals																		
Arsenic (As)	mg/kg	5	<5	16	<5	8	<5	<5	22	<5	<5	7	136	63	<5	45	100	20
Cadmium (Cd)	mg/kg	1	<1	<1	<1	<1	<1	<1	1	<1	<1	<1	1	<1	<1	<1	20	3
Total Chromium (Cr)	mg/kg	2	10	26	17	16	3	5	56	8	31	14	95	113	8	15	12,000	400
Copper (Cu)	mg/kg	5	14	15	<5	24	<5	<5	38	<5	18	24	456	56	18	<5	1,000	100
Lead (Pb)	mg/kg	5	17	36	5	102	27	<5	136	686	10	137	466	332	76	11	300	600
Nickel (Ni)	mg/kg	2	24	27	2	15	6	<2	48	10	28	8	42	39	6	5	600	60
Zinc (Zn)	mg/kg	5	36	78	9	120	33	17	124	84	16	122	54	56	91	14	7,000	200
Mercury (Hg)	mg/kg	0.1	<0.1	<0.1	<0.1	0.6	<0.1	<0.1	1.4	<0.1	<0.1	<0.1	5.5	5.9	<0.1	<0.1	15	1
Polycyclic Aromatic Hydrocarbons (PAH)																		
Benzo(a)pyrene (BaP)	mg/kg	0.5	1.5	7	1.1	5.7	19.8	<0.5	3.9	22.2	3.1	1.2	3.6	27.1	<0.5	78.9	1	
Naphthalene		0.5	0.5	1.2	<0.5	0.7	0.8	<0.5	<0.5	1.8	0.6	<0.5	0.8	1.7	<0.5	22.9	5.0 ^A /1,440 ^B	
Total PAH	mg/kg	0.5	19	98	15	60	217	<0.5	56	249	37	10	61	277	19	1,158	20	
Monocyclic Aromatic Hydrocarbons (MAH)																		
Benzene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	1.2 ^A /99.1 ^B	
Toluene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	4500 ^A	
Ethylbenzene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	480 ^A	
Total Xylene	mg/kg	0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	110 ^A	
Total Recoverable Hydrocarbons (all aromatic)																		
C ₆ – C ₁₀ Fraction	mg/kg	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	33/1,680 ^B	
>C ₁₀ – C ₁₆ Fraction	mg/kg	50	<50	<50	<50	<50	<50	<50	130	<50	<50	<50	480	310	<50	210	285/1,680 ^B	
>C ₁₆ – C ₃₄ Fraction	mg/kg	100	250	1,080	110	330	960	<100	620	1,160	210	<100	1,410	4,880	<100	4,360	1260 ^B	
>C ₃₄ – C ₄₀ Fraction	mg/kg	100	<100	210	<100	150	300	<100	210	390	140	<100	280	1,640	<100	950	1,260 ^B	
Total Cyanide (CN)	mg/kg	1	-	3	-	-	11	-	-	69	40	-	676	-	-	9	500	
Phenol	mg/kg	0.5	<0.5	19	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	3.5	8,500	
Total phenolics																		
Ammonia	mg/kg	20	-	-	-	-	-	-	-	-	-	-	-	50	-	-		
Sulfate (NEPM)	mg/kg	50	-	-	-	-	120	50	-	-	7,260	-	-	15,500	<50	<50		2000
Total sulfate			-	-	-	-	160	<100	-	-	24,600	-	-	162,000	180	<100		
Sulfide (total)	mg/kg	100					600	<100			<100			2,400	200			
Calculated in-organic Sulfide	mg/kg	-	-	-	-	-	544	-	-	-	-	-	-	-	226	-		600

TABLE 4 SOUTH PORT COMMUNITY NURSING HOME SOIL RESULTS (CONTINUED)

Analyte	Units	LOR	BH5	BH6	BH6	BH6	BH7	BH7	BH7	BH8	BH8	BH8	BH9	BH9	BH9	Guidelines	
																NEPM [A] HIL	NEPM EIL
Depth	m	-	0.6-0.7	0.0 0.1	0.3-0.4	1.7-1.8	0.0 0.1	0.3-0.4	0.6-0.7	0.0 0.1	0.3-0.4	1.4-1.5	0.2-0.3	0.9-1.0	1.4-1.5		
Cap/Gasworks/Natural	-	-	Gasworks	Cap	Gasworks	Natural	Cap	Gasworks	Gasworks	Cap	Gasworks	Natural	Cap	Natural	Natural		
Field pH Value	pH Unit	0.1	8.0	6.0	6.5	4	6.5	7.5	8.0	6.5	8.0	4.0	8.0	6.0	4.0		
Field PID Reading			-	-	-	-	-	-	-	-	20.0	14	23	9.5	22		
Heavy Metals																	
Arsenic (As)	mg/kg	5	13	6	<u>28</u>	20	6	10	<5	6	7	15	5	11	10	100	20
Cadmium (Cd)	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	20	3
Total Chromium (Cr)	mg/kg	2	105	10	8	21	9	10	7	12	8	5	15	19	7	12,000	400
Copper (Cu)	mg/kg	5	52	49	<u>245</u>	<u>340</u>	14	14	<5	29	16	<5	23	6	<5	1,000	100
Lead (Pb)	mg/kg	5	91	88	43	11	70	64	6	72	69	<5	144	8	<5	300	600
Nickel (Ni)	mg/kg	2	<u>70</u>	20	8	26	13	18	4	12	14	<2	60	5	4	600	60
Zinc (Zn)	mg/kg	5	44	73	17	84	84	70	7	92	81	10	117	44	46	7,000	200
Mercury (Hg)	mg/kg	0.1	<u>1.5</u>	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	15	1
Polycyclic Aromatic Hydrocarbons (PAH)																	
Benz(a)pyrene (BaP)	mg/kg	0.5	20.2	2.4	<0.5	<0.5	1.6	13.2	60.9	97.6	2.3	<0.5	7.8	<0.5	<0.5	1	
Naphthalene		0.5	4.5	<0.5	<0.5	<0.5	<0.5	0.9	7	28.9	<0.5	<0.5	<0.5	<0.5	<0.5	5.0 ^A /1,400 ^B	
Total PAH	mg/kg	0.5	260	27	1	<0.5	14	175	813	1,744	35	<0.5	87	<0.5	<0.5	20	
Monocyclic Aromatic Hydrocarbons (MAH)																	
Benzene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	1.2 ^A /99.1 ^B	
Ethylbenzene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	4500 ^A	
Toluene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	480 ^A	
Total Xylene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	110 ^A	
Total Recoverable Hydrocarbons (all aromatic)																	
C ₆ – C ₁₀ Fraction	mg/kg	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	33/1,680 ^B	
>C ₁₀ – C ₁₆ Fraction	mg/kg	50	300	<50	<50	<50	<50	60	<50	330	<50	<50	<50	<50	<50	285/1,680 ^B	
>C ₁₆ – C ₃₄ Fraction	mg/kg	100	2,690	240	<100	<100	140	1,320	240	4,390	170	<100	410	<100	<100	1260 ^B	
>C ₃₄ – C ₄₀ Fraction	mg/kg	100	820	140	<100	<100	<100	410	<100	820	<100	<100	120	<100	<100	1,260 ^B	
Total CN	mg/kg	1	540	-	247	7	-	3	1	-	5	-	-	1	-	500	
Phenol	mg/kg	0.5	0.6	<0.5	<0.5	<0.5	<0.5	0.9	1.8	1.6	<0.5	<0.5	<0.5	<0.5	<0.5	8,500	
Total phenolics																	
Ammonia	mg/kg	20	<20	-	-	-	-	-	<20	-	-	<20	-	-	-		
Sulfate (NEPM)	mg/kg	50	<u>2,280</u>	-	-	-	-	<50	<50	-	-	<50	-	-	-		2000
Total sulfate			<u>11,800</u>	-	-	-	-	<100	<100	-	-	<100	-	-	-		
Sulfide (total)	mg/kg	100	<u>7,400</u>					500	100			<100					
Calculated in-organic Sulfide	mg/kg	-	<u>6,963</u>	-	-	-	-	-	-	-	-	-	-	-	-		600

Notes:

- LOR = Level of reporting;
- = Not analysed;
- Shaded = exceeds health based criteria; Underline = exceeds ecological based criteria;
- A** = CRC CARE Technical Report 10 (2011) – HSL-A Soil Health Screening Levels derived from Vapour Intrusion and Direct Contact (Tables 3 and 4) The lowest value for each chemical of concern has been adopted
- B** = Using CRC Care Risk Based Criteria Model – modified SSTL (direct contact only)
- NEPM (A) HIL = National Environmental Protection Council (1999) – National Environmental Protection (Assessment of Site Contamination) – Health based soil investigation guidelines ‘Standard’ residential with garden/accessible soil; and
- NEPM EIL = National Environmental Protection Council (1999) – National Environmental Protection (Assessment of Site Contamination) – Ecological based soil investigation guidelines.

TABLE 5 GASWORKS PARK SOIL RESULTS

Analyte	Units	LOR	BH10	BH10	BH10	BH11	BH11	BH13	BH13	BH13	BH13	BH13	BH14	BH14	BH14	BH14	BH15	BH15	Guidelines	
																			NEPM [E] HIL	NEPM EIL
Depth	m	-	0.2-0.3	1-1.1	1.6-1.7	0.5-0.6	1.3-1.4	0.0 – 0.1	0.1-0.2	0.3-0.4	0.6-0.7	1.1-1.3	0.05-0.15	0.4-0.5	0.7-0.8	1.3-1.4	0.0 – 0.1	0.4-0.5		
Cap/Gasworks/Natural	-	-	Cap	Cap	Gasworks	Gasworks	Gasworks	Cap	Gasworks	Gasworks	Gasworks	Gasworks	Cap	Gasworks	Gasworks	Gasworks	Cap	Gasworks		
Field pH Value	pH Unit	0.1	7.5	8.0	8.5															
Field PID Reading			-	10.2	6.6															
Heavy Metals																				
Arsenic (As)	mg/kg	5	25	13	<5	<5	<5	<5	5	<5	26	12	7	22	23	13	6	<5	200	20
Cadmium (Cd)	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	40	3
Total Chromium (Cr)	mg/kg	2	19	12	7	<2	<2	2	36	17	17	13	16	116	112	123	2	4	240,000	400
Copper (Cu)	mg/kg	5	<5	<5	<5	<5	<5	6	20	9	13	18	22	14	24	7	<5	8	2,000	100
Lead (Pb)	mg/kg	5	21	9	<5	<5	<5	10	41	15	146	84	126	484	273	95	<5	40	600	600
Nickel (Ni)	mg/kg	2	10	6	3	4	<2	3	29	13	15	15	14	68	67	26	<2	6	600	60
Zinc (Zn)	mg/kg	5	17	7	<5	<5	<5	16	87	30	124	59	58	293	233	110	6	42	14,000	200
Mercury (Hg)	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.4	<0.1	0.8	0.3	0.2	3.8	1.3	0.5	<0.1	0.2	30	1
Polycyclic Aromatic Hydrocarbons																				
Benzo(a)pyrene (BaP)	mg/kg	0.5	9.2	1.7	0.6	1,040	<0.5	3.1	3.2	1.2	29.8	157	17.8	128	194	104	<0.5	16.9	2	
Naphthalene	mg/kg	0.5	2.4	<0.5	<0.5	6,600	0.8	1.2	<0.5	<0.5	4.3	22.7	2	24.9	30.2	69.3	<0.5	1	1,900 ^A	
Total PAH	mg/kg	0.5	118	19	5	28,597	1	41	35	15	379	2,400	232	1,570	2,854	1,441	<8.0	169	40	
Monocyclic Aromatic Hydrocarbons																				
Benzene	mg/kg	0.2	<0.2	<0.2	<0.2	13.7	<0.2	<0.2	<0.2	<0.2	<0.2	0.3	<0.2	0.2	0.3	0.5	<0.2	<0.2	122 ^B	
Ethylbenzene	mg/kg	0.5	<0.5	<0.5	<0.5	1.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	5,300 ^A	
Toluene	mg/kg	0.5	<0.5	<0.5	<0.5	10.4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	18,000 ^A	
Total Xylene	mg/kg	0.5	<0.5	<0.5	<0.5	24.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.9	<0.5	<0.5	15,000 ^A	
Total Recoverable Hydrocarbons																				
C ₆ – C ₁₀ Fraction	mg/kg	10	<10	<10	<10	67	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	1,980 ^B	
>C ₁₀ – C ₁₆ Fraction	mg/kg	50	<50	<50	<50	7,320	<50	<50	<50	<50	80	410	<50	570	580	580	<50	<50	1980 ^B	
>C ₁₆ – C ₃₄ Fraction	mg/kg	100	540	120	<100	24,100	<100	220	250	110	1,610	9,450	1,000	7,910	11,800	7,240	<100	790	1490 ^B	
>C ₃₄ – C ₄₀ Fraction	mg/kg	100	170	<100	<100	3,770	<100	<100	190	<100	440	2,090	300	1,970	2,910	1,740	<100	250	1,490 ^B	
Total CN	mg/kg	1	45	-	-	-	-	-	4	1	-	-	-	763	-	-	-	8	1,000	
Phenol	mg/kg	0.5	<0.5	<0.5	<0.5	702	<0.5	<0.5	<0.5	<0.5	0.7	<2.5	<0.5	2.6	<2.5	4.1	<0.5	<0.5	17,000	
Total Phenolics																				
Ammonia	mg/kg	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Sulfate (NEPM)	mg/kg	50	<50	-	-	-	-	-	-	<50	-	-	<50	-	-	-	-	-		2000
Total sulfate			560	-	-	-	-	-	-	<100	-	-	530	-	-	-	-	-		
Sulfide (total)		100	<100							<100			800							
Calculated inorganic Sulfide	mg/kg	-	-	-	-	-	-	-	-	-	-	-	815	-	-	-	-	-		600

TABLE 5 GASWORKS PARK SOIL RESULTS (CONTINUED)

Analyte	Units	LOR	BH15	BH16	BH16	TP1	TP1	TP1	TP2	TP2	TP2	TP3	TP3	TP3	TP4	TP4	TP4	TP5	TP5	Guidelines	
																				NEPM [E] HIL	NEPM EIL
Depth	m	-	0.8-0.9	0.2-0.3	0.7-0.8	0.0 – 0.1	0.3-0.35	0.35-0.4	0.0 – 0.1	0.95-1.0	1.5-1.6	0.0 – 0.1	0.3	1.4	0.0 – 0.1	0.25-0.3	0.5	0.0 – 0.1	0.8		
Cap/Gasworks/Natural	-	-	Gasworks	Cap	Gasworks	Cap	Gasworks	Gasworks	Cap	Gasworks	Natural	Cap	Cap	Natural	Cap	Cap	Gasworks	Cap	Gasworks		
Field pH Value	pH Unit	0.1				8.0	7.5	8.5	8.3	9.0	9.0	6.0	-	9.5	7.0	7.4	8.0	6.5	8.5		
Field PID Reading						-	-	-	53.3	47	-	3.6	-	10.3	3.0	5.0	13	2.8	1.5		
Heavy Metals																					
Arsenic (As)	mg/kg	5	<u>25</u>	16	<u>26</u>	<5	<5	10	16	18	5	<5	<5	<5	9	<u>43</u>	14	9	-	200	20
Cadmium (Cd)	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	40	3
Total Chromium (Cr)	mg/kg	2	6	13	14	5	18	17	12	8	<2	22	8	<2	11	12	9	7	-	240,000	400
Copper (Cu)	mg/kg	5	<5	22	12	5	30	21	18	20	<5	14	6	<5	8	<5	31	6	-	2,000	100
Lead (Pb)	mg/kg	5	12	87	90	5	8	11	56	45	<5	18	16	<5	23	12	446	26	-	600	600
Nickel (Ni)	mg/kg	2	5	14	27	17	<u>96</u>	36	10	5	<2	17	4	<2	8	4	21	5	-	600	60
Zinc (Zn)	mg/kg	5	30	<u>285</u>	<u>556</u>	17	38	20	108	141	<5	54	17	<5	38	17	<u>257</u>	28	-	14,000	200
Mercury (Hg)	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.6	<0.1	-	30	1
Polycyclic Aromatic Hydrocarbons																					
Benzo(a)pyrene (BaP)	mg/kg	0.5	416	15.8	33.4	<0.5	<0.5	<0.5	14.2	103	<0.5	<0.5	<0.5	<0.5	2.5	2.3	20.4	2	108	2	
Naphthalene	mg/kg	0.5	527	2.8	2.6	<0.5	<0.5	<0.5	0.7	9.7	<0.5	<0.5	0.6	<0.5	<0.5	0.7	6.5	<0.5	<5	1,900 ^A	
Total PAH	mg/kg	0.5	7,729	205	417	<0.5	<0.5	1	143	1,172	<0.5	<0.5	7	<0.5	29	26	242	21	898	40	
Monocyclic Aromatic Hydrocarbons																					
Benzene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	5.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	120 ^A 122 ^B	100
Ethylbenzene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	5,300 ^A	14,000
Toluene	mg/kg	0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	18,000 ^A	4,500
Total Xylene	mg/kg	0.5	12.9	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	0.8	0	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	15,000 ^A	12,000
Total Recoverable Hydrocarbons																					
C ₆ – C ₁₀ Fraction	mg/kg	10	20	<10	<10	<10	<10	<10	<10	12	<10	<10	<10	<10	<10	<10	<10	<10	<10	1,980 ^B	4,400
>C ₁₀ – C ₁₆ Fraction	mg/kg	50	2,030	<50	60	<50	<50	<50	<50	130	<50	<50	<50	<50	<50	80	90	<50	130	1980 ^B	
>C ₁₆ – C ₃₄ Fraction	mg/kg	100	14,700	700	2,400	<100	<100	130	570	3,490	<150	<250	<200	<100	200	<100	1030	<100	3,780	1490 ^B	
>C ₃₄ – C ₄₀ Fraction	mg/kg	100	2,420	180	640	<100	<100	<100	170	860	<150	<250	<150	<100	<100	<100	310	<100	1,140	1,490 ^B	
Total CN	mg/kg	1	-	3	-	-	<1	-	3	-	-	-	2	-	-	<1	-	-	-	1,000	
Phenol	mg/kg	0.5	7.4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	17,000	
Total Phenolics																					
Ammonia	mg/kg	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Sulfate (NEPM)	mg/kg	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		2000
Total sulfate			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Sulfide	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		600

TABLE 5 GASWORKS PARK SOIL RESULTS (CONTINUED)

Analyte	Units	LOR	TP5	TP6	TP6	TP6	TP7	TP7	TP7	TP7	TP8	TP8	TP9	TP9	TP9	TP10	TP10	TP10	Guidelines	
																			NEPM [E] HIL	NEPM EIL
Depth	m	-	1.8	0.0 – 0.1	0.25-0.3	1.75-1.8	0.0 – 0.1	0.3-0.4	1.75-1.8	2.9-3	0.0 – 0.1	0.6-0.7	0.0 – 0.1	0.4-0.5	0.7-0.8	0.0 – 0.1	0.5-0.6	1.0-1.1		
Cap/Gasworks/Natural			Natural	Cap	Cap	Gasworks	Cap	Gasworks	Gasworks	Gasworks	Cap	Natural	Cap	Gasworks	Gasworks	Cap	Gasworks	Gasworks		
Field pH Value	pH Unit	0.1	7.5	6.5	8.0	8	8.5	8.5	-		8.0	8.0	7.5	8.5	8.0	7.5	7.0	7.0		
Field PID Reading			4.5	0.4	1.5	0.8	4.2	-	138		16	0.8	14	37	24	-	320?	110		
Heavy Metals																				
Arsenic (As)	mg/kg	5	<5	<5	23	13	<5	19	9	-	6	28	<5	54	10	5	12	26	200	20
Cadmium (Cd)	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1	<1	<1	40	3
Total Chromium (Cr)	mg/kg	2	4	16	15	11	7	32	55	-	29	11	6	17	8	14	19	51	240,000	400
Copper (Cu)	mg/kg	5	<5	8	14	20	6	24	36	-	113	<5	14	<5	20	18	13	50	2,000	100
Lead (Pb)	mg/kg	5	<5	19	58	64	85	633	153	-	222	6	42	8	148	56	303	537	600	600
Nickel (Ni)	mg/kg	2	<2	12	11	27	4	25	22	-	47	3	4	4	9	15	16	41	600	60
Zinc (Zn)	mg/kg	5	15	33	58	211	43	238	68	-	132	6	38	6	150	78	135	251	14,000	200
Mercury (Hg)	mg/kg	0.1	<0.1	<0.1	<0.1	0.8	0.1	1.9	0.6	-	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	0.3	1	30	1
Polycyclic Aromatic Hydrocarbons																				
Benzo(a)pyrene (BaP)	mg/kg	0.5	<0.5	2.2	12.8	42.4	21.4	41.5	570	<0.5	3.8	<0.5	0.8	<0.5	31.4	0.8	38.5	83.4	2	
Naphthalene	mg/kg	0.5	<0.5	<0.5	6.3	<5	<5	5.2	2,440	<0.5	<0.5	<0.5	<0.5	<0.5	5.5	<0.5	7.4	63.6	1,900 ^A	
Total PAH	mg/kg	0.5	<8	24	158	472	243	402	13,486	2	39	5	9	2	336	8	459	1,366	40	
Monocyclic Aromatic Hydrocarbons																				
Benzene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	21.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	1.1	120 ^A 122 ^B	100
Ethylbenzene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	3.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	5,300 ^A	14,000
Toluene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	18.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.1	18,000 ^A	4,500
Total Xylene	mg/kg	0.5	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	23.4	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	0.8	15,000 ^A	12,000
Total Recoverable Hydrocarbons																				
C ₆ – C ₁₀ Fraction	mg/kg	10	<10	<10	<10	<10	<10	<10	83	<10	<10	<10	<10	<10	<10	<10	<10	<10	1,980 ^B	4,400
>C ₁₀ – C ₁₆ Fraction	mg/kg	50	<50	<50	<50	100	70	120	8,230	<50	<50	<50	<50	<50	<50	<50	<50	300	1980 ^B	
>C ₁₆ – C ₃₄ Fraction	mg/kg	100	<200	<250	520	1,790	1,150	2,230	29,500	<120	180	<100	100	<100	1,520	<150	2,000	3,710	1490 ^B	
>C ₃₄ – C ₄₀ Fraction	mg/kg	100	<250	<200	200	520	440	830	4,460	<200	<200	<150	<150	<100	510	210	700	1,080	1,490 ^B	
Total CN	mg/kg	1	-	-	1	-	-	176	252	-	-	<1	-	-	-	-	-	198	1,000	
Phenol	mg/kg	0.5	<0.5	<0.5	0.5	<5	<5	0.6	68.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	3.6	17,000	
Total phenolics																				
Ammonia	mg/kg	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Sulfate (NEPM)	mg/kg	50	-	-	-	-	-	-	6,170	-	-	90	-	-	-	-	-	-		2000
Total sulfate			-	-	-	-	-	-	16,200	-	-	-	-	-	-	-	-	-		
Sulfide (total)	mg/kg	100							5,100											
Calculated inorganic Sulfide	mg/kg	-	-	-	-	-	-	-	3,784	-	-	-	-	-	-	-	-	-		600

TABLE 5 GASWORKS PARK SOIL RESULTS (CONTINUED)

Analyte	Units	LOR	TP11	TP11	TP11	TP11	TP12	TP12	TP12	TP13	TP13	TP13	TP14	TP14/ DUP3	TP14	TP15	TP15	TP15	Guidelines	
																			NEPM [E] HIL	NEPM EIL
Depth	m	-	0.0 - 0.2	0.5-0.6	1.2-1.3	2-2.1	0.0 - 0.1	0.2-0.3	0.6-0.7	0.0 - 0.1	0.3-0.35	0.8-0.85	0.1-0.15	0.5-0.6	0.85-0.9	0.0 - 0.1	0.5-0.6	1.0-1.1		
Cap/Gasworks/Natural		-	Cap	Cap	Gasworks	Natural	Cap	Cap	Gasworks	Cap	Cap	Gasworks	Cap	Cap	Gasworks	Cap	Cap	Gasworks		
Field pH Value	pH Unit	0.1	6.5	8.0	5.0	6.0	6.5	8.0	8.0	6.0	8.0	8.0	7.5	8.5	6.5	5.0	6.0	8.0		
Field PID Reading			-	23	40	130	-	122	131	3.8	4.8	4.9	15	23.2	108	-	-	1.1		
Heavy Metals																				
Arsenic (As)	mg/kg	5	<5	<5	10	<5	5	5	15	<5	6	<5	<5	14	6	8	35	<5	200	20
Cadmium (Cd)	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	40	3
Total Chromium (Cr)	mg/kg	2	41	51	16	5	9	21	18	10	17	4	4	19	3	11	21	6	240,000	400
Copper (Cu)	mg/kg	5	14	17	19	<5	7	11	15	7	8	16	<5	<5	17	25	<5	20	2,000	100
Lead (Pb)	mg/kg	5	14	32	435	124	47	133	460	22	19	70	10	18	73	125	12	52	600	600
Nickel (Ni)	mg/kg	2	29	35	14	<2	6	16	14	7	14	38	<2	6	8	9	10	8	600	60
Zinc (Zn)	mg/kg	5	55	66	126	8	31	49	218	24	30	63	19	13	54	132	9	77	14,000	200
Mercury (Hg)	mg/kg	0.1	<0.1	<0.1	1.4	<0.1	<0.1	0.1	0.7	<0.1	<0.1	<0.1	<0.1	<0.1	0.4	0.2	<0.1	0.2	30	1
Polycyclic Aromatic Hydrocarbons																				
Benzo(a)pyrene (BaP)	mg/kg	0.5	<0.5	<0.5	35.4	1.5	2	17.1	36.3	0.6	16.2	189	<0.5	3.6	353	0.7	1.7	65.8	2	
Naphthalene	mg/kg	0.5	<0.5	<0.5	5.3	1.7	<0.5	1.7	4.2	<0.5	1.4	40.4	<0.5	1.5	117	<0.5	<0.5	9.4	1,900 ^A	
Total PAH	mg/kg	0.5	2	1	418	26	22	200	436	5	179	2,458	<0.5	75.6	7,045	6	20	679	40	
Monocyclic Aromatic Hydrocarbons																				
Benzene	mg/kg	0.2	<0.2	<0.2	0.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	1.8	<0.2	<0.2	<0.2	120 ^A 122 ^B	
Ethylbenzene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	5,300 ^A	
Toluene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.5	<0.5	<0.5	<0.5	18,000 ^A	
Total Xylene	mg/kg	0.5	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	1.2	<3.2	<3.2	<3.2	15,000 ^A	
Total Recoverable Hydrocarbons																				
C ₆ – C ₁₀ Fraction	mg/kg	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	13	<10	<10	<10	1,980 ^B	
>C ₁₀ – C ₁₆ Fraction	mg/kg	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	260	<50	<50	1,460	<50	<50	80	1980 ^B	
>C ₁₆ – C ₃₄ Fraction	mg/kg	100	<100	<100	1,640	<100	<100	790	1,840	<100	600	7,120	<100	<100	18,500	<100	<100	2,800	1490 ^B	
>C ₃₄ – C ₄₀ Fraction	mg/kg	100	<350	<150	540	<100	<100	230	560	<100	140	1,730	<120	<100	3,460	<100	<100	850	1,490 ^B	
Total CN	mg/kg	1	-	2	254	-	-	35	204	-	17	20	2	3	-	-	<1	-	1,000	
Phenol	mg/kg	0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	5.6	<0.5	<0.5	7.8	<0.5	<0.5	<5	17,000	
Total phenolics																				
Ammonia	mg/kg	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Sulfate (NEPM)	mg/kg	50	-	-	3410	270	-	<50	-	-	-	-	-	-	-	<50	-	-		2000
Total sulfate			-	-	6,710	240	-	390	-	-	-	-	-	-	-	230	-	-		
Sulfide (total)	,mg/kg	100			<100	700		500								<100				
Calculated in-organicSulfide	mg/kg	-	-	-	-	704	-	555	-	-	-	-	-	-	-	-	-	-		600

TABLE 5 GASWORKS PARK SOIL RESULTS (CONTINUED)

Analyte	Units	LOR	TP15	TP16	TP16	TP16	TP16	TP17	TP17	TP17	TP18	TP18	TP18	TP19	TP19	TP19	TP20	TP20	Guidelines	
																			NEPM [E] HIL	NEPM EIL
Depth	m	-	2.4-2.5	0.05-0.15	0.4-0.5	1-1.1	2-2.1	0.0 – 0.1	0.3-0.4	1.0-1.1	0.0 – 0.1	0.25-0.3	0.7-0.8	0.0-0.1	0.3-0.4	0.6-0.7	0.1-0.2	0.6-0.7		
Cap/Gasworks/Natural		-	Natural	Cap	Cap	Gasworks	Natural	Cap	Cap	Cap	Cap	Cap	Gasworks	Cap	Cap	Gasworks	Cap	Gasworks		
Field pH Value	pH Unit	0.1	4.5	5.5	8.0	9.0	4.5	6.5	6.5	4.5	6.5	7.5	6.0	7.0	7.0	5.5	7.5	4.5		
Field PID Reading			0.8	1.0	2.4	1.6	1.5	11	9.0	9.0	8.0	-	12	1.9	10	-	-	2.0		
Heavy Metals																				
Arsenic (As)	mg/kg	5	-	<5	7	12	-	<5	11	14	<5	17	<u>26</u>	<5	16	<5	<5	<5	200	20
Cadmium (Cd)	mg/kg	1	-	<1	<1	<1	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	40	3
Total Chromium (Cr)	mg/kg	2	-	7	6	4	-	2	12	35	7	16	11	<2	12	17	29	<2	240,000	400
Copper (Cu)	mg/kg	5	-	10	8	35	-	<5	67	24	10	20	<5	<5	19	26	12	<5	2,000	100
Lead (Pb)	mg/kg	5	-	49	48	399	-	11	161	254	30	64	<u>6720</u>	6	77	69	11	12	600	600
Nickel (Ni)	mg/kg	2	-	6	10	28	-	5	24	30	6	19	6	<2	11	25	26	<2	600	60
Zinc (Zn)	mg/kg	5	-	40	131	90	-	13	191	<u>232</u>	52	80	<u>312</u>	<5	66	36	42	<5	14,000	200
Mercury (Hg)	mg/kg	0.1	-	0.2	0.1	<0.1	-	<0.1	0.2	<u>1.6</u>	0.1	0.1	<u>1.2</u>	<0.1	0.2	0.2	<0.1	<0.1	30	1
Polycyclic Aromatic Hydrocarbons																				
Benzo(a)pyrene (BaP)	mg/kg	0.5	<0.5	12.3	21.1	32.8	<0.5	0.7	1.3	31.8	5.2	5.9	69.1	<0.5	5.7	<0.5	1.3	185	2	
Naphthalene	mg/kg	0.5	<0.5	1.8	2.9	2.2	<0.5	<0.5	<0.5	12.4	<0.5	<0.5	18.7	<0.5	0.7	<0.5	<0.5	24.2	1,900 ^A	
Total PAH	mg/kg	0.5	<0.5	152	248	275	<0.5	6	13	443	54	65	977	<0.5	75	3	21	2,194	40	
Monocyclic Aromatic Hydrocarbons																				
Benzene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	1	<0.2	<0.2	0.2	<0.2	<0.2	<0.2	<0.2	1.1	120 ^A 122 ^B	
Ethylbenzene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	5,300 ^A	
Toluene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.9	18,000 ^A	
Total Xylene	mg/kg	0.5	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	15,000 ^A	
Total Recoverable Hydrocarbons																				
C ₆ – C ₁₀ Fraction	mg/kg	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	1,980 ^B	
>C ₁₀ – C ₁₆ Fraction	mg/kg	50	<50	<50	<50	<50	<50	<50	<50	170	<50	<50	500	<50	<50	<50	<50	270	1980 ^B	
>C ₁₆ – C ₃₄ Fraction	mg/kg	100	<100	390	900	880	<100	<100	<100	2,240	580	240	4,820	<100	520	140	<100	7,380	1490 ^B	
>C ₃₄ – C ₄₀ Fraction	mg/kg	100	<100	<100	270	410	<100	<100	<100	1,060	570	<100	1,400	<100	280	<100	<100	1,930	1,490 ^B	
Total CN	mg/kg	1	-	-	-	17	-	-	6	-	-	24	-	-	-	154	-	199	1,000	
Phenol	mg/kg	0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	1	<0.5	<0.5	1.7	<0.5	<0.5	<0.5	<0.5	3.8	17,000	
Total phenolics																				
Ammonia	mg/kg	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Sulfate (NEPM)	mg/kg	50	-	<50	-	-	-	-	-	-	-	<50	<u>14,300</u>	-	-	-	-	1,710		2000
Total sulfate			-	520	-	-	-	-	-	-	-	410	<u>213,000</u>	-	-	-	-	3,130		
Sulfide (total)	mg/kg	100	-	100	-	-	-	-	-	-	-	200	<u><100</u>	-	-	-	-	3,200		
Calculated in-organic Sulfide	mg/kg	-	-	104	-	-	-	-	-	-	-	241		-	-	-	-	<u>3,061</u>		600

TABLE 5 GASWORKS PARK SOIL RESULTS (CONTINUED)

Analyte	Units	LOR	TP20	TP21	TP21	TP21	TP22	TP22	TP22	TP22	TP23	TP23	TP23	TP24	TP24	TP24	TP25	Guidelines	
																		NEPM [E] HIL	NEPM EIL
Depth	m	-	0.8-0.9	0.0 – 0.1	0.45-0.5	0.8-0.9	0.0 – 0.1	0.3-0.4	0.6-0.7	2.4-2.5	0.0 – 0.1	0.4-0.5	1-1.1	0.0-0.1	0.5-0.6	1.1-1.2	0.0-0.1		
Cap/Gasworks/Natural		-	Gasworks	Cap	Cap	Cap	Cap	Cap	Gasworks	Natural	Cap	Gasworks	Gasworks	Cap	Cap	Gasworks	Cap		
Field pH Value	pH Unit	0.1	4.5	7.5	8.0	8.0	6.5	7.5	8.5	-	7.5	8.0	8.5	6.5	8.0	7.5-8	8.0		
Field PID Reading			2.2	0.4	0.4	0.7	2.4	2.2	2.1	3.1	-	-	-	-	-	2.6	-		
Heavy Metals																			
Arsenic (As)	mg/kg	5	<u>30</u>	<5	<5	<u>23</u>	10	<u>63</u>	-	-	<5	16	16	<5	<u>40</u>	13	<5	200	20
Cadmium (Cd)	mg/kg	1	<1	<1	<1	<1	<1	<1	-	-	<1	<1	<1	<1	<1	<1	<1	40	3
Total Chromium (Cr)	mg/kg	2	<2	8	33	9	10	24	-	-	5	10	16	23	13	<2	7	240,000	400
Copper (Cu)	mg/kg	5	<5	18	11	<5	8	<5	-	-	7	16	<5	10	<5	<5	<5	2,000	100
Lead (Pb)	mg/kg	5	56	140	9	17	16	20	-	-	6	12	16	10	9	<5	11	600	600
Nickel (Ni)	mg/kg	2	3	10	24	5	8	9	-	-	19	4	8	19	5	3	3	600	60
Zinc (Zn)	mg/kg	5	89	77	37	26	52	43	-	-	19	8	11	34	<5	7	82	14,000	200
Mercury (Hg)	mg/kg	0.1	0.2	0.1	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	30	1
Polycyclic Aromatic Hydrocarbons																			
Benzo(a)pyrene (BaP)	mg/kg	0.5	82	0.9	<0.5	35.8	20.8	1.2	17.5	<0.5	<0.5	<0.5	1.1	<0.5	<0.5	161	<0.5	2	
Naphthalene	mg/kg	0.5	9.7	<0.5	<0.5	5.4	3	<0.5	0.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	5.8	<0.5	1,900 ^A	
Total PAH	mg/kg	0.5	2,351	12	<0.5	663	284	10	167	<0.5	<0.5	4	11	1	2	2,506	<0.5	40	
Monocyclic Aromatic Hydrocarbons																			
Benzene	mg/kg	0.2	0.3	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	120 ^A 122 ^B
Ethylbenzene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	5,300 ^A
Toluene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	18,000 ^A
Total Xylene	mg/kg	0.5	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	15,000 ^A
Total Recoverable Hydrocarbons																			
C ₆ – C ₁₀ Fraction	mg/kg	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	1,980 ^B
>C ₁₀ – C ₁₆ Fraction	mg/kg		1,230	<50	<50	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	230	<50	1980 ^B	
>C ₁₆ – C ₃₄ Fraction	mg/kg		12,700	<100	<100	2,000	140	<100	510	<100	<100	<100	100	<100	<100	8,610	<100	1490 ^B	
>C ₃₄ – C ₄₀ Fraction	mg/kg	50	3,570	<100	<100	430	<100	<100	170	150	100	<100	<100	<100	<100	1,940	110	1,490 ^B	
Total CN	mg/kg	1	4,240	-	44	-	-	<1	-	-	-	<1	-	-	2	-	-	1,000	
Phenol	mg/kg	0.5	3.2	<0.5	<0.5	0.5	0.8	<0.5	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	1.3	<0.5	17,000	
Total phenolics																			
Ammonia	mg/kg	20	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Sulfate (NEPM)	mg/kg	50	<u>2,900</u>	<50	60	-	-	-	-	-	-	-	-	-	-	-	-	-	2000
Total sulfate			<u>86,800</u>	800	200	-	-	-	-	-	-	-	-	-	-	-	-	-	
Sulfide (total)	mg/kg	100	<u>18,400</u>	<100	<100	-	-	-	-	-	-	-	-	-	-	-	-	-	
Calculated in-organic Sulfide	mg/kg	-	<u>5,848</u>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	600

TABLE 5 GASWORKS PARK SOIL RESULTS (CONTINUED)

Analyte	Units	LOR	TP25	TP25	TP26	TP26	TP26	TP26	GW38	GW37	GW39	Guidelines	
												NEPM [E] HIL	NEPM EIL
Depth	m	-	0.7-0.8	1.2-1.3	0.0-0.1	0.5-0.6	1.8-1.9	2.5-2.6	11.0-11.1	11.0-11.1	11.4-11.5		
Cap/Gasworks/Natural		-	Cap	Natural	Cap	Cap	Natural	Natural	Natural	Natural	Natural		
Field pH Value	pH Unit	0.1	7.5-8	6.0	8.0	8.0	8.0	6.5	-	-	-		
Field PID Reading			-	-	-	-	-	-	-	-	-		
Heavy Metals													
Arsenic (As)	mg/kg	5	5	<5	<5	17	<5	14	-	-	-	200	20
Cadmium (Cd)	mg/kg	1	<1	<1	<1	<1	<1	<1	-	-	-	40	3
Total Chromium (Cr)	mg/kg	2	16	<2	3	10	5	14	-	-	-	240,000	400
Copper (Cu)	mg/kg	5	<5	<5	<5	5	<5	<5	-	-	-	2,000	100
Lead (Pb)	mg/kg	5	20	<5	<5	19	<5	8	-	-	-	600	600
Nickel (Ni)	mg/kg	2	9	<2	6	7	6	9	-	-	-	600	60
Zinc (Zn)	mg/kg	5	12	<5	12	51	<5	<5	-	-	-	14,000	200
Mercury (Hg)	mg/kg	0.1	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	-	-	-	30	1
Polycyclic Aromatic Hydrocarbons													
Benzo(a)pyrene (BaP)	mg/kg	0.5	1.9	<0.5	<0.5	39.1	<0.5	<0.5	<0.5	<0.5	<0.5	2	
Naphthalene	mg/kg	0.5	0.6	<0.5	<0.5	11.6	1.5	<0.5	0.6	<0.5	<0.5	1,900 ^A	
Total PAH	mg/kg	0.5	24	<0.5	<0.5	597	5	8	<0.5	<0.5	<0.5	40	
Monocyclic Aromatic Hydrocarbons													
Benzene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	120 ^A 122 ^B	
Ethylbenzene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	5,300 ^A	
Toluene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	18,000 ^A	
Total Xylene	mg/kg	0.5	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	15,000 ^A	
Total Recoverable Hydrocarbons													
C ₆ – C ₁₀ Fraction	mg/kg	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	1,980 ^B	
>C ₁₀ – C ₁₆ Fraction	mg/kg		<50	<50	<50	70	<50	<50	<50	<50	<50	1980 ^B	
>C ₁₆ – C ₃₄ Fraction	mg/kg		<100	<100	<100	2,050	<100	<100	<100	<100	<100	1490 ^B	
>C ₃₄ – C ₄₀ Fraction	mg/kg	50	<100	<100	<100	600	<100	<100	<100	<100	<100	1,490 ^B	
Total CN	mg/kg	1	29	-	-	108	4	-				1,000	
Phenol	mg/kg	0.5	<0.5	<0.5	<0.5	1.8	<0.5	<0.5	-	-	-	17,000	
Total phenolics													
Ammonia	mg/kg	20	<20	-	-	<20	30	500	<20	510	410		
Sulfate (NEPM)	mg/kg	50	-	-	-	<50	610	-	-	-	-		2000
Total sulfate			-	-	-				-	-	-		
Sulfide (total)	mg/kg	100				300	1,200						
Calculated in-organic Sulfide	mg/kg	-	-	-	-	351	<u>1,203</u>	-	-	-	-		600

Notes:

- LOR = Level of reporting;
- = Not analysed;
- Shaded = exceeds health based criteria; Underline = exceeds ecological based criteria;
- A** = CRC CARE Technical Report 10 (2011) - HSL-C Soil Health Screening Levels for Vapour Exposure in Open Space and Direct Contact (Table 4) - Intrusive Maintenance Workers (IMW) and Commercial Occupants of buildings also considered;
- B** = Using CRC Care Risk Based Criteria Model – modified SSTL (direct contact only)
- NEPM (E) HIL = National Environmental Protection Council (1999) – National Environmental Protection (Assessment of Site Contamination) – Health based soil investigation guidelines 'Parks, recreational open space and playing fields'; and
- NEPM EIL = National Environmental Protection Council (1999) – National Environmental Protection (Assessment of Site Contamination) – Ecological based soil investigation guidelines.

TABLE 6 TPH SPECIATION RESULTS

Sample	TPH (C ₁₆ -C ₃₅)		TPH (C _{>35})	
	Aliphatic (mg/kg)	Aromatic (mg/kg)	Aliphatic (mg/kg)	Aromatic (mg/kg)
TP4 (0.5)	ND	690	ND	200
TP6 (0.25-0.3)	ND	810	ND	200
TP7 (0.0-0.1)	ND	150	ND	ND
TP7 (0.3-0.4)	ND	1,140	ND	400
TP12 (0.2-0.3)	ND	710	ND	300
TP13 (0.3-0.35)	ND	360	ND	200
TP13 (0.8-0.85)	ND	3,520	ND	600
TP16 (0.4-0.5)	ND	740	ND	300
TP18 (0.7-0.8)	ND	1,220	ND	300
TP19 (0.3-0.4)	ND	260	ND	200
TP26 (0.5-0.6)	ND	10,600	ND	1,100

TABLE 7 95% UCL –GASWORKS PARK STRATIGRAPHIC LAYERS

Analyte	Sample population	Distribution	95%UCL (mg/kg)	Std Deviation (mg/kg)	Estimated Mean (mg/kg) ⁶	Normal Mean (mg/kg) ⁶	Coefficient of Variance	Criteria
Capping layer (0.0-0.6 mbgs)								
B(a)P	42	Lognormal	9.33	6.53	5.03	4.93	1.32	2
Naphthalene	42	Normal	1.3	1.09	0	1.0	1.1	1,870
Total PAH	42	Lognormal	248.7	79.8	91.8	59.8	1.3	40
TRH >C ₁₀ -C ₁₆	39	Normal	54	7.4	51.7	52.1	0.14	1,980
TRH >C ₁₆ -C ₃₄	39	Normal	377	341.5	266	285	1.2	1,490
TRH >C ₃₄	39	Normal	189	112	157.6	159	0.7	1,490
Gasworks waste layers – sands, silts and clays (0.1 to >3.0 mbgs)								
B(a)P	49	Lognormal	977	10.3	111.1	16.8	1.9	2
Naphthalene	49	Lognormal	236	9.97	29.6	4.5	4.8	1,870
Total PAH	49	Lognormal	15,470	10.62	1563.6	236.6	2.6	40
TRH >C ₁₀ -C ₁₆	34	Lognormal	1,164	4.3	520.2	190.7	2.5	1,980
TRH >C ₁₆ -C ₃₄	34	Normal	7,998	6950	5981	5981	1.2	1,490
TRH >C ₃₄	34	Normal	1,682	1158	1345.6	1345.6	0.9	1,490
Sulfate ⁵	-	-	-	-	-	-	-	2,000
Mercury	49	Lognormal	0.9	3.37	0.58	0.27	1.9	30
Total cyanide	13	Lognormal	10,669	7.08	529.7	107.57	2.3	1,000
Lead	46	Lognormal	448	5.19	202.2	53.68	3.6	600
Arsenic	48	Normal	22.2	20.2	17.3	17.3	1.2	200
Copper	48	Normal	24.8	2.4	19.3	12.6	2.7	2,000
Nickel	47	Normal	19.4	15.3	17.1	15.6	1.0	600
Zinc	47	Normal	134.4	115	136.7	106.2	1.1	14,000
Natural Material (>0.3 mbgs)								
B(a)P	14	Normal	0.7	0.27		0.57	0.47	2
Naphthalene	14	Normal	0.85	0.40	0.66	0.66	0.60	1,900
Total PAH	14	Normal	12.0	4.8	9.8	9.7	0.5	40

Notes:

1. Insufficient sample numbers exist to undertake 95%UCL on sulphate;
2. the estimated mean is a geometric mean calculated under a log normal distribution; the normal mean is an arithmetic mean calculated under a normal distribution; standard deviation is adopted from normal distribution;
3. all concentrations in mg/kg except for coefficient of variance, which is unitless;
4. Criteria is health based (HIL or modified SSTL where applicable); and
5. **Bold** exceeds Tier 1 health criteria

TABLE 8 95% UCL – SOUTHPORT NURSING HOME STRATIGRAPHIC LAYERS

Analyte	Sample population	Distribution	95%UCL (mg/kg)	Std Deviation (mg/kg)	Estimated Mean (mg/kg) ⁶	Normal Mean (mg/kg) ⁶	Coefficient of Variance	Criteria
Capping layer (0.0-0.6 mbgs)								
B(a)P	10	Lognormal	74.4	4.25	8.7	3.64	2.3	1
								1
Total PAH	10	Lognormal	1,395	4.71	121.5	45.02	2.5	20
								20
Naphthalene	11	Lognormal	7.6	3.4	1.8	0.92	2.6	5
								5
TRH >C ₁₀ -C ₁₆	10	Normal	138	89	4.2	86	1.0	286
TRH >C ₁₆ -C ₃₄	10	Lognormal	1,741	1308	5.9	766	1.7	1,260
TRH >C ₃₄	10	Normal	333	220	5.1	205	1.1	1,260
Gasworks waste layers – sands, silts and clays (0.1 to >3.0 mbgs)								
B(a)P	13	Normal	36.4	25.5	25.3	22.5	1.14	1
Total PAH	13	Lognormal	1,749	365	310	292	1.25	20
Naphthalene	13	Lognormal	20.4	9.0	-0.2	3.4	2.6	5
TRH >C ₁₀ -C ₁₆	13	Normal	206	143	4.5	135	1.1	286
TRH >C ₁₆ -C ₃₄	13	Normal	2,171	1,635	6.4	1,362	1.2	1,260
TRH >C ₃₄	13	Normal	646	461	5.6	418	1.1	1,260
Sulfate ³	-	-	-	-	-	-	-	
Mercury	11	Lognormal	13.6	5.56	0.9	0.27	1.8	15
								15
Cyanide ³	-	-	-	-	-	-	-	500
Lead ³	-	-	-	-	-	-	-	300
Arsenic	11	Lognormal	97.9	3.44	22.9	11.67	1.5	100
Copper	11	Lognormal	292.6	4.27	41.2	16.7	2.3	1,000
Nickel	11	Normal	38.6	24.1	27.9	25.5	0.95	600
Zinc	11	Normal	66.4	35.9	50.1	46.8	0.77	7,000

Notes:

- Insufficient sample numbers exist to undertake 95%UCL on sulphate and cyanide
- Two discrete concentration populations between minor impacts (Pb <LOR to 144 mg/kg) and severe impacts (Pb 332-686 mg/kg), therefore 95%UCL give non-representative statistics, and sample numbers are too small to split into minor and severe impacts, therefore statistical analysis not undertaken for lead;
- Insufficient sample numbers exist to undertake 95%UCL PAH in natural, and all samples reported non-detectable results;
- the estimated mean is a geometric mean calculated under a log normal distribution; the normal mean is an arithmetic mean calculated under a normal distribution; standard deviation is adopted from normal distribution;
- all concentrations in mg/kg except for coefficient of variance, which is unitless;
- Criteria is health based (HIL or modified SSTL where applicable); and
- Bold** exceeds Tier 1 criteria

TABLE 9 95%UCL – GASWORKS PARK DEPTH METRES BELOW GROUND SURFACE

Analyte	Sample population	Distribution	95%UCL (mg/kg)	Std Deviation (mg/kg)	Estimated Mean (mg/kg) ³	Normal Mean (mg/kg) ⁴	Coefficient of Variance	Criteria
0.0-0.2 mbgs								
B(a)P	30	Lognormal	7.3	6.3	3.5	4	1.6	2
Total PAH	30	Lognormal	77.4	77.6	42	49.7	1.56	40
0.2-0.5 mbgs								
B(a)P	23	Lognormal	64.7	5.5	15.8	4.15	1.9	2
Total PAH	23	Lognormal	590.2	4.7	173.6	57.2	1.9	40
TRH >C ₁₆ -C ₃₄	22	Lognormal	1,524	3.4	684	336.3	2.0	1,490
TRH >C ₃₄	22	Lognormal	348	2.2	238.5	176.9	1.5	1,490
0.5-1.0 mbgs								
B(a)P	26	Lognormal	3,890	11	137.6	22.8	1.8	2
Naphthalene	26	Lognormal	112	5.1	33.7	9.8	4.8	1,900
Total PAH	25	Lognormal	56,515	10.9	2056	340.2	2.4	40
TRH >C ₁₀ -C ₁₆	25	Lognormal	1,085.2	4.3	387	142.9	2.5	1,980
TRH >C ₁₆ -C ₃₄	25	Lognormal	41,168	6.7	7,705	1488	1.3	1,490
TRH >C ₃₄	26	Normal	1,392	1,181	1,115	1,012	1.2	1,490
1.0-1.5 mbgs								
B(a)P	13 ⁴	Normal	80.8	58.4	63.7	52	1.1	2
Total PAH	13 ⁴	Normal	1,184	905	837	737	1.2	40
TRH >C ₁₆ -C ₃₄	13	Normal	4,543	3,418	3,986	2,853	1.2	1,490
TRH >C ₃₄	13	Normal	1,154	745	871	785	0.95	1,490

Notes:

- Two discrete concentration populations between minor impacts (B(a)P <LOR to 1.7 mg/kg; Total PAH <LOR to 19 mg/kg; TPH <LOR) and severe impacts (B(a)P 31.8-157 mg/kg; Total PAH 275-2,506 mg/kg), therefore statistics performed on severe impact samples only;
- The estimated mean is a geometric mean calculated under a log normal distribution;
- normal mean is an arithmetic mean calculated under a normal distribution;
- statistics undertaken on all fill material data collected from across the site;
- Criteria is health based (HIL or modified SSTL where applicable); and
- Bold** exceeds Tier 1 criteria.



TABLE 10 95%UCL – SANDY CLAY CAP (2ND CAPPING LAYER)

Analyte	Sample population	Distribution	95%UCL (mg/kg)	Std Deviation (mg/kg)	Estimated Mean (mg/kg) ³	Normal Mean (mg/kg) ⁴	Coefficient of Variance	Criteria
B(a)P	13	Normal	12	9	7.6	7.6	1.2	2
Total PAH	13	Normal	151	111.2	95.7	95.7	1.2	40
Total TRH	13	Lognormal	2,523	4.3	452.1	178.6	1.2	-

TABLE 11 PASS ACTION CRITERIA TO TRIGGER FURTHER INVESTIGATION

Type of Material		≤1000 T (≤600 m ³) disturbed			>1000 T (>600 m ³) disturbed		
Texture	Clay	Sulfur Trail	Acid Trail	NAGP	Sulfur Trail	Acid Trail	NAGP
Units	%	%S	mol H ⁺ /T	kgH ₂ SO ₄ /T	%S	mol H ⁺ /T	kgH ₂ SO ₄ /T
Coarse	≤5	0.03	18	1.0	0.03	18	1.0
Medium	5-40	0.06	36	2.0	0.04	25	1.4
Fine	≥40	0.1	62	3.0	0.05	31	1.8

Notes:

1. 'disturbed' refers to excavation, dewatering, dredging, etc
2. refer to Table 6 below for conversion factors between laboratory units
3. Coarse = sands; Medium = sandy loams/silts to light clays/silts; Fine = medium to heavy clays, silty clays
4. NAGP net acid generation potential – requires %S and acid neutralizing capacity (ANC) to determine

TABLE 12 PASS ASSESSMENT

Sample	Soil Texture	Action Criteria		Field pH	Sulfide (%)	Sulfur (kgH ₂ SO ₄ /T)
		Sulfur Trail (%S)	NAGP (kgH ₂ SO ₄ /T)			
BH4 (0.6-0.7)	Clay	0.1	3.0	6	0.24	7.344
BH5 (0.0-0.1)	Sand	0.03	1.0	6.5	0.02	0.612
BH5 (0.2-0.3)	Clay	0.1	3.0	8	0.14	4.284
BH5 (0.6-0.7)	Sand	0.03	1.0	8	0.74	22.644
BH7 (0.3-0.4)	Clay	0.1	3.0	7.5	0.05	1.53
BH7 (0.6-0.7)	Silt	0.06	2.0	8	0.01	0.306
TP7 (1.75-1.8)	Sand	0.03	1.0	-	0.51	15.606
TP12 (0.2-0.3)	Clay	0.1	3.0	8	0.05	1.53
TP16 (0.05-0.15)	Sand	0.03	1.0	5.5	0.01	0.306
TP18 (0.25-0.3)	Clay	0.1	3.0	7.5	0.02	0.612
TP20 (0.6-0.7)	Sand	0.03	1.0	4.5	0.32	9.792
TP20 (0.8-0.9)	Sand	0.03	1.0	4.5	1.84	56.304

Sample	Soil Texture	Action Criteria		Field pH	Sulfide (%)	Sulfur (kgH ₂ SO ₄ /T)
		Sulfur Trail (%S)	NAGP (kgH ₂ SO ₄ /T)			
TP26 (0.5-0.6)	Clay	0.1	3.0	8	0.03	0.918
TP26 (1.8-1.9)	Clay	0.1	3.0	8	0.12	3.672

Notes:

1. Samples selected reported detectable sulphide as S (%) – indicates field pH not recorded;
2. Action criteria adopted dependent on texture: clay is considered fine; silt is considered medium; and sand is considered coarse;
3. Action Criteria adopted assumes ≤600 m³ of PASS material disturbance;
4. To convert %S to kgH₂SO₄/Tonne use conversion factor of 30.6 as per *Victorian Best Practice Management Guidelines for Assessing and Managing CASS* (2010); and
5. It should be noted that this assessment is considered as indication only to provide a rough idea of sulphur based activity
6. Shaded cells indicate action criteria exceeded.

TABLE 13 PAH FINGERPRINTING AND SOURCE ANALYSIS

Sample	Fingerprinting Method A	Fingerprinting Method B	Field notes (borelogs)	CoPC conc. (mg/kg)	Conclusion
BH1 (0-0.1)	Predominantly ash from black coal with minor coke	Predominantly ash from black coal with minor coke	Ash and coke	PAH 19	Pyrogenic residue
BH1 (0.3-0.4)	Predominantly coke with minor ash from black coal	Predominantly ash from black coal with minor coke		PAH 98	
BH1 (1-1.1)	Predominantly ash from black coal	Predominantly ash from black coal		PAH 15	
BH2 (0-0.1)	Predominantly coke with minor ash from black coal	Predominately ash from black coal with minor ash from brown coal	Ash and coke	PAH 60	Pyrogenic residue
BH2 (0.2-0.3)	Predominantly ash from black coal and minor coke	Predominantly ash from black coal with minor coke		PAH 217	
BH3 (0-0.1)	Predominantly coke with minor ash from black and brown coal	Predominantly coke with minor ash from black and brown coal	Ash and coke	PAH 56	Pyrogenic residue
BH3 (0.2-0.3)	Predominantly ash from black coal with minor coke	Predominantly ash from black coal with minor coke		PAH 249	
BH3 (0.6-0.7)	Predominantly ash from black coal with minor coke	Predominantly ash from black coal with minor coke		PAH 37	
BH4 (0.2-0.3)	Low correlation to known sources of PAH	Low correlation to known sources of PAH	Spent oxides and green staining	PAH 61; Hg 5.5; As 136; Pb 466; Cu 456	Secondary Gas Condensate
BH4 (0.6-0.7)	Predominantly coke	Predominantly coke with minor ash from brown coal		PAH 277; SO4 162,000; Hg 5.9; Pb 332; As 63	
BH5 (0.2-0.3)	Predominantly black coal tar with minor ash from black coal	Predominantly black coal tar with minor ash from black coal	ash and coke; hydrocarbon odour	PAH 1,158; TPH 4,650	Primary Gas Condensate & pyrogenic residue
BH5 (0.6-0.7)	Predominantly ash from black coal with minor coke	Predominantly coke with minor black coal tar		PAH 260; TPH 3,080	
BH6 (0-0.1)	Predominantly ash from black coal and coke	Predominantly ash from black coal with minor black coal tar	Black staining	PAH 27	Pyrogenic residue
BH7 (0.3-0.4)	Predominantly ash from black coal and coke	Predominantly ash from black coal with minor coke	Coke and ash, slight PAH odour	PAH 175	Pyrogenic residue
BH7 (0.6-0.7)	Predominantly ash from black coal	Predominantly ash from black coal with minor coke		PAH 813	
BH8 (0-0.1)	Predominantly black coal tar	Predominantly black coal tar with minor ash from black coal	No tar noted on borelogs, however, general gasworks waste including ash and coke noted	PAH 1,744; TPH 4,640	Primary Gas Condensate & pyrogenic residue
BH8 (0.3-0.4)	Predominantly black coal tar with minor ash from black coal	Predominantly ash from black coal		PAH 35	Pyrogenic residue
BH9 (0.2-0.3)	Predominantly coke with minor ash from brown coal	Predominantly coke with minor ash from black coal	PAH odour	PAH 87	Pyrogenic residue
BH10 (0.2-0.3)	Predominantly ash from black coal	Predominantly ash from black coal	No tar noted on borelogs,	PAH 118	Pyrogenic residue

Sample	Fingerprinting Method A	Fingerprinting Method B	Field notes (borelogs)	CoPC conc. (mg/kg)	Conclusion
	with minor black coal tar	with minor black coal tar	however, ash and coke noted; low PID		
BH10 (1.0-1.1)	Predominantly coke with minor ash from black coal	Predominantly coke with minor ash from black coal	√	PAH 19	
BH11 (0.5-0.6)	Predominantly black coal tar	Low correlation to known sources of PAH	Tar, ash and coke noted on borelogs, strong PAH odour	PAH 28,597; TPH 30,700	Primary Gas Condensate & pyrogenic residue
BH13 (0.0-0.1)	Predominantly ash from black coal and black coal tar	Predominantly black coal tar and ash from black coal	Ash and coke	PAH 41	Pyrogenic residue
BH13(0.1-0.2)	Predominantly coke and ash from black coal and minor black coal tar	Predominantly coke with minor ash from black coal	Ash and coke	PAH 35	Pyrogenic residue
BH13 (0.3-0.4)	Predominantly ash from black coal and coke	Predominantly ash from black coal and coke		PAH 15	Pyrogenic residue
BH13(0.6-0.7)	Predominantly ash from black coal and black coal tar	Predominantly ash from black coal with minor coke		PAH 379	Primary Gas Condensate & pyrogenic residue
BH13(1.1-1.3)	Predominantly ash from black coal and black coal tar	Predominantly ash from black coal and coke	Viscous tar noted @0.9m	PAH 2,400; TPH 10,000	Primary Gas Condensate
BH14 (0.05-0.15)	Predominantly ash from black coal, black coal tar and coke	Predominantly ash from black coal and coke	Coke	PAH 232	Pyrogenic residue
BH14(0.4-0.5)	Predominantly ash from black coal, black coal tar and coke	Predominantly ash from black coal with minor coke	Ash with some coke; slight hydrocarbon odour	PAH 1,570; CN 763; Hg 3.8; Pb 484 Zn 293; TPH 8,730	Primary, Secondary Gas Condensate and Pyrogenic residue
BH14(0.7-0.8)	Predominantly ash from black coal, black coal tar and coke	Predominantly ash from black coal and coke		PAH 2,854; TPH 12,800	Primary Gas Condensate and Pyrogenic residue
BH14(1.3-1.4)	Predominantly ash from black coal, black coal tar and coke	Predominantly ash from black coal and black coal tar		PAH 1,441; TPH 7,990	
BH15 (0.4-0.5)	Predominantly coke with minor ash from brown coal	Predominantly coke with minor ash from brown coal	Ash and coke	PAH 169	Pyrogenic residue
BH15 (0.8-0.9)	Predominantly black coal tar with minor steelworks tar	Predominantly black coal tar with minor ash from black coal	No tar noted on borelogs, ash and coke noted, strong PAH odour, PID 297ppm	PAH 7,729, TPH 16,400	Primary Gas Condensate and Pyrogenic residue
BH16(0.2-0.3)	Predominantly ash from black coal with minor black coal tar	Predominantly ash from black coal with minor coke and black coal tar	Coke and ash	PAH 205	Pyrogenic residue
BH16(0.7-0.8)	Predominantly ash from black coal with minor coke	Predominantly ash from black coal with minor coke		PAH 417; TPH 2,520	
TP2 (0.0-0.1)	Coke and ash from brown coal	Coke and ash from brown coal	Ash and coke	PAH 143	Pyrogenic residue
TP2 (0.95-1.0)	Coke and ash from brown coal	Coke and ash from black coal		PAH 1,172; TPH 3,740	
TP4 (0.5)	Coke and ash from black coal	Coke and ash from black coal	Ash, coke, spent oxides incl. yellow sulfurous material	PAH 242; Pb 446; Zn 257	Secondary Gas condensate and Pyrogenic residue

Sample	Fingerprinting Method A	Fingerprinting Method B	Field notes (borelogs)	CoPC conc. (mg/kg)	Conclusion
TP5 (0.8)	Coke and ash from brown coal	Coke and ash from black and brown coal	Ash, charcoal, coke and clinker; no odour; low PID	PAH 898; TPH 4,130	Pyrogenic residue
TP6 (0.25-0.3)	Coke and ash from black coal and black coal tar	Ash from black coal	Ash and coke with solidified tar layer 0.8-1.1m	PAH 158;	Primary Gas Condensate & pyrogenic residue
TP6 (1.75-1.8)	Coke and ash from black coal and black coal tar	Coke and ash from black coal		PAH 472;	
TP7(0.0-0.1)	Coke and ash from black coal and black coal tar	Coke and ash from black coal	Tar, coke, clinker and slag; naphthalene odour	PAH 243	Primary Gas Condensate & pyrogenic residue
TP7(0.3-0.4)	Coke and ash from black and brown coal	Coke and ash from black and brown coal		PAH 402; TPH 2,480	Primary Gas Condensate & pyrogenic residue
TP7(1.75-1.8)	Black coal tar	Black coal tar	Semi viscous and solidified tar; naphthalene odour; PID 138ppm	PAH 13,486, TPH 59,500; SO4 16,200	Primary Gas Condensate
TP9 (0.7-0.8)	Coke and ash from black and brown coal	Coke and ash from black and brown coal	Ash and coke	PAH 336	Pyrogenic residue
TP10 (0.5-0.6)	Coke and ash from black and brown coal/ black coal tar	Coke and ash from black and brown coal	Coke and slag; PID320ppm	PAH 459; TPH 2,100	Primary Gas Condensate & pyrogenic residue
TP10 (1.0-1.1)	Ash from black coal and black coal tar	Ash from black coal and black coal tar	No tar noted on borelogs Creosote odour noted; PID 110ppm	PAH 1,366; TPH 4,120	Primary Gas Condensate
TP11 (1.2-1.3)	Coke and ash from black and brown coal and black coal tar	Coke and ash from black coal	Coke; PAH odour; Solid tar layer 1.4-1.6m; PID 130 ppm;	PAH 418;	Primary Gas Condensate & pyrogenic residue
TP12 (0.2-0.3)	Coke and ash from black and brown coal	Coke and ash from black coal	Ash and coke; black staining	PAH 200	Pyrogenic residue
TP12 (0.6-0.7)	Coke and ash from black and brown coal	Coke and ash from black coal	Ash and coke; black staining PAH odour	PAH 436; TPH 1,990	
TP13 (0.3-0.35)	Coke and ash from black and brown coal and black coal tar	Coke and ash from black coal	Ash and coke	PAH 179	Pyrogenic residue
TP13 (0.8-0.85)	Ash from black and brown coal and black coal tar	Ash from black coal and black coal tar	Strong PAH odour	PAH 2,458; TPH 7,630;	Primary Gas Condensate & pyrogenic residue
TP14 (0.8-0.85)	Ash from black coal and black coal tar	Ash from black coal and black coal tar	No tar noted on borelogs Ash and coke noted, strong PAH odour, PID 108ppm	PAH 7,045; TPH 20,000	Primary Gas Condensate & Pyrogenic residue
TP15 (1.0-1.1)	Coke and ash from brown and black coal	Coke and ash from black coal	Ash and coke, strong PAH odour	PAH 679; TPH 3,050	Pyrogenic residue
TP16 (0.05-0.15)	Coke, ash from black and brown coal and black coal tar	Coke and ash from black coal	Ash, coke and slag noted. Slight PAH odour.	PAH 152	Pyrogenic residue
TP16 (0.4-0.5)	Coke, ash from black and brown coal	Coke and ash from black coal/black		PAH 248;	Pyrogenic residue

Sample	Fingerprinting Method A	Fingerprinting Method B	Field notes (borelogs)	CoPC conc. (mg/kg)	Conclusion
	and black coal tar	coal tar			
TP16 (1.0-1.1)	Coke and ash from black and brown coal	Coke and ash from black and brown coal		PAH 275;	Pyrogenic residue
TP17 (1.0-1.1)	Coke, ash from black and brown coal and black coal tar	Coke and ash from black coal and black coal tar	Ash, coke and slag noted; no odour no PID reading	PAH 443; TPH 2,690	Pyrogenic residue
TP18 (0.0-0.1)	Coke and ash from black and brown coal	Coke and ash from black and brown coal	Ash and coke noted	PAH 54	Pyrogenic residue
TP18 (0.25-0.3)	Coke, ash from black and brown coal and black coal tar	Coke and ash from black and brown coal		PAH 65	Pyrogenic residue
TP18 (0.7-0.8)	Coke, ash from black and brown coal and black coal tar	Coke, ash from black and brown coal and black coal tar	Spent oxides, ash, coke and slag; no PID reading or odour	PAH 977; Pb 6,720; Zn 312; SO ₄ 213,000; TPH 5,660	Primary and Secondary Gas Condensate, Pyrogenic residue
TP19 (0.3-0.4)	Coke, ash from black and brown coal	Coke and ash from black coal	Ash and coke	PAH 75	Pyrogenic residue
TP20 (0.6-0.7)	Coke, ash from black and brown coal	Coke and ash from black coal	Black ash, coke and slag (distinct layer)	PAH 2,194, TPH 8,090	Pyrogenic residue
TP20 (0.8-0.9)	Low correlation to known sources of PAH	Low correlation to known sources of PAH	Spent oxides noted on borelogs	PAH 2,351; TPH 14,700; CN 4,240; SO ₄ 86,800;	Secondary Gas Condensate
TP21 (0.8-0.9)	Predominantly black coal tar and ash from black coal	Predominantly ash from black coal and black coal tar	Refusal on asphalt; PAH odour noted	PAH 663	Pyrogenic residue and asphalt
TP22 (0-0.1)	Predominantly ash from black coal	Predominantly ash from black coal and coke	Ash and coke	PAH 284	Pyrogenic residue
TP22 (0.6-0.7)	Predominantly coke and minor ash from brown coal	Predominantly coke and minor ash from brown coal	Ash and coke	PAH 167	Pyrogenic residue
TP24 (1.1-1.2)	Predominantly ash from black coal and coke	Predominantly ash from black coal and coke	Ash coke and slag; PAH odour	PAH 2,506; TPH 9,400	Pyrogenic residue
TP25 (0.7-0.8)	Predominantly ash from black coal and coke	Predominantly ash from black coal and coke	Coke and ash	PAH 24	Pyrogenic residue
TP26 (0.5-0.6)	Predominantly ash from black coal and black coal tar	Predominantly ash from black coal and coke	Coke, ash slag and minor liquid tar; highly odourous	PAH 597; TPH 2,190	Primary Gas Condensate & pyrogenic residue



TABLE 14 CHEMICALS FOR WHICH FURTHER RISK ASSESSMENT IS NECESSARY




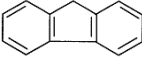
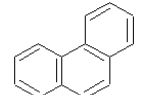
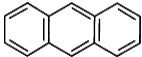
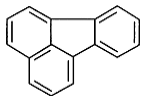
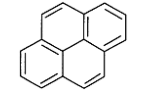
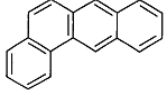
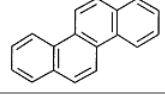
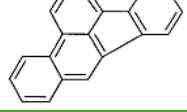
Class of Chemical	Chemicals Exceeding Tier 1	Notes
PAHs	Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene,	For volatile PAHs produce Tier 2 based on benzo(a)pyrene equivalence and specific assessment for naphthalene
	Fluoranthene, Pyrene, Benz(a)anthracene, Chrysene, Benzo(b,k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)anthracenem, Benzo(ghi)perylene, Sum of 16 PAHs	For non Volatile PAHs Produce Tier 2 criteria based on bioavailability, benzo(a)pyrene equivalence, and re-evaluation of exposure scenarios
TPH/TRH	>C ₁₆ -C ₃₄ aromatic fraction	Produce Tier 2 criteria based on re-evaluation of "direct contact" exposure scenarios for open space areas
Class of Chemical	Chemicals NOT Exceeding Tier 1	Notes
Inorganic Substances	Sulfate, sulfide, total cyanide	No further assessment due to insignificant number of samples exceeding Tier 1. Tier 1 criteria will remain as the site criteria but will still have to be managed as part of the future remediation works at the site.
Heavy Metals	Arsenic, Lead, Nickel, Chromium, Cadmium, Copper, Mercury, Zinc	
Monoaromatic Hydrocarbons	Benzene, Toluene, Ethyl-benzene, Xylenes	
TPH/TRH	C ₆ -C ₁₀ , >C ₁₀ -C ₁₆ , >C ₃₄ aromatic, and all aliphatic fraction ranges	

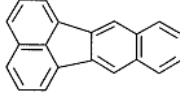
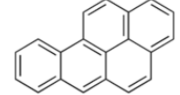
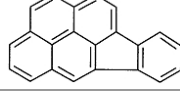
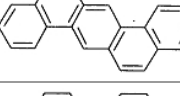
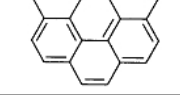


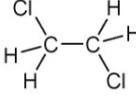
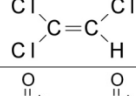
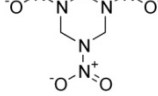
TABLE 15 CLASSIFICATION OF BIOAVAILABILITY AND TOXICITY FOR PAH CONTAINING MATERIALS

Group	Petrogenic			Pyrogenic				
	Petrogenic	Heated Petrogenic Residues	Heated Petrogenic Particulates	Pyrogenic Residue	Pyrogenic Gas Particulates	Primary Gas Condensates	Secondary Gas Condensates	Distilled Products of Primary Gas Condensates
Material	Coal, Bitumen, Tank bottoms, Diesel.	Waste Oil	Exhaust soots	Coke, clinker, ashes, charcoal, cinders	Chimney soots	Tar, Benzol, Naphtha oil	Material collected in spent oxides & ammonical liquors	Creosote, pitch, naphthalene, etc.
Typical soil conc. (mg/kg)	Solid <10 Liquid <100	<100	<5 mg/kg	<5 to <5000	<10	100 to >50000	50 - 5000	50-5000
Bonding on Soil	Solid-strong, Liquid-free	Free Interstitial fast Diffusion	Strong physical & chemical	Strong physical/chemical	Full range from free to strong chemical	Free Interstitial/ Fast Diffusion	Free Interstitial/ fast Diffusion	Free Interstitial/ fast Diffusion
Bioavailability	Solid: Very low Liquid: Med - high	High	Low	Very low	Part High Part low	High	Part Medium Part High	High
Bioremediation Potential	Overall Low	High	Low	Very low	Part High Part low	Medium to High	Medium to High	Mostly High
BTEF*	Solid 0.001 Liquid 0.1	0.1	0.01	0.001	0.1-1.0	1.0	1.0	1.0

Note: *derived from availability, concentration and exposure pathway

TABLE 16 SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS OF ORGANICS

Analyte	CAS	Structure	Molecular weight	Vapour Pressure	Density	Solubility	Air Diffusion Coeff.	Water Diffusion Coeffi.	Henry's Law Coefficient		Koc	Kd	Volatile
Units			g/mol	mmHg	g/cm ³	mg/L	cm ² /s	cm ² /s	atm m ³ /mol	Unit-less	cm ³ /g	cm ³ /kg	
Naphthalene	91-20-3		128.18	8.20×10 ⁻²	1.025	3.10×10 ¹	6.00×10 ⁻²	8.40×10 ⁻⁶	4.40×10 ⁻⁴	1.80×10 ⁻²	1.54×10 ³	6.16	Yes
Acenaphthylene	208-96-8		152.2	6.68×10 ⁻³	0.899	1.61×10 ¹	4.39×10 ⁻²	7.50×10 ⁻⁶	1.13×10 ⁻⁴	4.62×10 ⁻³	2.50×10 ³	1.00×10 ¹	Yes
Acenaphthene	83-29-9		154.21	2.30×10 ⁻³	1.222	3.90	5.10×10 ⁻²	8.30×10 ⁻⁶	1.84×10 ⁻⁴	7.53×10 ⁻³	5.03×10 ³	2.01×10 ¹	Yes
Fluorene	86-73-7		166.22	6.00×10 ⁻⁴	1.203	1.69	4.40×10 ⁻²	7.90×10 ⁻⁶	9.62×10 ⁻⁵	3.93×10 ⁻³	9.16×10 ³	3.66×10 ¹	Yes
Phenanthrene	85-01-8		178.23	1.21×10 ⁻⁴	1.179	1.08	3.30×10 ⁻²	5.90×10 ⁻⁶	2.56×10 ⁻⁵	1.05×10 ⁻³	1.40×10 ⁴	5.60×10 ¹	Yes
Anthracene	120-12-7		178.24	6.00×10 ⁻⁶	1.280	4.34×10 ⁻²	3.90×10 ⁻²	7.90×10 ⁻⁶	5.56×10 ⁻⁵	2.27×10 ⁻³	1.64×10 ⁴	6.56×10 ¹	Yes
Fluoranthene	206-44-0		202.26	5.00×10 ⁻⁵	1.252	2.60×10 ⁻¹	3.02×10 ⁻²	5.60×10 ⁻⁶	8.86×10 ⁻⁶	3.62×10 ⁻⁴	5.55×10 ⁴	2.22×10 ²	No
Pyrene	129-00-00		202.26	4.50×10 ⁻⁶	1.271	1.35×10 ⁻¹	2.80×10 ⁻²	7.20×10 ⁻⁶	1.19×10 ⁻⁵	4.87×10 ⁻⁴	5.43×10 ⁴	2.17×10 ²	Yes
Benz(a)anthracene	56-55-3		228.3	3.05×10 ⁻⁸	1.274	9.40×10 ⁻³	5.10×10 ⁻²	5.20×10 ⁻⁶	1.20×10 ⁻⁵	4.91×10 ⁻⁴	1.77×10 ⁵	7.08×10 ²	No
Chrysene	218-01-9		228.3	6.30×10 ⁻⁹	1.274	2.00×10 ⁻³	2.48×10 ⁻²	6.30×10 ⁻⁶	5.23×10 ⁻⁶	2.14×10 ⁻⁴	1.81×10 ⁵	7.24×10 ²	No
Benzo(b)fluoranthene	205-99-2		252.32	5.00×10 ⁻⁷	1.286	1.50×10 ⁻³	2.26×10 ⁻²	4.90×10 ⁻⁶	6.57×10 ⁻⁷	2.69×10 ⁻⁵	5.99×10 ⁵	2.40×10 ³	No

Analyte	CAS	Structure	Molecular weight	Vapour Pressure	Density	Solubility	Air Diffusion Coeff.	Water Diffusion Coeff.	Henry's Law Coefficient		Koc	Kd	Volatile
			g/mol	mmHg	g/cm ³	mg/L	cm ² /s	cm ² /s	atm m ³ /mol	Unit-less	cm ³ /g	cm ³ /kg	
Benzo(k)fluoranthene	207-08-9		252.32	9.59×10^{-11}	1.286	8.00×10^{-4}	2.26×10^{-2}	4.90×10^{-6}	5.84×10^{-7}	2.39×10^{-5}	5.87×10^5	2.35×10^3	No
Benzo(a)pyrene	50-32-8		252.32	5.60×10^{-9}	1.351	1.62×10^{-3}	4.30×10^{-2}	5.00×10^{-6}	4.57×10^{-7}	1.87×10^{-5}	5.87×10^5	2.35×10^3	No
Indeno(1,2,3-cd)pyrene	193-39-5		276.34	1.01×10^{-10}	-	1.90×10^{-4}	1.90×10^{-2}	4.80×10^{-6}	3.48×10^{-7}	1.42×10^{-5}	1.95×10^6	7.80×10^3	No
Dibenz(ah)anthracene	53-70-3		278.36	2.78×10^{-12}	1.282	2.49×10^{-3}	2.02×10^{-2}	4.60×10^{-6}	1.41×10^{-7}	5.77×10^{-6}	1.91×10^6	7.64×10^3	No
Benzo(ghi)perylene	191-24-2		276.34	1.01×10^{-10}	1.378	2.60×10^{-4}	4.90×10^{-2}	4.90×10^{-6}	1.41×10^{-7}	5.77×10^{-6}	1.60×10^6	6.40×10^3	No
Benzene	71-43-2		78.11	9.52×10^1	0.873	1.79×10^3	8.80×10^{-2}	1.09×10^{-5}	5.43×10^{-3}	2.22×10^{-1}	5.89×10^1	2.36×10^{-1}	Yes
Carbon Tetrachloride	56-23-5		153.84	1.13×10^2	1.5844	8.00×10^2	7.80×10^{-2}	9.00×10^{-6}	3.02×10^{-2}	1.24	1.74×10^2	6.96×10^{-1}	Yes
1,2-Dichloroethane	107-06-2		98.96	8.70×10^1	1.2453	8.52×10^3	1.04×10^{-1}	1.01×10^{-5}	1.11×10^{-3}	4.54×10^{-2}	1.74×10^1	6.96×10^{-2}	Yes
Trichloroethene	79-01-6		131.39	7.26×10^1	1.461	1.10×10^3	7.90×10^{-2}	4.90×10^{-6}	1.02×10^{-2}	4.17×10^{-1}	1.66×10^2	6.64×10^{-1}	Yes
RDX	121-82-4		222.12	4.1×10^{-9}	1.82	5.98×10^1	-	-	1.2×10^{-5}	4.91×10^{-4}	7.17	2.87×10^{-2}	No

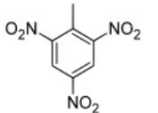
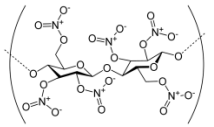
Analyte	CAS	Structure	Molecular weight	Vapour Pressure	Density	Solubility	Air Diffusion Coeff.	Water Diffusion Coeff.	Henry's Law Coefficient		Koc	Kd	Volatile
			g/mol	mmHg	g/cm ³	mg/L	cm ² /s	cm ² /s	atm m ³ /mol	Unit-less	cm ³ /g	cm ³ /kg	
2,4,6-TNT	118-96-7		227.13	2.00×10 ⁻⁴	1.654	1.30×10 ²	2.45×10 ⁻²	6.80×10 ⁻⁶	4.57×10 ⁻⁷	1.87×10 ⁻⁵	2.81×10 ³	1.12×10 ¹	No
Nitrocellulose	9004-70-0		variable	-	0.765	-	-	-	-	-	-	-	No

TABLE 17 SITE SPECIFIC EXPOSURE RATIOS FOR FUTURE LAND-USE

Future Land Use/Exposure	Daily	Annual	Lifetime	Exposure Ratio
Units	hours	hours/year	hours	-
Residential (standard default)	24	8760	350,400	1.0 [^]
Residential (medium/high density)	24	8760	350,400	0.25 [^]
Open Space (surface)	2	730	51,100	0.5 [^]
Open Space (sub-soil with grass)	2	48	3360	0.1 [*]

Notes:

1. [^] default values from Taylor and Langley (1998), adopted by NEPM (1999);
2. ^{*} NEPM (1999) open space default value of 0.5, modified by grass cover as per ANZECC (1992) to 20% of value.