

ROYAL ORDNANCE, BISHOPTON



REMEDIATION AND RECLAMATION EARTHWORKS

ENVIRONMENTAL STATEMENT

APPENDIX 9.1 ASSESSMENT OF CONTAMINATED DUST

October 2006

Appendix 9.1: Assessment of contaminated dust

9.89 The earthworks phases cover the following site zones:

Table 9.9 Earthworks phases and site zones

Earthworks Phase	Site zone
Phase 0	Zone D, Zone G, Zone I, Zone J, Zone M, Zone P, Zone R
Phase 1	Zone A, Zone D, Zone E, Zone G, Zone I, Zone J, Zone N, Zone O
Phase 2	Zone L, Zone P, Zone Q, Zone R
Phase 3	Zone A, Zone B, Zone G
Phase 4	Zone A, Zone C, Zone F, Zone G, Zone I, Zone L, Zone P, Zone R
Phase 5	Zone Q
Phase 6	Zone A, Zone H, Zone I, Zone L, Zone P
Common to all phases (Borrow Area)	Zone P

9.90 The levels of contamination recorded in each of these site zones are set out in the site investigation factual report.² Air quality guidelines have been specified for a wide range of substances of potential concern with regard to health impacts. The average measured levels of contaminants in each zone were compared with the air quality guidelines to identify the ten substances which would pose the greatest risks to health if not properly controlled during the earthworks.

9.91 The ten priority substances for control identified in each of the zones listed in Table 9.9 are set out in Table 9.10.

Table 9.10 Analysis of priority substances for control

Substance	Priority substance in Zone																
	A	B	C	D	E	F	G	H	I	J	L	M	N	O	P	Q	R
Arsenic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Barium	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Benzo(a)pyrene	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Beryllium	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cadmium	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Copper			✓										✓	✓		✓	
Lead	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Manganese	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Nickel	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Phosphorus	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Vanadium	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓		✓

9.92 There is considerable overlap between the substances identified as priorities in each zone, with a total of eleven substances covering the top ten in each of the zones under consideration. The average measured concentration of each priority contaminant in each zone was then compared with the benchmarks in Table 9.5 (Environmental Statement). The ratio of the highest measured concentration to the benchmark for

assessment of contaminated dust is given in Table 9.11. A value greater than 1 would indicate a concentration which warrants further investigation and possibly additional controls. A value less than 1 indicates that dust deposition at a rate of 200 mg/m²-day or airborne dust at a concentration of 100 µg/m³ would not give rise to a level of the contaminant above the relevant benchmark. This means that a value of less than 1 indicates that trace contaminant levels in airborne dust can be adequately controlled using normal dust control measures.

Table 9.11 Ratio of average measured concentration to benchmark for dust deposition

Substance	Average measured concentration of priority contaminants as a proportion of benchmark for dust deposition								
	Zone A	Zone B	Zone C	Zone D	Zone E	Zone F	Zone G	Zone H	Zone I
Arsenic	0.075	0.090	0.120	0.110	0.100	0.100	0.100	0.100	0.110
Barium	0.0028	0.0030	0.0047	0.0071	0.0056	0.0082	0.0042	0.0033	0.0049
Benzo(a)pyrene	0.46	0.24	0.020	0.32	0.40	0.050	0.21	0.110	0.22
Beryllium	0.125	0.063	0.15	0.035	0.055	0.075	0.050	0.055	0.060
Cadmium	0.020	0.0089	0.016	0.0067	0.0067	0.0067	0.0067	0.0067	0.0067
Copper			0.27						
Lead	0.0080	0.37	0.15	0.047	0.027	0.020	0.016	0.0091	0.0116
Manganese	0.054	0.060	0.080	0.044	0.063	0.057	0.049	0.040	0.042
Nickel	0.044	0.064	0.064	0.060	0.084	0.071	0.069	0.065	0.064
Phosphorus	0.063	0.073	0.084	0.072	0.122	0.061	0.057	0.069	0.061
Vanadium	0.00110	0.00136		0.00118	0.00130	0.00144	0.00118	0.00136	0.0015
Substance	Average measured concentration of priority contaminants as a proportion of benchmark for dust deposition								
	Zone J	Zone L	Zone M	Zone N	Zone O	Zone P	Zone Q	Zone R	
Arsenic	0.150	0.150	0.100	0.110	0.060	0.080	0.19	0.110	
Barium	0.0049	0.0062	0.0059	0.0030	0.0086	0.0023	0.0092	0.0073	
Benzo(a)pyrene	0.99	0.28	0.65	0.050	0.060	0.040	0.19	0.090	
Beryllium	0.050	0.075	0.070	0.050	0.025	0.085	0.090	0.060	
Cadmium	0.011	0.0089	0.0133	0.0067	0.0089	0.0067	0.016	0.0089	
Copper				0.114	0.109		0.132		
Lead	0.0227	0.025	0.018	0.30	0.037	0.0051	0.069	0.0125	
Manganese	0.061	0.052	0.045	0.049	0.017	0.058	0.038	0.049	
Nickel	0.085	0.085	0.089	0.087	0.047	0.053	0.105	0.049	
Phosphorus	0.067	0.082	0.069	0.065	0.048	0.071	0.097	0.089	
Vanadium	0.00136	0.00184	0.0015			0.00128		0.00140	

9.93 There are no values above 1 in Table 9.11. The highest ratio is a value of 0.99 for benzo(a)pyrene in Zone J. This indicates that there is no need for further assessment or control on the basis of the measured levels of trace contaminants in soils. The measured levels of benzo(a)pyrene are close to the benchmark level in a number of areas, including Zone J. The measured levels of benzo(a)pyrene are likely to be largely due to levels in tarmac. While these need to be properly dealt with, PAHs in tarmac are likely to be bound within large agglomerations of material and would not be readily dispersed in dust.

9.94 Over the long term, controlling fugitive dust is expected to be sufficient to comply with benchmarks for deposition of contaminants. However, the site investigation identified specific areas of contamination in each zone. Additional controls will need to be applied when earthworks activities are being carried out in these specific areas. These are set out in Table 9.8 (Environmental Statement).