8 ENVIRONMENTAL IMPACT ASSESSMENT

8.1 Air Quality

8.1.1 Existing Environment

Air Quality
The current air quality environment in the vicinity of the CPWE is likely to be significantly influenced by existing emission sources within the BIP, as well as emissions from the Sydney International Airport, located 2 km to the west-northwest of the BIP and emissions from vehicles using the major arterial road network surrounding the Site, such as Southern Cross Drive, Wentworth Avenue and Bunnerong Road.

No relevant ambient air quality monitoring has been undertaken in the immediate vicinity of the CPWE, so the assessment of existing air quality at the Site and surrounds is based on data collected by the DEC's ambient air quality monitoring network in the Sydney metropolitan region.

Regional ambient air quality data was obtained from the DEC ambient air quality monitoring station at Randwick, located in a residential area on the corner of Avoca and Bundock Streets, approximately 3 km northeast of the BIP at a similar distance inland from the coast. This monitoring site measured background pollutant data including:

- Oxides of nitrogen (NO, NO_2 and NO_x);
- Sulphur dioxide (SO_2);
- Ozone (O_3); and
- Fine particulate matter up to 10 microns in aerodynamic diameter (PM_{10}).

As part of the GTP project, Orica commissioned URS to monitor ambient air at a number of locations in the vicinity of the BIP. Baseline monitoring was done in September and October 2005, and included ambient monitoring of VOCs and dioxin concentrations. The majority of VOCs were not able to be detected and VOCs detected did not exceed the adopted criteria, with the exception of 1,2-dichloroethane (EDC), which exceeded the adopted criteria at one of the four sampling locations. However due to the conservative nature of the screening level criterion, it was further concluded that risks to workers were considered low and acceptable. The single sample dioxin ambient air concentration was comparable to other urban/light industrial locations in Sydney.

Furthermore, air quality sampling has been undertaken periodically on the CPWE site since 1998. Air emissions were measured at a number of locations on the CPWE, as well as soil gas sampling and ambient air quality monitoring. The results indicated that the data collected was generally consistent with data collected in previous air monitoring rounds conducted from 1998 to March 2004. Comparative results indicated that the emission rate of PCE and HCBD in a number of individual locations had increased between the sampling events in 1998 and October 2004. Low concentrations of a number of common urban air contaminants (such as benzene, toluene and xylenes) were detected downwind of the CPWE. In addition, one sample located 10 m downwind of the CPWE reported a concentration of PCE just above the LOR.

Three main types of air quality criteria relevant to industrial developments have been utilised in this assessment to ensure that the resulting local and regional ambient air quality meets the relevant air quality standards and impact assessment criteria. These criteria include Emission Standards (maximum allowable pollutant emission concentrations (stack concentrations) specified for particular types of equipment), Ambient Air Quality Standards (standards against

which ambient air quality monitoring results may be assessed) and Air Impact Assessment Criteria (criteria designed for use in air dispersion modelling studies and air quality impact assessments for new or modified emission sources).

In the NSW EPA (now DEC) document *Action for Air - the NSW Government's 25-year Air Quality Management Plan*, the DEC adopted a number of regional ambient air quality goals for a range of air pollutants. In June 1998 the National Environment Protection Council (NEPC) also released a National Environment Protection Measure (NEPM) for Ambient Air Quality, setting out national standards and goals for common ambient air pollutants. Ambient air quality guidelines for air pollutants associated with the proposed project are presented in **Table 8-1**.

Table 8-1: Ambient Air Quality Guidelines

Pollutant	Concentration		Averaging Period	Agency	Maximum of Allowable Exceedances
	(ppm)	(µg/m3, 0C)			
SO_2	0.20 0.08 0.02	572 229 57	1 hour 24 hours Annual	NEPC (NEPM)	1 day per year 1 day per year
NO_2	0.12 0.03	246 62	1 hour Annual	NEPC (NEPM)	1 day per year
Ozone	0.10 0.08	214 171	1 hour 4 hours	NEPC (NEPM)	1 day per year
CO	9	11,250	8 hours	NEPC (NEPM)	1 day per year
TSP	-	90[a]	Annual	NSW EPA	
PM_{10}	- -	50 30	24 hours Annual	NEPC & NSW EPA NSW EPA	5 days per year
$PM_{2.5}$	- -	25[b] 8[b]	24 hours Annual	NEPC NEPC	

a. Set to protect against amenity loss

b. Advisory reporting standard

The DEC impact assessment criteria set for those pollutants relevant to the activities proposed for the CPWE remediation project have been obtained from the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (Approved Methods), which was revised by the DEC in 2005. These are shown in **Table 8-2** to **Table 8-5**. The Approved Methods provides guidance for the selection and configuration of air dispersion models, methodologies to be used to compile meteorological datasets and emissions data, and specifies the assessment criteria to be used to evaluate compliance.

Table 8-2: DEC Impact Assessment Criteria for SO_2, NO_2, PM_{10}, TSP, CO and HF

Pollutant	Concentration		Averaging Period
	(ppm)	($\mu g/m^3$)	
Sulphur Dioxide (SO_2)	0.25	712	10 minutes
	0.20	570	1 hour
	0.08	228	24 hours
	0.02	60	Annual

Pollutant	Concentration		Averaging Period
	(ppm)	(µg/m^3)	
Nitrogen Dioxide (NO_2)	0.12	246	1 hour
	0.03	62	Annual
Particulate Matter (PM_{10})	-	50	24 hour
(less than 10 micron in diameter)	-	30	Annual
Total Suspended Particulates (TSP)	-	90	Annual
Carbon Monoxide (CO)	87	100,000	15 minutes
	25	30,000	1 hour
	9	10,000	8 hours
Hydrogen Fluoride (HF) [a]	-	0.5	90 days
	-	0.84	30 days
	-	1.7	7 days
	-	2.9	24 hours

Source: Table 7.1 Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales, NSW DEC (August 2005).

a. General land use, which includes all areas other than specialised land use. Specialised land use includes all areas with vegetation sensitive to fluoride, such as grape vines and stone fruits.

Table 8-3: DEC Impact Assessment Criteria for deposited dust

Pollutant	Averaging Period	Maximum Increase in Deposited Dust Level	Maximum Total Deposited Dust Level
Deposited Dust [a]	Annual	2 g/m^2/month	4 g/m^2/month

Source: Table 7.1 Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales, NSW DEC (August 2005).

a. Dust is assessed as insoluble solids as defined by AS 3580.101-1991 (AM-19).

Table 8-4: DEC Impact Assessment Criteria for toxic air pollutants

Pollutant	Concentration		Averaging Period
	(ppm)	(µg/m^3)	
Cadmium (Cd)	-	0.018	1 hour
1,2-Dichloroethane (EDC)	0.018	70	1 hour
Dioxins and Furans [c]	-	2.0 x 10^{-6}	1 hour
Trichloroethylene (TCE)	0.09	500	1 hour
Vinyl Chloride (VCM)	0.009	24	1 hour
Chlorine (Cl_2)	0.018	50	1 hour
Chloroform ($CHCl_3$)	0.18	900	1 hour
Chloromethane (CM)	0.9	1,900	1 hour
1,2-Dichloroethylene (DCE)	3.7	14,400	1 hour
Hydrogen Chloride (HCl)	0.09	140	1 hour
Mercury (organic) (Hg)	-	0.18	1 hour
Mercury (inorganic) (Hg)	-	1.8	1 hour
Methylene Chloride (DCM)	0.9	3,190	1 hour

Pollutant	Concentration		Averaging Period
	(ppm)	(µg/m^3)	
Sulfuric Acid (H_2SO_4)	-	18	1 hour
1,1,2 Trichloroethane (TCA)	0.18	1,000	1 hour

Source: Table 7.2a and Table 7.2b Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales, NSW Dec (August 2005).

a. Toxic equivalent as defined in clause 29 of the Regulation.

Table 8-5: DEC Impact Assessment Criteria for odorous air pollutants

Pollutant	Concentration		Averaging Period
	(ppm)	(µg/m^3)	
Tetrachloroethylene (PCE)	0.52	3,500	1 hour

Source: Table 7.4a and Table 7.4b Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales, NSW Dec (August 2005).

It is noted that ambient air quality criteria only consider the inhalation exposure pathway. For some pollutants, such as dioxins, other pathways are often the main contributor to carcinogenic risk. Thus for pollutants such as dioxins, the DEC requires a quantitative HHIA be conducted. Modelling of the proposed dioxin emissions has been undertaken as part of the air quality impact assessment, however as required by the DEC, a quantitative HHIA has been carried out to assess the implications of the modelling results for public health (refer **Section 8.9**).

Odour

In November 2006, DEC released two documents entitled *Technical framework* and *Technical notes for the Assessment and Management of Odour from Stationary Sources in NSW*. These documents outline the DEC's proposed approach for the assessment of odour emissions, using a three-level system of odour impact assessment of increasing complexity and detail.

- Level 1 is a simple screening exercise to identify the potentially affected zone and site suitability for a proposed facility or expansion of an existing facility.
- Level 2 is a simple dispersion modelling procedure. A Level 2 assessment is to be undertaken as a minimum for any odour-emitting development for which an Environmental Impact Statement (EIS)/EA or EPA licence is required. A Level 2 assessment uses worst case meteorological data (this can be a synthetic dataset, i.e. the Metsamp data file included with AUSPLUME) and worst case odour emission rates. A Level 2 assessment is a conservative screening level assessment and if odour criteria are met, no further assessment is required. Failure to meet the design odour criteria, however, means that a more detailed and refined Level 3 assessment is required.
- Level 3 is a more refined, comprehensive dispersion modelling assessment. A level 3 assessment is to be undertaken when a Level 2 assessment has indicated non-compliance with the odour design criteria. A Level 3 assessment includes the use of hourly averaged site-specific meteorological data and a robust emissions data set.

Potential odour impacts from the CPWE were assessed as part of the air quality impact assessment using a comprehensive dispersion modelling study. However, due to the complexity

with determining odour thresholds for the chlorinated organic compounds (and hence the confidence that can be assigned to the odour threshold data), it is probably more appropriate to consider this odour assessment as Level 1 or 2.

The Approved Methods specifies ground level concentration (GLC) criteria for a number of odorous air pollutants, but it does not provide odour thresholds for all of the pollutants of concern in this study. Therefore a literature search was performed to identify odour threshold data for the pollutants of concern. Odour threshold limits were found for 14 of the 18 studied chlorinated organic compounds. No available literature quoted threshold levels for No available literature quoted threshold levels for OCS, HCB, PCB or PER. These compounds have thus been excluded from this analysis, and from the lack of data it can be assumed that these compounds are not particularly odorous.

Odour thresholds for the other 14 compounds are presented in **Table 8-6**. Although this analysis used the lower threshold values (as a conservative approach), the upper thresholds are included to indicate the range of values existing in the literature and the uncertainty associated with these thresholds. It should be noted that the odour detection limit, or odour threshold, is equivalent to one odour unit (1ou ≈ odour threshold (µg/m³)).

Table 8-6: Odour Thresholds for the Modelled Odorous Compounds

Pollutant	Abbreviation	Lower Odour Threshold (µg/m³)	Upper Odour Threshold (µg/m³)
Hexachlorobutadiene	HCBD	11,000[a]	12,000[b]
Tetrachloroethylene	PCE	6,900[d]	320,000[e, f]
Hexachloroethane	HCE	1,500[g]	10,000[c]
Chloroform	$CHCl_3$	3,000[h]	1,400,000[h]
Chloromethane	CM	21,000[i]	740,000[j]
1,1-Dichloroethane	1,1-DCA	400,000[c]	450,000[k]
1,2-Dichloroethane	EDC	25,000[l, m, n]	450,000[l, m, n]
1,1-Dichloroethylene	1,1-DCE	750,000[o]	2,000,000[p]
cis-1,2-Dichloroethylene	1,2-DCE (cis)	790,000[c]	-
trans-1,2-Dichloroethylene	1,2-DCE (trans)	340[q]	67,000[g]
Methylene Chloride	DCM	4,200[r]	1,500,000[r]
1,1,2-Trichloroethane	1,1,2-TCA	45,000[c]	-
Trichloroethylene	TCE	1,100[r]	440,000[r]
Vinyl Chloride Monomer	VCM	26,000[r]	7,700,000[o]

a. Agency for Toxic Substances and Disease Registry (ATSDR). *Toxicological Profile for Hexachlorobutadiene*. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 1994.

b. Ruth JH, *Odor threshold and irritation levels of several chemical substances: a review*. Am Ind Hyg Assoc J, 47: A142-A151, 1986

c. ACGIH (2004) "TLVs and BEIs with other worldwide occupational exposure values 2004 CD-ROM", 2004

d. Agency for Toxic Substances and Disease Registry (ATSDR), *TOX FAQs for Tetrachloroethylene (PERC)*, http://www.atsdr.cdc.gov/tfacts18.html, 1997

e. Association of American Railroads, *Emergency action guide for tetrachloroethylene*. Mar. 1995

f. Hazardous Substances Data Bank (HSDB), Database record for trichloroethylene. Last rev: 08/05/97

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l. May, J., Odour thresholds of solvents for the judgement of solvent odour in air, Staub, 26: 385-389, 1966 (in German)

m. Hellmann, T.M. & Small, F.H. [Characterization of the odour properties of 101 petrochemicals using sensory methods]. J. Air Pollut. Control Assoc., 24: 979-982, 1974

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q. Spectrum Laboratories, *Chemical Fact Sheet*, http://www.speclab.com/compound/c156605.htm

r. International Programme on Chemical Safety – INTOX database, www.intox.org

8.1.2 Potential Impacts

Air Quality

Potential air quality impacts associated with the proposed remediation of the CPWE are due to the release of emissions from the Site during operation. Emissions from the Site which could potentially impact upon air quality include:

- Stack emissions from the ECS on the ESB and the FSB;
- Stack emissions from the DTD Plant;
- Fugitive chlorinated organic emissions from the ESB during relocation of the ESB enclosure between stages;
- Fugitive chlorinated organic emissions from covered trucks transporting contaminated waste from the ESB to the FSB;
- Fuel combustion emissions from vehicles and machinery associated with the CPWE;
- Dust emissions from treated soil stockpiles; and
- Dust emissions from the treated soil reinstatement activities at the Site, including transport of the treated soil from the stockpiles to the car park.

In quantitatively assessing air quality impacts from the proposed remediation of the CPWE, three components were addressed:

- Air emissions from the proposed new project itself;
- Air emissions from the plant and equipment already operating at the BIP site; and
- Background pollutant concentrations from other emission sources in the regional airshed (i.e. other industries, vehicles, domestic sources, natural sources etc).

The cumulative impacts of these three contributing source groups were assessed on a pollutant-by-pollutant basis.

If adequate ambient monitoring data is available for the area immediately surrounding the Site, it can be concluded that it already includes the impact of existing emission sources at the Site. Thus only the incremental impact of the proposed new project needs to be modelled and added to the regional background data in order to investigate potential cumulative impacts on air

quality. As noted previously, the nearest appropriate DEC ambient monitoring site is located in Randwick – approximately 3 km from the BIP. In addition to this, some monitoring of VOCs and dioxin levels has been completed in areas adjacent to the BIP.

An inventory of predicted emissions from the ESB, FSB and DTD Plant has been compiled, including details for stack conditions and expected pollutant concentrations and discharge rates for both stack and fugitive emissions. These emissions have been estimated based on the maximum capacity of the treatment plant and minimum performance specifications provided to the plant designers for the off-gas treatment systems in order to provide a conservative assessment of likely air quality impacts under normal operating conditions from the proposed CPWE remediation operations. An inventory of emissions for existing sources at the BIP has also been included in the assessment.

Emissions were also estimated for two abnormal operating scenarios. Both abnormal operating scenarios occur for 15 minutes, since the contingency plan if such an event occurs includes isolation of the feed source to the rotary dryer and it takes 15 minutes for the material inside the dryer to be processed. The scenarios are conservative estimates.

Five scenarios were modelled in the air quality impact assessment and these include:

- Baseline Scenario – includes the existing sources (see Section 6.3 of **Appendix E**) within the BIP without the contribution from the proposed CPWE remediation;
- Normal Scenario – which includes the Baseline Scenario plus operations for the proposed CPWE remediation under normal conditions (see Section 6.1 and 6.2 of **Appendix E**);
- Upset Condition (loss of natural gas supply (1-hour average)) Scenario – includes the Baseline Scenario plus the proposed CPWE remediation emissions when the DTD Plant is assumed to have lost natural gas supply and hence the thermal oxidiser burner is extinguished and does not operate for a period of 15 minutes. Emergency power is restored after 15 minutes and a controlled shutdown of the DTD Plant is performed. For the purpose of providing a conservative hourly average predicted GLC, this scenario assumes that normal operation occurs for the first 45 minutes of the hour and then loss of natural gas supply causes upset conditions for 15 minutes before a controlled shutdown is performed (see Section 6.1.3 of **Appendix E**).
- Upset Condition (loss of natural gas supply (15-minute average)) Scenario – which is the same scenario as the loss of power (1-hour average), except that the emission rates differ to account for the sub-hour averaging period for short term impacts; and
- Upset Condition (acid gas scrubber failure) Scenario – includes the Baseline Scenario plus the proposed CPWE remediation emissions when the thermal oxidiser is operating normally, but the acid gas scrubber fails resulting in increased emissions of gaseous hydrogen chloride (HCl) from the DTD Plant stack.

The dispersion modelling results of the Baseline and the Normal scenarios are used in the air quality impact assessment, while the dispersion modelling results for the Normal scenario and Upset Conditions scenarios are used in the HHIA and the Upset Conditions in the PHA.

Conservative emission rates were used as input data for atmospheric dispersion modelling. The atmospheric dispersion modelling results have been assessed against the air quality assessment criteria outlined in **Section 8.1.1** to provide an air quality impact assessment for the

normal operation of the proposed CPWE remediation project. The results for the abnormal operating conditions have informed the PHA and the HHIA for this project (refer **Section 8.8** and **Section 8.9**).

Eighteen discrete receptor locations were used to assess predicted pollutant concentrations at nearby sensitive locations including:

- Receptor 1: Botany Golf Course (334,854 mE, 6,240,740 mN)
- Receptor 2: Banksmeadow Primary School (334,404 mE, 6,241,541 mN)
- Receptor 3: Garnet Jackson Reserve (334,554 mE, 6,242,240 mN)
- Receptor 4: Pagewood Primary School (335,054 mE, 6,242,840 mN)
- Receptor 5: Botany Athletic Centre Grandstand – Hensley Athletics Field (335,759 mE, 6,242,258 mN)
- Receptor 6: Botany Athletic Centre Running Track – Hensley Athletics Field (335,764 mE, 6,242,334 mN)
- Receptor 7: Denison Street north (335,954 mE, 6,241,891 mN)
- Receptor 8: Denison Street north 2 (335,954 mE, 6,241,891 mN)
- Receptor 9: Denison Street south (336,004 mE, 6,241,440 mN)
- Receptor 10: Guides Hall (335,954 mE, 6,240,840 mN)
- Receptor 11: Retirement Village (336,454 mE, 6,243,080 mN)
- Receptor 12: Our Lady of the Annunciation School (336,259 mE, 6,242,505 mN)
- Receptor 13: Marist Brothers High School (336,459 mE, 6,242,325 mN)
- Receptor 14: Childcare Centre (336,569 mE, 6,242,005 mN)
- Receptor 15: St Agnes Primary School (336,699 mE, 6,240,990 mN)
- Receptor 16: South Sydney High School (336,809 mE, 6,242,555 mN)
- Receptor 17: Matraville Primary School (336,449 mE, 6,241,395 mN)
- Receptor 18: Kelloggs (food manufacturing plant) (334,707 mE, 6,242,125 mN)

The location of these receptors is shown in **Figure 14**. Sensitive receptors were selected at locations where children and the elderly are expected to be present for significant periods of time. The dispersion modelling study was undertaken using the CALPUFF dispersion model and included the proposed emissions from the CPWE, along with existing emissions sources located within the BIP. Regional background levels of criteria pollutants such as NO_2, PM_{10} and SO_2 were also included based on data collected by the DEC at the Randwick monitoring site.

The maximum predicted GLCs from all predictions at discrete receptors for each pollutant were calculated for each of the five modelling scenarios. The highest of the maximum predicted concentrations are shown in **Table 8-7** to **Table** 8-8**.**

Table 8-7: Highest predicted maximum GLCs at discrete receptors for SO_2, NO_2, PM_{10}, CO, HF and TSP for the Baseline, Normal, and Upset Condition (loss of natural gas supply, 1-hr average) scenarios

Pollutant	Averaging Period	NSW DEC Guideline (µg/m3)	Maximum Predicted GLCs at Discrete Receptors (µg/m3)					
			Baseline		Normal		Upset	
			Exc. Back.a	Inc . Back.b	Exc. Back.a	Inc . Back.b	Exc. Back.a	Inc . Back.b
SO_2	10 minute	712	98	183	115	183	113	183
	1 hour	570	68	128	81	128	79	128
	24 hour	228	16	26	16	26	N/A	N/A
	Annual	60	1.3	4.7	2.8	6.1	N/A	N/A
NO_2	1 hour	246	92	215	225	259	225	259
	Annual	62	3.9	27	14	59	N/A	N/A
PM_{10}	1 hour	N/A	1.0	116	82	117	76	117
	24 hour	50	0.20	36	21	42	N/A	N/A
	Annual	30	0.030	18	3.5	22	N/A	N/A
CO	15 minute	100,000	21	N/A	92	N/A	92	N/A
	1 hour	30,000	16	N/A	70	N/A	70	N/A
	8 hour	10,000	5.3	N/A	30	N/A	N/A	N/A
HF	1 hour	N/A	0.88	N/A	8.7	N/A	9.0	N/A
	24 hour	2.9	0.19	N/A	2.7	N/A	N/A	N/A
	7 days	1.7	0.09	N/A	1.1	N/A	N/A	N/A
	30 days	0.84	0.035	N/A	0.7	N/A	N/A	N/A
	90 days	0.5	0.025	N/A	0.5	N/A	N/A	N/A
TSP	1 hour	N/A	N/A	N/A	379	N/A	379	N/A
	Annual	90	N/A	N/A	14	N/A	N/A	N/A

a. Excluding background

b. Including background

c. It should be noted that the maximum predictions shown in the table vary spatially and with time. The maximum predictions when background concentrations are included can be at different location to the maximum predictions for the same operating scenario when background is not included.

Table 8-8: Highest predicted maximum GLCs at discrete receptors for the Toxic Air Pollutants for the Baseline, Normal, and Upset Condition (loss of natural gas supply, 1-hr average) scenarios

Pollutant	Averaging Period	NSW DEC Guideline ($\mu g/m^3$)	Maximum predicted GLCs at discrete receptors ($\mu g/m^3$)		
			Baseline	Normal	Upset
EDC	1 hour	70	0.17	0.17	0.17
	Annual	N/A	0.0069	0.0069	N/A
HCl	1 hour	140	2.6	9.5	8.0
VCM	1 hour	24	0.27	0.27	0.27
	Annual	N/A	0.010	0.01	N/A
Dioxins	1 hour	2×10^{-6}	2.4×10^{-8}	2.4×10^{-8}	8.6×10^{-8}
	Annual	N/A	4.5×10^{-10}	7.3×10^{-10}	N/A
Cd	1 hour	0.018	0.00062	0.0036	9.7×10^{-4}
Cl_2	1 hour	50	0.013	1.5	1.3
Hg	1 hour	1.8	0.0049	0.27	0.30
	Annual	N/A	8.9×10^{-5}	0.01	N/A
H_2SO_4	1 hour	18	0.93	18	14.4
PCE	1 hour	3,500	38	38	38
	Annual	N/A	1.1	1.1	N/A
$CHCl_3$	1 hour	900	0.24	0.24	0.24
	Annual	N/A	0.0050	0.0082	N/A
CM	1 hour	1,900	N/A	0.0023	0.004
	Annual	N/A	N/A	1.7×10^{-4}	N/A
DCM	1 hour	3,190	0.0031	0.0036	0.01
	Annual	N/A	5.6×10^{-5}	9.3×10^{-5}	N/A
1,1,2-TCA	1 hour	1,000	N/A	0.0053	0.49
	Annual	N/A	N/A	2.8×10^{-4}	N/A
TCE	1 hour	500	1.1	1.1	1.1
	Annual	N/A	0.038	0.04	N/A

Table 8-9: Highest predicted maximum GLCs at discrete receptors for the Other Modelled Pollutants for the Baseline, Normal, and Upset Condition (loss of natural gas supply, 1-hr average) scenarios

Pollutant	Averaging Period	Maximum Predicted GLCs at Discrete Receptors ($\mu g/m^3$)		
		Baseline	Normal	Upset
HCBD	1 hour	0.025	0.24	13
	Annual	7.4×10^{-4}	0.01	N/A
OCS	1 hour	N/A	4.02×10^{-4}	0.102
	Annual	N/A	1.64×10^{-5}	N/A
HCB	1 hour	2.0×10^{-4}	2.95×10^{-3}	0.069
	Annual	$6.0\text{x}10^{-6}$	1.26×10^{-4}	N/A
HCE	1 hour	2.7	2.7	2.7
	Annual	0.10	0.10	N/A
DCA	1 hour	N/A	7.86×10^{-4}	0.015
	Annual	N/A	6.44×10^{-5}	N/A
1,1 DCE	1 hour	0.405	0.405	0.040
	Annual	0.0014	0.0014	N/A
1,2 DCE (cis)	1 hour	N/A	0.01	0.033
	Annual	N/A	7.77×10^{-4}	N/A
1,2 DCE (trans)	1 hour	N/A	0.001	0.014
	Annual	N/A	8.17×10^{-5}	N/A
PER	1 hour	N/A	1.13×10^{-4}	3.38×10^{-3}
	Annual	N/A	4.66×10^{-6}	N/A
PCB	1 hour	N/A	1.52×10^{-5}	1.00×10^{-4}
	Annual	N/A	6.01×10^{-7}	N/A

Table 8-10: Highest predicted maximum GLCs at discrete receptors for the Upset Condition (loss of natural gas supply, 15-minute average) scenario

Pollutant	Averaging Period	Maximum Predicted GLCs at Discrete Receptors (µg/m³)
		Upset Condition (15 minute average)
SO_2	15 minute	96
NO_2	15 minute	297
PM_{10}	15 minute	108
CO	15 minute	92
Cl_2	15 minute	0.6
EDC	15 minute	0.22
HCl	15 minute	5.0
VCM	15 minute	0.36
Dioxins	15 minute	3.9×10^{-7}
Cd	15 minute	9.8×10^{-4}
HF	15 minute	4.3
Hg	15 minute	0.4
H_2S	15 minute	0.01
H_2SO_4	15 minute	12.9
HCBD	15 minute	68
OCS	15 minute	0.5
HCB	15 minute	0.35
PCE	15 minute	50
HCE	15 minute	3.6
$CHCl_3$	15 minute	0.3
CM	15 minute	0.01
DCA	15 minute	0.08
EDC	15 minute	0.22
1,1 DCE	15 minute	0.06
1,2 DCE (cis)	15 minute	0.15
1,2 DCE (trans)	15 minute	0.07
DCM	15 minute	0.07
PER	15 minute	0.02
1,1,2-TCA	15 minute	2.6
TCE	15 minute	2.1
TSP	15 minute	501
PCB	15 minute	5.3×10^{-4}

Table 8-11: Highest predicted maximum HCl GLCs at discrete receptors for the Upset Condition (acid gas scrubber failure) scenario

Pollutant	Averaging Period	Highest predicted maximum GLC's at discrete receptors (uq/m3) Upset Condition (acid gas scrubber failure)
HCl	15 minute	327
	1 hour	247

Based on the emissions and modelling parameters outlined above (and in further detail in **Appendix E**), the DEC air quality assessment criteria are anticipated to be met for most of the pollutants that were assessed. The exceptions are discussed below.

- Nitrogen dioxide: The long-term (annual average) NO_2 assessment criterion is predicted to be met at the discrete receptors for the normal operating scenario. The maximum predicted annual average NO_2 concentration at the discrete receptors (including background concentration and the contribution from other existing sources at the BIP) was 95% of the DEC guideline. However, the short term (1-hour average) was predicted to be 105% of the guideline. Iterative modelling has shown that the maximum prediction for the hourly average that causes a breach of the guideline is influenced more by other sources on the BIP and background NO_2. Considering that this assessment has been performed based on conservative assumptions, the predicted impacts are considered to be over-predicted. Hence it is assumed that emission rates used in this study would provide a reasonable maximum permissible rate that is protective of air quality.
- Hydrogen fluoride (HF): The original dispersion model was run using the stack concentration limit to determine the mass flux at the stack. The predicted GLCs exceeded the relevant DEC guidelines for HF. Therefore the modelling was analysed to determine the required emission rates to meet the air quality criteria. The emission rate provided in this study is therefore maximum permissible rate that is predicted to meet the criteria. The stack concentration limit was assumed in the absence of any historical data to predict a stack concentration. Because there is no significant fluoride source in the CPWE and based on the results of stack testing on the Allied Feeds site, fluoride emissions are not predicted to be an issue.
- Sulphuric acid (H_2SO_4): The dispersion model was run using a high side stack concentration based on the results of the treatability trials and testing. The predicted GLCs exceeded the relevant DEC guidelines for H_2SO4 so the modelling was analysed to determine the required emission rates to meet the air quality criteria. The emission rate provided in this study is therefore a maximum permissible rate that is predicted to meet the criteria. Modelling using average parameters indicated that the concentration limit is achievable. However there is some uncertainty related to the amount of sulphur liberated from the soil, the partitioning between SO_2 and SO_3 in the thermal oxidiser and conversion to H_2SO_4 in the scrubber. This issue will be evaluated during commissioning trials and further emission controls installed if required, to minimize emissions.
- Mercury and Total Metals: There is uncertainty regarding compliance with Hg stack concentrations and GLCs. This is also reflected in predicted aggregate metal stack concentrations and GLCs, solely because aggregate

metals includes Hg. The Hg is associated with bottom ash from coal-fired boilers and represents a concentrated residue from naturally occurring inorganic Hg. The uncertainty arises mainly because the amount of Hg actually removed during processing in the rotary dryer varies with soil treatment temperature (about 50% at 350°C and about 100% at 450°C), and the extent to which the Hg would be captured in the ECS is unquantifiable. Little is known about partitioning of Hg between its forms (particle bound, elemental and oxidised) in the ECS, though the presence of carbon (from ash in the soil) and chlorine (from contaminants) tends to reduce the amount of Hg in the stack. In the absence of definitive data the modelling was undertaken using average soil concentrations and "worst case" removal efficiencies (100% removal in the rotary dryer and 0% removal in the ECS). Although the predicted stack concentrations are exceeded by a factor of five in the worst case, the resultant GLCs are still acceptable by a factor of six when compared against the ambient air criteria for inorganic Hg, which is the form that any Hg emitted from the plant would exist. The extent to which Hg can be controlled will be evaluated during commissioning trials, and further emission controls installed, if required, to minimise emissions.

Two abnormal operating scenarios have been identified. These scenarios assess short-term abnormal events. The modelling results for these scenarios have been assessed in the HHIA and the PHA for this EA. In addition, where DEC air quality impact assessment criteria do not exist for pollutants in this study, the modelling results have been assessed in the HHIA.

Based on the results of the modelling study as described above, under normal operating conditions, the maximum emissions from the proposed CPWE remediation are not predicted to have a significant impact on air quality in the surrounding area. It is also noted that this assessment has been based on the minimum performance specifications and they therefore represent potential maximum impacts.

In addition, the proposed remediation operations would only exist for a temporary period until the CPWE remediation works are completed. When remediation is completed, emissions from the works will no longer exist and any volatilisation of chlorinated organic compounds from the existing CPWE will have been removed.

Odour

Potential odour impacts associated with the proposed remediation of the CPWE may be caused by the release of odours and vapours from the exposure of contaminated materials during excavation and handling.

Odour was assessed at the Site by comparing the predicted concentrations of modelled odorous compounds against reported odour thresholds, or detection limits (refer **Table 8-12**). The air quality impact assessment involved no odour sampling, so should only be relied on as a screening analysis. Although all the chlorinated organic compounds have been assessed, it is possible that the modelling did not include other compounds or combinations of compounds that are 'unknown' to exist in the CPWE but may be responsible for objectionable offsite odour. Therefore there is a chance that the results presented here underestimate the odour impacts.

Eighteen volatile chlorinated organic substances were modelled for the CPWE remediation works and the resulting peak GLCs were compared to odour threshold values from literature.

Table 8-12: Predicted Odour Concentrations of Volatile Chlorinated Organic Compounds

Pollutant	Abbreviation	Odour Concentration (Max GLC / Min Threshold)
Hexachlorobutadiene	HCBD	0.017
Tetrachloroethylene	PCE	0.297
Hexachloroethane	HCE	0.042
Chloroform	$CHCl_3$	0.0024
Chloromethane	CM	2.0×10^{-06}
1,1-Dichloroethane	1,1-DCA	5.7×10^{-07}
1,2-Dichloroethane	EDC	2.0×10^{-04}
1,1-Dichloroethylene	1,1-DCE	1.6×10^{-06}
cis-1,1-Dichloroethylene	1,2-DCE (cis)	5.8×10^{-07}
trans-1,1-Dichloroethylene	1,2-DCE (trans)	6.1×10^{-04}
Methylene Chloride	DCM	4.4×10^{-05}
1,1,2-Trichloroethane	1,1,2-TCA	1.1×10^{-06}
Trichloroethylene	TCE	6.6×10^{-03}
Vinyl Chloride Monomer	VCM	1.3×10^{-03}
Sum		0.37

This analysis could not find any odour threshold values for four of the compounds and these were excluded from this study on the basis that it can be assumed that these excluded compounds are not particularly odorous (since no odour threshold data for them exists) and therefore do not contribute significantly to the overall odour impacts.

Of the other fourteen chlorinated organic compounds, PCE is predicted to be the most likely to cause odour, accounting for 80% of the total impact. However, it should be noted that the predicted odour concentration from PCE is very low at 0.30 ou compared to the relevant DEC odour guideline of 2 ou.

The cumulative effect of all eighteen volatile chlorinated organic compounds can be estimated as having a maximum impact of 0.37 ou, which is well within the DEC guideline. Combined with other conservative elements in the analysis, such as the assessment of the upset condition (loss of natural gas supply - 1 hour average) scenario and application to maximum GLCs, the result indicates that off-site odours from these emissions are unlikely to be detectable at any time.

Dust

Dust emissions from the construction phases of the project would not be expected to result in off-site nuisance impacts. The construction periods for dust generating activities are relatively short, access roads are sealed and the Site is compact. Dust mitigation measures would be specified in the Construction Environment Management Plan (CEMP) for the CPWE remediation project to minimise the potential for any emissions from construction activities.

During operations, dust emissions from activities in the ESB and FSB will be contained inside those buildings, which will be operated so that airflow will pass through the ECS. Wheel-generated dust from truck and machinery movements outside of the buildings would not be expected to cause nuisance and these would be controlled by water sprays, if necessary.

8.1.3 Environmental Safeguards

Given that the emissions from the proposed CPWE remediation works result in predicted GLCs that are well below the DEC assessment criteria, there is no requirement for additional specific environmental safeguards to be implemented, above those built into the design of the ESB, FSB and DTD Plant.

These measures include the complete enclosure of excavation activities and contaminated material handling activities in the ESB and FSB. Both of these buildings incorporate an air ECS which includes dust filters and activated carbon adsorption beds.

Emissions from the DTD Plant are treated by a series of emissions control equipment prior to release to atmosphere. This typically includes a:

- Cyclone – gases from the rotary kiln pass through a hot cyclone to remove large particulate matter.
- Thermal oxidiser – the gas exiting the cyclone will be directed to a thermal oxidiser to destroy chlorinated organic compounds.
- Quench – the gas exiting the thermal oxidiser is partially quenched in a refractory lined evaporative cooler to prepare the emissions for the baghouse, but to avoid condensing acid gases.
- Baghouse – a pulse jet baghouse is used to capture particulate matter and metals. A particulate matter emission concentration of < 30 mg/Nm^3 corrected to 11% oxygen is expected to be achieved. If required, activated carbon may also be blown into the baghouse to coat the fabric filters and assist with removal of Hg that is present in the feed soil. The need for this additional control technology will not be known with certainty until commissioning trials have been completed, but provision will be made for the necessary hardware.
- ID fan – an induced draft fan is used as the prime mover to pull gases through the system and exhaust it to the scrubber.
- Acid gas scrubber – the gas exiting the ID fan is directed to a packed scrubber, which neutralises acid gases (i.e. HCl and SO_2).
- Stack- The scrubber gas exhausts to the stack.

These control measures for the DTD Plant have been further detailed in **Appendix E** to this EA.

Dust emissions from the construction phase of the project would not be expected to result in off-site nuisance impacts. Dust control measures would be implemented during construction and operation to ensure that dust emissions are maintained at an acceptable level. In order to minimise potential impacts on air quality associated with dust emissions during the construction and operation periods, the following measures would be included as part of the CEMP:

- Consideration will be given to stopping work when wind speeds cause visible dust emissions;
- Soil mounds will be treated with surface binding agents or sealed by seeding or surfacing with vegetation or covered with secured tarpaulins;
- Stockpiles will be of the minimum practicable height and will be located away from the Site boundary, if feasible;
- Access to the CPWE site will be via sealed roadways;

- Any particles potentially generated during the erection of boundary fences, barriers and screens will be suppressed using water;
- Land preparation activities will be controlled using water suppression, if necessary;
- Areas of disturbed soil will be minimised during the construction period; and
- Water may be used to suppress dust emissions during dry windy periods (as required).

8.1.4 Residual Impacts

The proposed remediation of the CPWE is not expected to result in any significant residual impacts associated with air quality, provided that emissions are kept below those modelled in the air quality impact assessment undertaken in respect of the proposal. The emission rates in this assessment are predominantly based on worst-case assumptions in order to provide a conservative assessment. Potential residual impacts associated with dust emissions during construction will be minimised through the implementation of environmental safeguards, and will be of a temporary nature.

A monitoring program would be designed for each of the ESB, FSB and DTD Plant stacks to include measurement of the exhaust gas temperature, flow rate, oxygen concentration (DTD Plant only) and moisture content in order to enable the calculation of pollutant emission rates corrected to dry conditions at specified O_2 contents as per agreed standards. Stacks would also be fitted with sampling port(s) in accordance with Australian Standards and safe access provided for stack sampling.

An ambient monitoring program may also be conducted to ensure that fugitive emissions are controlled and unacceptable impacts are not experienced off-site.

8.1.5 Conclusion

Dispersion modelling undertaken for the proposed CPWE remediation has demonstrated that under conservative pollutant emission rates and meteorological conditions, all pollutant concentrations are predicted to be below the DEC assessment criteria for all sensitive receptors surrounding the BIP. Residual impacts associated with dust emissions will be of a minor and temporary nature, and are not likely to pose a significant constraint on the proposal.

8.2 Noise

8.2.1 Introduction

Noise emissions from the BIP are licensed by the DEC, with Orica's noise emissions being controlled by EPL No. 2148.

The Conditions within this Licence pertaining to noise have been negotiated with reference to the *NSW Industrial Noise Policy* (INP) and are primarily concerned with the impact upon nearby residences. The nearest residential sensitive receivers are primarily located to the east of the CPWE across Denison Street. Other potential receivers include residences located to the west which are shielded from the Site by other industrial buildings, nearby industry primarily within the BIP such as Qenos, and Hensley Athletics Field - an active recreational area.

Orica has elected to ensure that noise associated with the proposal, including construction and operational noise, is controlled such that the total noise from the BIP meets the appropriate

licence condition regardless if the noise falls into the 'construction' or 'operational' category. In this regard, noise emissions at nearby residences, primarily directly across Denison Street should be 10dBA below the current EPL requirements, which are based on 'acceptable' amenity levels ($L_{Aeq\ (period)}$ dBA) for an Urban/Industrial Interface over the whole day, evening or night period.

This is considered to represent a conservative approach, which is over and above the usual requirements of the INP, where the background noise levels are determined and criteria developed based on the Rating Background Level (RBL) of the area. Orica is committed to minimising the impact of the project, especially to nearby residences and therefore this more stringent approach has been taken. This is a conservative approach and would ensure that the "new" noise resulting from the proposed works does not result in exceedances of the Noise Limits within the EPL.

8.2.2 Existing Environment

The existing noise environment within the BIP is primarily dominated by various industrial activities, as well as traffic noise generated from these activities. All receivers within the BIP are subject to meeting a noise criterion of L_{Aeq} 70dBA, based on the INPs acceptable amenity levels.

Noise emissions from the BIP are required to meet appropriate licence conditions with respect to residential receivers surrounding the BIP. The nearest residential receivers are located to the east of the Site, on Denison Street. The current EPL requirements are based on acceptable amenity levels for an urban/industrial interface and apply over the day, evening and night periods. Noise emissions at these residences should therefore be 10dBA below the current EPL requirements (No. 2148), and are shown in **Table 8-13**.

Table 8-13: Noise Criteria

Location	Day	Evening	Night
	$L_{Aeq,15min}$ (dBA)		
Nearest affected receivers across Denison Street	55	45	40

Note: Where the noise source contains annoying characteristics, such as dominant low frequency content, adjustment factors as per the *INP* apply.

DEC also requires that consideration be given to the potential for sleep arousal within nearby residential receivers. The primary sleep arousal criteria adopted for this project is 63dBA L_{Amax} (based on data from long term monitoring commissioned by Orica) during the hours 10pm to 7am assessed external to a bedroom window.

Hensley Athletics Field is an active recreational area attracting a noise criterion of L_{Aeq} 55dBA (when in use) and is based on the acceptable amenity levels contained within the INP. This criterion is for industry-related noise. A project specific criterion of 45dBA (10dB below INP) has been adopted. This approach will ensure that project related noise does not result in exceedances of the noise limits within the EPL.

8.2.3 Potential Impacts

Construction and Operation

The proposal will involve periods when both construction and operational noise will occur simultaneously, and it is appropriate to ensure that all noise is controlled such that the total noise from the BIP meets the appropriate licence conditions. Appropriate operating scenarios

were developed for all time periods to assess the potential impact of noise during both construction and operation.

To predict the worst case noise levels at typical stages over the duration of the project, the following scenarios have been considered. The worst case noise levels are likely to be experienced during times where both temperature inversions and wind are present. The most significant meteorological effect during the daytime and evening periods is usually wind. At the BIP, some minor presences of temperature inversions during the day and evening periods have been included in the model.

Scenario 1
This scenario involves preparation and erection of the ESB and FSB as well as site sheds etc. A sub scenario involving sheet piling is also considered. The requirement for sheet piling will not be known until the depth of the contaminated material is confirmed.

Scenario 2
This scenario involves the excavation of material from within the ESB, course screening and transfer of contaminated material to the FSB via haul trucks. The DTD Plant would be fully operational with treated material moved and stockpiled using a front end loader. The WTP and two emission control systems have been considered.

A sub scenario involves the treatment of soil using the DTD Plant during the night-time period. Both emission control systems have been assumed to be operating.

Scenario 3
This scenario involves the activities occurring towards the end of the project associated with decommissioning together with the process of moving the treated soil from the stockpiles to the car park using haul trucks. A bulldozer and vibrating roller will be used to reinstate the soil.

Scenario 4
This scenario involves the activities occurring towards the end of the project, associated with decommissioning.

The acoustic impact from plant items likely to be used during each scenario has been assessed through the sound power level (SWL) of each item. **Table 8-14** summarises the plant used during each scenario together with its respective SWL and other data such as number of items and source height.

Table 8-14: Sound Power Levels for Each Scenario

Plant / Equipment Item	Sound PowerLevel ($L_{Aeq,15min}$ (dBA))	Source Height (m)	Comments
Scenario 1 – Daytime			
Various power tools, crane and lifts	100	4	3 simultaneous source locations considered
Scenario 1b – Daytime			
Scenario 1 and driven sheet piling	120	6	Noise dominated by piling. Likely to attract a penalty of up to 5dBA for impulsiveness
Scenario 2 – Daytime			
FSB – Day/Evening	101	8.5	
ESB –Day/Evening	101	8.5	

Plant / Equipment Item	Sound PowerLevel ($L_{Aeq,15min}$ (dBA))	Source Height (m)	Comments
ESB - ECS (stack tip)	104	30	
ESB - ECS (fan)	105	2	
FSB - ECS (stack tip)	104	30	
FSB - ECS (fan)	105	2	
DTD (fan)	117	2	
DTD (@ height)	106	10	
DTD (stack tip)	92	30	
WWTP	95	3	
Loader	107	2	
Scenario 2 – Evening/Night			
FSB	97	0.5	
ESB - ECS (stack tip)	104	30	
ESB - ECS (fan)	105	2	
FSB - ECS (stack tip)	104	30	
FSB - ECS (fan)	105	2	
DTD (fan)	117	2	
DTD (@ height)	106	10	
DTD (stack tip)	92	30	
Scenario 3 – Daytime			
Various Hand Tools/ Crane	100	4	
10T Roller	107	2	
Water Cart	107	2	
D6 Dozer	107	2	
Haul Truck	98	2	
Scenario 4 – Daytime			
Various power tools, crane and lifts	100	4	3 simultaneous source locations considered

Note: Activities defined as 'construction' will occur 7:00 and to 6:00pm on weekdays and 8:00am to 1:00pm Saturdays. No construction work is to occur in the evening or night-time periods or on Sundays or Public Holidays.

Unmitigated noise levels at the nearby receivers during all time periods considering neutral meteorological conditions and adverse meteorological conditions that are typical to the area were calculated, and are presented below in **Table 8-15**. Calculations have been made to the closest and most affected residences across Denison Street, just south of Wentworth Avenue. These residences are between approximately 200 m (from ESB) and 300 m (from DTD Plant and other associated plant). Other residences are located at least twice this distance and therefore would be subject to noise levels at least 6dBA lower than the closer residences.

Noise predictions to the nearest and most affected buildings within the BIP (predominantly the offices of Qenos and ABB) as well as an assessment of the impact to Hensley Athletics Field have also been undertaken. The location of noise receptors included in the assessment is shown in **Figure 15**.

Table 8-15: Summary of Calculated Unmitigated Noise Levels to Receivers during the Daytime and Evening Periods

Receiver	Scenario	Calculated Noise Level $L_{Aeq,15min}$ (dBA)			Noise Criteria $L_{Aeq,15min}$(dBA)	
		Meteorological Condition				
		Neutral	Adverse			
		Daytime/Evening	Daytime	Evening	Daytime	Evening
Denison St Residences (North)	1	42	42	-	50	45
	1a	68	68	-		
	2	47	48	49		
	3	38	38	-		
	4	36	36	-		
Hensley Playing Field	1	55	55	-	45	
	1a	82	82	-		
	2	48	49	-		
	3	46	46	-		
	4	55	55	-		
Qenos Building	1	48	47	-	60	
	1a	73	73	-		
	2	57	57	-		
	3	50	50	-		
	4	50	50	-		
ABB Building	1	54	54	-	60	
	1a	53	53	-		
	2	56	56	-		
	3	55	55	-		
	4	55	55	-		

Note: The predicted noise levels for Scenario 1a include a 5dBA penalty for impulsiveness.

The above table shows that, with respect to the residential receivers, the daytime goals are met unless sheet piling is required. During the evening a 2dBA exceedance is predicted under neutral conditions, increasing to 4dBA when considering adverse weather conditions.

The predicted noise levels within Hensley Athletics Field exceed the goal for each of the scenarios.

The daytime noise criteria are met for nearby industrial receivers within the BIP, with the exception of the noise impinging on the Qenos office building façade should sheet piling be required.

During the night time period (10 pm to 7 am) the noise criteria of 40dBA is exceeded by 9dBA during adverse weather conditions, which act to enhance noise emissions from the proposed works to the nearby residential receivers. This is shown in **Table 8-16.** As such mitigation measures will be required.

Table 8-16: Summary of Calculated Unmitigated Noise Levels to Receivers during the Night-time Period

Receiver	Scenario	Calculated Noise Level $L_{Aeq,15min}$ (dBA)		Noise Criteria $L_{Aeq,15min}$(dBA)
		Meteorological Condition		
		Neutral	Adverse	
Denison St Residences (North)	2	46	49	40

The major contributors to overall noise at night impacting upon residences include:

- Noise from the ECS fans at ground level;
- Noise from the stack tip of the ECS (from the fans);
- Possible noise radiating from the stack itself (both break out and vibration);
- Noise from the DTD Plant fans at ground level; and
- Noise from the DTD Plant at a height including:
  - Baghouse;
  - Thermal oxidiser;
  - Ductwork; and
  - Rotating Drum (rotary dryer).

In order to meet the 40dBA night time goal, the following reductions in noise emissions are required:

- A reduction of at least 10dBA from each of the ECS and DTD Plant fans (discharge side);
- A reduction of at least 12dBA from each of the ECS and DTD Plant fans (intake and case radiated); and
- A reduction of nominally 6 to 10dBA is likely to be required from all processes/plant at a height.

Vibration

The impact of vibration to sensitive receivers has also been assessed. The principal impact resulting from vibration would occur during Scenario 1 if sheet piles were required along Corish Circle. The next major source of vibration would be the use of a vibratory roller during Scenario 3.

Although perceptible, it is unlikely that these two vibration sources will exceed the required guideline levels (with reference to the DEC Guideline Assessing Vibration: 'a technical guideline' and British Standard 6472-1992) to the nearby industrial buildings. The risk of building damage (with reference to German Standard 4150-1999 Part 3) is considered low.

Wilkinson Murray has insufficient information regarding the 'vibration limits' at Qenos, however discussion of the history of vibration events that have occurred at a closer distance than the work proposed as part of this project, the impact will be low and likely to be acceptable to Qenos.

It is possible that the vibration levels from these two sources, could, at times be perceptible at the residences, however are unlikely to cause adverse reactions for residents (provided they are well informed). The risk of building damage is considered very low.

Once operational, all rotating plant items of the DTD Plant will be required to be correctly aligned and balanced. It is therefore unlikely that vibration levels will be perceptible by receivers from the operation of the DTD Plant itself.

Given the low risk associated with vibration impacts (both annoyance and structural damage) a detailed vibration assessment is not deemed necessary. However, monitoring is recommended prior to works that will generate significant vibration, particularly near plant associated with Qenos.

Road Traffic Noise
All sensitive receivers surrounding and within the BIP are impacted by existing road traffic noise from surrounding arterial roads, including Denison Street, Foreshore Road and Wentworth Avenue. Existing road traffic movements were last surveyed by the RTA in 2002 with Annual Average Daily Traffic volumes (AADT) of typically 10,000 to 30,000 vehicles on these nearby arterial roads. The vast majority of the road traffic is through traffic and not related to any of the proponents of BIP.

All traffic movements entering and exiting the Site during both construction and operation will be via Denison Street. Traffic flows of less than 100 vehicles are anticipated during the busiest initial construction period, with flows reducing significantly during operation of the remediation facility. Of these 100 vehicles, less than 1% would be heavy vehicles. Using the DEC's NSW Environmental Criteria for Road Traffic Noise, traffic generating developments are allowed an increase of 2dBA, (assuming the worst case that these limits are currently exceeded) once all reasonable and feasible mitigation is considered.

The anticipated traffic volumes for both construction and operation would also coincide with peak periods. However, given the low number of vehicle movements generated by this development (only for a short period of time) and given the negligibly low risk of exceeding 0.1dB (well below the 2dB limit), a detailed assessment is not deemed necessary.

8.2.4 Environmental Safeguards

Construction and Operation
The following general mitigation measures shall be considered in the detailed design and specification of the DTD Plant in order to achieve the required noise reductions.

- ECS and DTD Plant fans (discharge side) shall be designed to achieve the required noise emissions. Silencers may also be incorporated on the discharge. This will in turn reduce the noise from the stack tips and from the stack itself;
- ECS and DTD Plant fans and motors (intake and case radiated) shall be designed to achieve the required noise emissions. Fans and motors may also be encased within an enclosure to minimise noise;
- Reduction in noise emissions from all processes/plant at a height shall be achieved through:
  - Installation of solid barriers (multiple layers of plywood) at a height (were practicable); and
  - Plant items shall be located at lower heights where possible such that shielding from the FSB can be maximised. Plant items shall be located

to the west of the DTD Plant (not facing the residences) where possible.

- A flexible connection between the fan and ductwork shall be used in the DTD Plant stack. The connection would be encased to control break out noise.
- Ductwork, including the stacks shall be acoustically lagged if required. This shall be confirmed once operational, and retrofitted if needed.

The following additional safeguards would be implemented to mitigate noise emissions in respect of the project:

- Preparation and implementation of a Construction Noise and Vibration Management Plan (CNVMP) to ensure noise level criteria are met;
- Notification to all those impacted by works likely to cause excessive vibration or noise – i.e. if sheet piling is required;
- Periodic noise and vibration testing should be undertaken during any activity associated with the proposed works that is likely to generate high noise and vibration levels;
- Consideration of the scheduling of works or inclusion of respite periods – i.e. during a major sporting event within the grounds of Hensley Athletics Field; and
- Provision of a 24 hour community hotline.

Road Traffic Noise
Primary access to the CPWE will be via Gate 3 on Denison Street. Likely routes to the site would be:

- Inbound - along General Holmes Drive, then Foreshore Road, Beauchamp Road, and then Denison Street accessing the BIP through Gate 3; and
- Outbound – exit via Gate 3, along Denison Street, Wentworth Avenue, and then Southern Cross Drive.

This approach will redistribute potential impacts with all nearby sensitive receivers due to additional road traffic movements associated with the project. It is assumed that vehicle movements would be evenly shared between the above two routes. Given the minor increase in traffic volume resulting from the proposal, noise impacts due to additional traffic volumes moving to and from the BIP are considered to be negligible.

8.2.5 Residual Impacts

Given that potential impacts with respect to noise and vibration are of a temporary and manageable nature, the construction and operation of the proposed DTD remediation facility is not expected to result in significant residual noise impacts. In considering the more sensitive residential receivers and adverse weather conditions that are typical of the Site, the predicted noise level exceeds the 40dBA noise criterion by up to 9dBA. This exceedance can be controlled with selection of the most quiet plant practical, plant positioning, acoustic enclosures, lagging, silencers and other design features.

As part of the environmental safeguards with respect to mitigating noise and vibration, periodic noise and vibration testing will be undertaken during any activity that is likely to generate high noise emissions or vibration levels.

8.2.6 Conclusion

Noise generated from the proposed project would occur during both construction and operation. Upon implementation of the environmental safeguards, potential noise impacts are not anticipated to pose constraints to the construction and operation of the proposed remediation facility.

A CNVMP should be developed and implemented to ensure noise level criteria are met. The CNVMP should also address vibration, in particular from the use of a sheet piling rig (if required) and later a vibration roller, so that the noise vibration levels to nearby residential receivers, sensitive receivers within the BIP and other sensitive receivers external to the BIP are managed.

8.3 Social Impacts

8.3.1 Introduction

The social impact of a proposal is the effect it may impose on people. This includes how it may alter their way of life, the character, cohesion and demography of the community or their customs and values. Social impacts may be quantitative, such as the effects on employment or population, or they may be qualitative, such as effects on the amenity of the area, the perceptions of the community towards the proposal or effects on community cohesion.

8.3.2 Local Community Profile

The CoBB local government area is located in the south eastern region of Sydney and has a population of 35,897 comprising 17,735 males and 18,162 females (2001 census, ABS).

It covers an area of approximately 22 km^2 and has a population density of some 1,700 persons per square kilometre.

The LGA is bounded by the City of South Sydney in the north (Gardeners Road), the City of Randwick in the east (Bunnerong Road) and Rockdale to the west (International Airport). The southern boundary follows the northern shore of Botany Bay and stretches to encompass Botany Bay. The CoBB LGA includes the suburbs of:

- Daceyville;
- Eastlakes;
- Mascot;
- Botany;
- Banksmeadow;
- Hillsdale;
- Eastgardens;
- Pagewood; and
- Part of Rosebery.

The characteristics of the area are largely related to the significant amount of industry and commercial activities which occupy more than half of the total land area. The City of Botany encompasses Australia's major seaport, Port Botany, and Airport, Kingsford-Smith. The LGA contains more than 65 parks and is a popular residential location.

Botany provides a significant contribution to the NSW economy, with over 2,000 companies and businesses within the area, some of which are internationally based. Botany attracts a non-residential workforce of more than 100,000 people.

As the Site is located within an industrial park, the immediate surrounding development is largely dominated by industrial uses. The nearest residential development from the subject site is approximately 300 m to the east of the CPWE, across Denison Road. A sporting oval known as the Hensley Athletics Field exists to the north east of the Site and is used regularly by the community.

8.3.3 Potential Impacts

Potential social impacts associated with the proposed remediation works primarily relate to amenity issues such as visual and noise impacts that will be generated during the remediation project. Other potential social impacts include increased traffic, and impacts associated with hazard and risks.

The DTD Plant will generate noise mostly during operation due to the large fans which form part of the Plant. As the Plant will operate 24 hours a day, noise will be most significant at night. The issue of noise is discussed in further detail in **Section 8.2**, and a noise assessment has been undertaken as part of this EA, which includes mitigation measures to minimise noise impacts on the surrounding environment (**Appendix F**).

Potential noise impacts associated with the construction and operation phases of the proposal include:

- Impacts on residential receivers in the evening during adverse weather conditions;
- Noise impacts with respect to the Hensley Athletics Field;
- Noise impacts associated with sheet piling, if required, on residential receivers; and
- Noise impinging on the adjacent industrial premises within the BIP should sheet piling be required.

The potential visual impact of the proposal relates largely to the 30 m stacks required for the ESB and FSB and the DTD Plant. Other parts of the ESB, FSB and DTD Plant structures will also be visible from certain angles, however given the nature and scale of these buildings they will integrate into the existing industrial landscape of the BIP site and will not be visually intrusive. Excavation of the CPWE material will be enclosed within the ESB and will therefore not be visible from surrounding areas.

The existing vegetation strips located on the eastern side of Corish Circle and Denison Street separate the Site from the Hensley Athletics Field and the nearest residential development. This vegetation provides some screening of the Site. If vegetation is required to be removed for the remediation works, it will be reinstated upon completion of works.

Traffic generation from the proposed remediation project will largely be internal to the BIP, with external traffic increases of less than 1% of existing traffic flows along key routes surrounding the BIP. Noise impacts associated with this additional traffic will also be minimal and largely internal to the BIP.

Given that the potential impacts of the proposal in terms of noise, visual impact and traffic are temporary and manageable, significant adverse effects upon the amenity of the surrounding area are not anticipated.

Potential impacts of the proposal in relation to hazard and risk relate mainly to the possibility of fugitive emissions as a result of a system failure. A PHA has been undertaken in respect of the proposal and concludes that the proposed works carry a low risk provided that the recommended management and mitigation measures are implemented and maintained for the duration of works (**Appendix G**). A HHIA has also been undertaken for the proposal and results indicate that the works will not pose an unacceptable risk to human health (**Appendix H**).

The primary objective of the proposal is to remove contaminants existing within the CPWE thus providing social benefits related to the prevention of further spread of contaminants to surrounding soil and groundwater, elimination of potential hazards associated with emissions to the environment from the CPWE and return of the land to a productive use in keeping with the surrounding BIP with subsequent improvements in the general amenity of the local area. These social benefits are considered to outweigh the temporary potential impacts associated with the proposed works.

8.3.4 Environmental Safeguards

The detailed noise assessment identified that a reduction of 10dBA from the noise associated with the fans is required to minimise potential noise impacts on nearby residences in the evening. Specific acoustic attenuation measures will be built into the detailed design of the DTD Plant and associated operations to ensure that noise from the Site is maintained at an acceptable level. This may include the housing of fans within purpose built enclosures and/or the incorporation of silencers. These measures are detailed in **Section 8.2** of this EA and in **Appendix F**. Other mitigation measures to be implemented with respect to noise impacts include:

- Advanced notification to all receivers likely to be impacted by excessive vibration and noise (particularly if sheet piling is required); and
- Careful planning of the scheduling of works with consideration to major sporting events taking place at the Hensley Athletics Field to ensure the event is not significantly impacted upon by noise associated with the proposed works.

Potential visual impacts associated with the proposal are likely to be minimal as the proposed remediation facility will be viewed in the wider context of the BIP. Excavation will occur within an enclosed building (the ESB), and therefore will not be visible. Existing vegetation on the eastern side of Corish Circle would provide some screening from Hensley Athletics Field and soil stockpiles surrounding the DTD Plant will provide for further screening. A landscaped mound will be reinstated along the eastern boundary of the CPWE site with Corish Circle to preserve the existing outlook across to the site from Hensley Athletics Field and nearby residential development.

In order to minimise potential traffic impacts on the community associated with the proposal, a Traffic Management Plan (TMP) will be prepared, which will address issues including site access, workforce car parking and unloading areas, and haulage routes, each incorporating existing BIP traffic management procedures. As traffic generation will predominantly be internal to the BIP, there will be minimal appreciable change in traffic volumes on local road networks during operation and construction.

Potential impacts associated with hazard and risk identified in the PHA were primarily limited to the BIP. The PHA identified management and mitigation measures aimed at reducing the likelihood and/or consequence of an incident which are discussed in detail in **Section 8.8**, and include design aspects of the DTD Plant and the preparation and implementation of an ERP.

In order to further minimise general disturbance to the local community as a result of the proposal, consultation will be undertaken over the duration of the remediation project. Consultation with the community will be detailed in a Community Liaison Plan which will be prepared for the project. The Plan shall include the following key components:

- A database shall be prepared identifying all key stakeholders in the proposed remediation works. Over the course of the project, the database shall be updated regularly and will be used to document communications with key stakeholders and interested parties.
- Appropriate communications tools will be used to distribute information to identified stakeholders prior to establishment of works at the CPWE. The tools shall contain information relating to the proposed CPWE remediation works, a project program showing the anticipated duration of works, opportunities for key stakeholder participation and contact details for more information.
- Regular meetings, focusing solely on the remediation of the CPWE, will be held to disseminate information on the progress of the works including information on incidents, issues and operational conditions, and be attended by technical specialists, where necessary, to address any specific concerns or issues that may arise. These meetings will be open for anyone to attend.
- The CPRC will continue to be a key stakeholder during the project and project information will be provided and discussed with the Committee.
- Newsletters shall be prepared and distributed to key stakeholders to communicate project information. The newsletters shall provide an avenue for communicating specific information on the progress of the remediation works where appropriate. Feedback on the information shall be collected via the consultation methods described above.
- A dedicated 24-hour 1800 telephone number/service shall be established to answer queries on the project and to receive comments and shall be available throughout the duration of the project.
- A notice board shall be posted at the main site entrance containing information about the project and contact details.
- Information about the project shall be posted on the web. The website shall be advertised to key stakeholders and regularly updated

A procedure would be developed for the appropriate recording and corrective action of complaints received from the community during the undertaking of the remediation works.

8.3.5 Residual Impacts

Potential residual impacts associated with the proposal include:

- A minor increase in traffic of less than 1%;
- Occasional noise impacts if sheet piling is required;
- The possibility of fugitive emissions as a result of a system failure; and
- Visual impacts associated with stacks and buildings on the Site.

The minor increase in external traffic will not result in ongoing impacts upon traffic in the area. If sheet piling is required, advance notification to potential noise receivers will be carried out in order to minimise disturbance during this phase of the project. The possibility of fugitive emissions resulting from system failure is considered highly unlikely to occur and emergency response measures will be put into place to ensure these impacts are minimised. The visual

impacts of the stacks and buildings will not be visually intrusive given the industrial nature of the Site and will be removed upon completion of works.

Given that the residual impacts will be short lived and temporary and in most cases are unlikely to be perceptible, they are considered to be outweighed by the benefits of the proposed remediation works.

8.3.6 Conclusion

The proposed remediation works are not expected to significantly or permanently alter the social environment in an adverse manner. It is considered that the overall social impact would be positive in that contaminated land will be remediated and returned to a suitable state for reuse, which will prevent the spread of contamination to surrounding land and groundwater and eliminate existing risks associated with the CPWE.

8.4 Land Use

8.4.1 Existing Environment

The BIP is located to the north east of Botany Bay, south of Sydney CBD within the Botany Bay LGA. The site of the proposed remediation works is the CPWE which is within the BIP. Under Botany Bay LEP 1995 the land is zoned 4(a) industrial.

The BIP occupies an area of approximately 74 hectares. It is an established industrial area which is characterised by heavy industrial land uses. Surrounding land use is illustrated in the form of a zoning plan in **Figure 16**. Land to the north, south and west of the CPWE is also within the BIP and used for industrial purposes. Land directly east of the subject site, on the opposite side of Corish Circle, is the Hensley Athletics Field, zoned for open space and used for active recreation. Further east on Denison Street are residential areas, some 300 m from the proposed remediation site.

Upon completion of the remediation works, the CPWE site is intended to be returned to productive use. The proposed project is permissible within the zone and the end use is considered to represent appropriate and efficient use of the land.

8.4.2 Potential Impacts

The proposed remediation works have the potential to impact on surrounding land uses predominately through impacts associated with amenity (noise, traffic, visual, air quality), hazard and risk.

The land uses surrounding the CPWE site are:

- Industrial;
- Recreational; and
- Residential.

Potential impacts resulting from the proposed remediation project on these land uses are discussed below.

Surrounding Industrial Land
Industrial land uses surrounding the east, south and west of the CPWE site are predominately located within the BIP site. The proposed remediation works are considered to be generally

compatible with the industrial zone of the BIP. The proposed remediation works will result in the return of the CPWE to a productive industrial use consistent with surrounding land use.

During the construction and operational phases of the project the potential exists for noise impacts upon surrounding industrial land uses. However, given the industrial nature of the surrounding area and the predicted level of noise generation, these potential impacts are not likely to be significant with the exception of noise impinging on the Olefines Administration building should piling be required.

The potential also exists for air quality impacts upon surrounding industrial developments during operation of the DTD Plant and in particular, in the event of a system failure.

Potential hazard and risk impacts are predominately limited to the boundaries of the BIP site. Potential incidents which could result in hazards include:

- Failure of emission control systems;
- Transport incidents within the BIP;
- DTD Plant incidents as a result of incomplete treatment of contaminants; and
- External events with the potential to damage the remediation facility.

The use of emission control systems and alarms would be implemented as management measures which aim to ensure that impacts during general operation are not significant. Further, in the unlikely event of a system failure, emergency response mechanisms have been incorporated into the design of the Plant to ensure that potential impacts are minimised such that they do not pose an unacceptable risk to surrounding industrial land uses. The PHA identified that risk to surrounding land uses within the BIP is considered to be low.

The material will be treated such that it meets the risk-based Remediation Goals as defined in the RAP. In addition, the Director-General's EARs noted that the following should apply to treatment of materials:

- A statistical average dioxin, furan and dioxin-like PCB WHO-TWQ of less than 1 µg/kg determined with a methodology acceptable to the DEC;
- An aggregate concentration of SCW constituents of less than 2 mg/kg; and
- A PCB concentration of less than 2 mg/kg.

The concentrations nominated in the Director-General's EARs, are more stringent than criteria currently in force in the relevant NSW CCOs. This is because they do not consider practicability (technical and economical) which is considered in the CCOs. The dioxin criterion is below that in the current dioxin CCO (1986).

It should be noted that the treatment standards nominated may not be achievable due to operational or practicability constraints. Accordingly, treatment standards to address the compounds highlighted in the Director-General's EARs, will be ultimately determined following optimisation trials in the context of practicability (technical and economical) as allowed (with the DEC's approval) in the applicable CCOs.

Once the remediation works are completed, the CPWE site will be returned to productive use, which is consistent with the intended use of the land under the Botany Bay LEP 1995.

The removal of contaminants from the soil is considered to bring benefits for the surrounding land uses through the cleanup of the land which will allow it to be returned to productive use.

Surrounding Recreational Land

The Hensley Athletics Field is situated to the east of the CPWE site and is zoned as open space. Potential impacts as a result of the proposed remediation works on the oval are primarily related to visual, air quality and noise impacts.

Potential visual impacts are associated with the stacks and associated buildings required for the ESB, FSB and the DTD Plant. Given the existing industrial use of the area, the scale and nature of the built form associated with the works will be consistent with the surrounding BIP. In addition, the structures will be temporary, with the stacks and buildings removed once the remediation project is completed. Therefore visual impacts would be short-term and temporary.

The traffic expected to be generated from the proposed remediation project will be largely internal to the BIP site with internal car parking and unloading areas provided. External traffic increases of less than 1% are expected. Therefore potential impacts associated with additional traffic resulting from the proposal are considered to be minimal and would be further managed by the proposed access route to the Site.

Potential impacts in relation to air quality relate to fugitive emissions from the ESB, FSB and DTD Plant. The air quality assessment and HHIA undertaken in respect of the project conclude that these impacts are minimal and do not pose an unacceptable risk to human health.

The PHA indicated that potential hazards associated with the works are limited to the boundaries of the BIP. The PHA concluded that the proposed works carry a low risk provided that the recommended management and mitigation measures are implemented.

The noise assessment undertaken in respect of the proposal identified that the remediation activities would not exceed the identified noise goals impacting on the Hensley Athletics Field with the implementation of the recommended mitigation measures

Surrounding Residential Land

Potential impacts of the proposed remediation works on nearby residential development are primarily related to noise, air quality, traffic, visual, noise and hazard and risk.

The DTD Plant will generate noise predominately during the operational phase due to the large fans forming part of the Plant. This noise will be most significant in the evening in the event of adverse weather conditions. The noise assessment undertaken in respect of the proposal concludes that, with the implementation of recommended mitigation measures, the noise impacts of the proposal on residential properties will not be significant.

The visual impacts resulting from the stacks and other buildings are not considered to be significant given the industrial nature of the BIP and the temporary nature of the structures. Soil stockpiles will be positioned to provide some screening during works and the CPWE site will be reinstated with a landscaped mound along the eastern boundary with Corish Circle to reinstate the existing outlook to the site.

Potential traffic impacts are considered to be minimal given that the predicted external additional traffic increases are less than 1% and that car parking and unloading areas will be provided within the BIP, and that the proposed access route to the Site will avoid the adjoining residential area.

Potential impacts in relation to air quality relate to fugitive emissions from the ESB, FSB and DTD Plant. The air quality assessment and HHIA undertaken in respect of the project conclude that these impacts are minimal and do not pose an unacceptable risk to human health.

The PHA indicated that potential hazards associated with the works are limited to the boundaries of the BIP. The PHA concluded that the proposed works carry a low risk provided that the recommended management and mitigation measures are implemented.

8.4.3 Environmental Safeguards

Potential impacts to surrounding land uses as a result of the proposed remediation project relate to amenity issues, such as noise, visual, air quality and traffic impacts as well as hazard and risk. These potential impacts would be temporary, given that the project is to be completed within an 18 month period.

Environmental safeguards proposed to minimise impacts in terms of land use include:

- DTD Plant commissioning and testing, including CPoP testing;
- Noise mitigation measures built into the design of the DTD Plant such that noise is minimised. These may include the housing of fans within purpose built enclosures and/or the incorporation of silencers;
- Advanced notification to all receivers likely to be impacted by excessive vibration and noise (particularly if sheet piling is required);
- Scheduling of works to take into consideration major sporting events taking place at the Hensley Athletics Field to ensure events are not significantly impacted upon by noise generated by the proposed works;
- Positioning of soil stockpiles to provide screening during works;
- Reinstatement of a landscaped mound along the eastern boundary with Corish Circle upon completion of works to reinstate the existing outlook to the CPWE site;
- Preparation and implementation of a TMP addressing issues such as site access, internal workforce car parking, vehicle unloading areas and haulage routes which avoid residential areas. The TMP will also incorporate existing Orica traffic management procedures; and
- An ERP for the remediation facility covering the ESB, FSB and DTD Plant operations will be developed prior to commencement of operations to minimise potential hazards associated with the works.

8.4.4 Residual Impacts

Once the environmental safeguards identified in **Section 8.4.3** have been implemented, potential residual impacts associated with the proposal on surrounding land uses include:

- A minor increase in traffic of less than 1%;
- Occasional noise impacts if sheet piling is to be required;
- The possibility of fugitive emissions as a result of a system failure; and
- Visual impacts associated with stacks and buildings on the Site.

The identified residual impacts will be temporary and are considered manageable. The removal of contaminants will provide benefits to surrounding land uses through the cleanup of the CPWE site allowing its return to a state suitable for industrial use. Given the temporary and manageable nature of the impacts, it is considered they are outweighed by the overall benefits of the proposed remediation works.

8.4.5 Conclusion

The proposed works are not expected to result in significant adverse impacts to surrounding land uses provided that the recommended safeguards are implemented. It is considered that the proposed remediation works will provide for overall environmental improvements within the BIP and the surrounding area.

8.5 Traffic

8.5.1 Existing Environment

Existing Road Network and Traffic Conditions
The Site is located within the BIP, approximately 8 km from the Sydney CBD, and is currently serviced by the existing road network surrounding the Site.

The major arterial and sub-arterial roads surrounding the Site have been designed to carry heavy commercial vehicles including B-Doubles, as well as light vehicles. Arterial roads principally form corridors for metropolitan traffic movements from one region to another, while sub-arterial roads connect arterial roads to areas of development, or from one part of a region to another.

Existing access to the CPWE is via Corish Circle. In order to minimise impacts upon nearby residents, this existing access will be closed off and access to the CPWE will be primarily via Denison Road directly east of the Site.

Existing Traffic Volumes
The Roads and Traffic Authority (RTA) publishes data on average daily flows on major roads. This information provides an indication of typical traffic conditions surrounding the project site. **Table 8-17** shows the Annual Average Daily Traffic (AADT), collected from five RTA count stations along major arterial roads surrounding the project site for a range of years.

Table 8-17: Annual Average Daily Traffic Flows

Road	Count Location	AADT#			
		1993	1996	1999	2002
Wentworth Avenue	East of Page Street	27616	28631	29563	30907
Wentworth Avenue	West of Bunnerong Road	16755	17172	19212	19644
Beauchamp Road	North of Botany Road	16682	16399	17694	17164
Botany Road	West of Beauchamp Road	25723	28064	31284	35826
Botany Road	East of Beauchamp Road (between Beauchamp Road and Bumborah Point Road)	14540	16424	19738	20331
Foreshore Road	East of General Holmes Drive	24841	21794	25166	29851

#RTA Traffic Volume Data for Sydney Region, 2002

Traffic flows along Denison Road to the east of the Site have been calculated at some 10,000 vehicles per day (north of Beauchamp Road) in previous studies undertaken in relation to the BIP (URS 2004).

Based upon the information above, the heaviest traffic volumes occur along Botany Road, Wentworth Avenue and Foreshore Road, with flows in excess of 20,000 vehicles per day.

8.5.2 Potential Impacts

Site Access
Vehicles travelling to and from the Site will be limited to employees, delivery of plant and equipment and deliveries of consumables. Primary routes to the Site would be:

- Inbound - along General Holmes Drive, then Foreshore Road, Beauchamp Road, and then Denison Street accessing the BIP through Gate 3; and
- Outbound – exit via Gate 3, along Denison Street, Wentworth Avenue, and then Southern Cross Drive.

Access routes to the secondary access point at Wight Street are as follows:

- Along Southern Cross Drive, then Foreshore Road, Beauchamp Road, Denison Street, Wentworth Avenue, Baker Street, Moore Street and then Wight Street accessing the CPWE; or
- Along Southern Cross Drive, then Wentworth Avenue, Page Street, Holloway Street, Baker Street Moore Street and then Wight Street accessing the CPWE.

The primary traffic routes to and from the Site utilise arterial roads to access the Sydney metropolitan area, therefore minimising the impact on the local road network.

Site access and key traffic routes are shown in **Figure 17**. The primary traffic routes to and from the Site utilise arterial roads to access to the Sydney metropolitan area, therefore minimising the impact on the local road network.

Site Establishment and Construction Traffic
The entire remediation project is expected to take approximately 18 months including Site establishment and construction (26 weeks), excavation and treatment (30 weeks), decommissioning and demobilisation (14 weeks) and reinstatement of the CPWE site (14 weeks). It should be noted that reinstatement of the CPWE site would be concurrent with demobilisation.

The main traffic generated during the initial Site establishment and construction period would include:

- Trucks of various sizes up to semi-trailer size making deliveries of equipment and plant such as the DTD Plant, materials for shed construction, cranes, shoring rigs, forklifts, cherry pickers and excavators. Only one such delivery is expected at any one time on the Site.
- Concrete trucks (possibly two present on the Site at any one time during construction);
- Light vehicle movements generated by employees at the Site.

There is expected to be a maximum of 45 construction personnel at any one time during the Site establishment and construction period. Construction hours would be between the hours of 7am and 6pm Monday to Friday, and 7am to 1pm Saturdays. No construction work would occur on Sundays and Public Holidays.

An assessment of additional volumes of traffic to be generated during peak site establishment and construction has been undertaken. Expected traffic volumes during this period are presented in **Table 8-18** below.

Table 8-18: Traffic Generation – Peak Construction Period

Vehicle Type	No. Movements Per Day
Heavy Vehicles	6
Light Vehicles	90
TOTAL	**96**

The combined increase in vehicle movements during the peak construction period are estimated to be equivalent to less than 1% of the existing traffic volumes on the surrounding road network. During construction hours vehicles would be accommodated within the BIP using existing parking areas for both deliveries and workforce parking, so there would be no impact on parking availability in surrounding roads. Therefore no significant impact is likely to result during the peak construction period with respect to the local and arterial road network.

Operational Traffic
Traffic generated by the proposed remediation works will be largely internal to the BIP.

The main internal traffic generating activities during excavation and soil treatment will involve the transportation of contaminated materials from the ESB to the FSB. This will be done via a fleet of three 12-tonne tip trucks, along designated internal haul roads as shown in **Figure 8**. Contaminated material is unloaded within the FSB and trucks decontaminated before returning to the ESB for the next load. It is anticipated that these trucks would operate on the Site 12 hours per day, six days per week and would be kept on-site out of operational hours for the duration of the works.

As all truck transport would occur within a limited area of the BIP and would be retained on the Site for the duration of works, it is expected that there would be no significant impact on traffic volumes within the BIP or on arterial roads surrounding the project site.

The main external traffic generating activities during the remediation works would comprise car movements related to the workforce on the Site. It is anticipated that there would be a maximum of 30 employees on the Site during the remediation works and it is assumed that all employees would travel by private car to work. This equates to a total of 60 light vehicle movements per day, equivalent to an increase of less than 1% of existing traffic volumes on the surrounding road network. This level of increase is expected to have a negligible impact upon local traffic flows.

Decommissioning and Reinstatement of Site
Decommissioning of the Site would involve the dismantling and removal of buildings and plant off-site, requiring a similar number of heavy and light vehicle movements to that experienced during the construction period.

Reinstatement of the CPWE site would generate largely internal traffic for the movement of treated soil material from stockpiles back to the CPWE. Equipment required for this may include a bulldozer which would be delivered by truck, however external traffic movements generated during this stage of the project would be well below both the construction and operational phases and would therefore have a negligible impact upon the surrounding road network.

8.5.3 Environmental Safeguards

A TMP would be prepared prior to Site establishment and construction on the CPWE. This would incorporate existing BIP traffic management procedures. The TMP would include:

- Designated Site access via Gate 3 on Denison Street for all construction and operational traffic;
- The use of existing workforce car parking and heavy vehicle unloading areas within the BIP site to ensure no impacts on the local traffic network surrounding the BIP;
- Designated haulage routes within the BIP for heavy vehicle movements (refer **Figure 8**) when transporting contaminated material from the ESB to the FSB during site operation;
- Compliance with designated speed limits and load limits specified for heavy vehicle routes; and
- Regular inspections of all implemented environmental control measures, including:
  - Inspections within the CPWE area and in the vicinity of the STA area prior to the commencement of work on each day of Site works;
  - Along haul roads and in perimeter areas outside Exclusion Zones prior to the commencement of work on the first working day of each week during the Site works; and
  - At all Site locations at hourly intervals throughout major storm events.

Vehicles travelling to and from the Site will be limited to employees during the construction and operational phases, delivery of plant and equipment during the construction phase and limited deliveries of supplies during operation. Trucks, plant and other machinery used for the remediation works would be kept on site for the duration of the project.

8.5.4 Residual Impacts

This EA has identified a number of traffic generating activities that would occur during both the construction and operational phases of the project. The construction and operation of the proposed remediation facility are not expected to result in significant residual impacts related to the generation of traffic on arterial and sub-arterial roads surrounding the Site, or within the BIP.

8.5.5 Conclusion

As there would be minimal appreciable change in traffic volumes during operation and construction, with the implementation of environmental safeguards identified in this EA, the proposed works are not expected to result in any significant traffic impacts. The use of local roads would be limited, therefore the project would not affect local traffic or parking within local streets. The predicted generation of traffic is negligible in comparison to traffic volumes on surrounding arterial roads, therefore it is expected that traffic generated would not adversely impact the operation of local road networks.

8.6 Water

8.6.1 Existing Environment

Groundwater
The CPWE is located within the Botany Basin which occupies a total area of some 80 km^2. Groundwater in the Botany Basin occurs in Quaternary unconsolidated sediments overlying impermeable bedrock of Hawkesbury Sandstone, known as the Botany Sands Aquifer.

A number of hydrostratigraphic units ranging from unconfined to fully confined are present within the Botany Sands Aquifer. Discrete high yielding layers are present within the aquifer, interconnected vertically via leakage through confining peat and clay layers, and laterally through the discontinuous geometry of the confining layers (URS 2004c).

A groundwater monitoring program has been in place at the CPWE since 1997, with some 14 monitoring events so far undertaken. Groundwater monitoring is undertaken in accordance with a requirement under Orica's EPL (No. 2148) and the recommendations of the *HCB Waste Management Plan – Groundwater Monitoring Program* (Woodward-Clyde 1997; as cited by URS, 2005b). Monitoring is now undertaken every six months until remediation starts where the EPL states that quarterly monitoring must be undertaken.

The historical inferred groundwater flow is generally in a south easterly direction towards Botany Bay which differs from the regional groundwater flow that flows in a general south westerly direction (Merrick 2004; as cited by URS 2005 and URS 2006). This variation is likely due to groundwater extraction from Qenos production bores ICI12, ICI13, ICI20, ICI23 and ICI25 located in the vicinity of the CPWE. Based upon information provided by Orica, these production bores have been active since the 1980s and are still active, producing between 1 and 2 ML/day in total (URS 2005).

Orica undertakes regular monitoring of groundwater at the CPWE and latest data from Round 14 (URS 2006) monitoring indicates that the watertable is greater than 4 m below the base of the CPWE.

The results of the groundwater monitoring indicate that volatile chlorinated hydrocarbons have been detected at low levels in the groundwater in the vicinity of the CPWE. HCBD is typically the only SVOC detected. However, HCB has also been detected at low levels in the past. These levels are not considered to pose a risk to human health or the environment.

Extensive groundwater monitoring and investigation work has also been undertaken across the BIP and in areas surrounding the BIP since the late 1980s has shown that a number of contaminant plumes are moving with the regional groundwater flow toward Penrhyn Estuary and Botany Bay, and are discharging contaminated groundwater via surface water drains, predominantly Springvale Drain, and terrestrial discharge into Penrhyn Estuary (URS 2004c).

In September 2003, the EPA (now DEC) issued the Notice of Clean Up Action (with a subsequent Variation in February 2004), requiring specific actions from Orica for the clean-up of groundwater contamination.

In response, Orica has constructed a GTP at the BIP. Although the system of groundwater treatment is still being developed, the process is generally as follows:

- Extraction of groundwater from wells installed in three containment lines across the BIP and outside the BIP;
- Transfer of groundwater through pipelines to an on-site treatment plant (GTP); and
- Transfer of treated water via pipelines to BIP users or to Bunnerong Canal and waste water to sewer.

With regard to groundwater treatment on the BIP, extensive hydrogeological modelling was undertaken to identify the required number of extraction wells, their locations, depths and extraction rates to ensure that containment of the plumes would be achieved with minimal environmental impact.

Surface Water
Surface water within the BIP is predominantly drained by Springvale Drain which flows generally north to south. The CPWE is located within the catchment area of Springvale Drain, approximately 3.9 km long, which is a largely open channel with a closed conduit in the upper and lower reaches. There are no waterways that run through the CPWE, so stormwater runoff from the bitumen surface of the car park area is the primary surface water on the Site.

The stormwater system on the Site discharges to Springvale Drain at 17 separate points. At the southern end of the BIP stormwater discharges to Springvale Drain through two pipes situated at the southern boundary of the Nant Street Tank Farm. Stormwater generated on the northern end of the BIP discharges to Springvale Drain at 15 separate points where the drain crosses the BIP. Springvale Drain discharges into the eastern end of Penrhyn Estuary, south of the BIP.

The discharge point for Springvale Drain is Penrhyn Estuary, which is a relatively small, man-made waterway, created as a result of the development of Port Botany in the late 1970s. The Estuary is characterised by a sandflat area, with a separate channel from each of the discharge points meeting midway within the system to form a single channel. The water quality in this area is primarily affected by inflows from the tide from Botany Bay, by surface water runoff from the Floodvale and Springvale Drains and groundwater discharge at the inter-tidal discharge zone.

8.6.2 Potential Impacts

Groundwater
The proposed remediation works have the potential to transfer contaminants in the CPWE to the groundwater during excavation of materials from the CPWE. This could occur through the mobilisation of contaminated sediments in surface runoff which could potentially infiltrate through to the groundwater, as well as through water contained within the CPWE leaking into the ground. It should be noted however, that the potential for groundwater contamination exists while ever the contamination remains present at the site and that the proposed works will ultimately remove the potential for further groundwater contamination.

Surface Water
The proposed remediation works have the potential to impact upon surface water through the transfer of contaminants from materials in the CPWE to stormwater runoff, thus affecting the quality of runoff to surrounding areas as well as Penrhyn Estuary.

The proposed remediation works have potential impacts, during both construction and operation. Sedimentation and erosion associated with earthworks, site establishment and construction of internal roads on the Site have the potential to transfer contaminants to surface water runoff. Water quality could also be affected by increased sedimentation and erosion resulting in sediment laden runoff.

Soil erosion and sedimentation could also potentially result from removal of vegetation surrounding the CPWE, stockpiling of treated materials and movement of heavy vehicles.

8.6.3 Environmental Safeguards

Excavation works associated with the proposed remediation are to be undertaken within an enclosure which would be fully bunded to prevent contaminated runoff leaving the Site. Spill management and emergency response procedures would also be in place on the Site to deal with unexpected incidents. Spill management, plant, buildings and decontamination units would be bunded and appropriate emergency response and incident management procedures would be in place for the entire duration of works. This would minimise the loss of contaminants to both surface and groundwater.

Excavation works would not encroach upon the watertable, therefore the potential for groundwater contamination is minimised. If water is encountered within the CPWE during excavation works, it would be removed for treatment at the WTP and the liner sealed (as best as practicable) whilst the ESB is relocated for subsequent stages.

It is anticipated that some seepage water may accumulate in the excavation over the course of the proposed remedial works. All water collected on the Site will be treated on-site to a standard suitable for discharge to sewer or reused during the excavation, remediation and reinstatement works, where possible. Only uncontaminated rainwater from building roof areas would be permitted to flow to stormwater drains. All other runoff is considered potentially contaminated and is treated as effluent. There is potential to capture stormwater for use for activities such as treated soil re-wetting and this option would be taken if detailed review shows that it is practicable.

The objective of the remediation works is to remove the source of contamination, therefore removing the potential for further contamination.

Sediment and erosion control measures, as discussed in **Section 8.7.3,** would be implemented and maintained on the Site, particularly around stockpiles of material to minimise sediment laden runoff leaving the Site. Upon completion of the proposed remediation works, the site would be recontoured and stabilised to ensure that local water quality impacts are minimised. The proposal includes a WTP to treat potentially contaminated water captured on-site. Water management on site is illustrated in **Figure 18**.

Mitigation and management measures would be implemented and maintained on the Site throughout the duration of works.

8.6.4 Residual Impacts

The potential for contaminants in the CPWE to be further transferred to surface and groundwater would be minimised through the implementation of mitigation and management measures, including sediment and erosion controls, throughout the duration of the works to ensure that contaminants are contained within the Site until treated. If water is encountered within the CPWE during excavation works, it would be removed for treatment at the WTP and the liner will be adequately sealed between stages of excavation.

Appropriate spill and incident management procedures would further ensure that environmental impacts are minimised. Given that the purpose is to remediate the contaminants in the soil contained within, and surrounding the CPWE, the proposal will have a positive impact upon soil both within and surrounding the CPWE.

Provided these measures are implemented, the potential residual impacts upon surface and groundwater are expected to be minimal.

As the proposal involves remediation of land to remove existing contaminants, it would ultimately result in benefits to both surface and groundwater quality. Environmental safeguards would be implemented throughout the remediation project to ensure that surface and groundwater is protected from further contamination.

8.6.5 Conclusion

The EA has identified that during Site establishment and excavation and/or treatment of contaminated soil, there are a number of issues to be considered in relation to surface and

groundwater. Provided that appropriate environmental safeguards such as sediment and erosion control devices, construction measures and spill and incident management procedures are implemented, the issues identified are not expected to be a significant restraint to the project. While the proposal does not involve the remediation of groundwater underlying the site, the remediation of the CPWE would remove a potential source of groundwater contamination.

8.7 Soil

8.7.1 Existing Environment

The Soil Landscapes of the Sydney 1:100 000 Sheet (Soil Conservation Service, NSW) identifies the soil on the subject site as part of the Tuggerah soil landscape. This soil landscape is of Quaternary origin, described as aeolian, fine to medium grained, well sorted marine quartz sand. Shell fragments are absent and the sand appears to be finer than that found on foredunes and on beaches which is consistent with aeolian environments. The soil landscape has an extremely high wind blown hazard, are non-cohesive and highly permeable. There are no known occurrences of acid sulphate soils in the area.

The CPWE was constructed on a compacted and trimmed natural sand base to a depth of approximately 3 m below the original surface of the ground. The CPWE area is approximately 134 m by 86 m, and contains approximately 45,000m^3 of contaminated soil originating from a drum store area where drummed Heavy Ends waste containing CHCs were stored prior to 1980 (refer **Section 2**).

The material contained within the CPWE visually consists of three components; fine to medium grained sand with components of peat and ash. Sand and peat were natural materials underlying the drum store area from which the contaminated material was excavated. The ash component, residue from coal fired boilers, had been placed on top of these natural materials to act as base for the drum store. Drum corrosion led to contamination of the underlying sandy soil and ash bed.

The main contaminants within the CPWE are semi volatile and volatile CHCs, HCBD, HCB, HCE, PCE and OCS (Woodward Clyde, 1998). More recent soil investigations undertaken at the site revealed the presence of contaminants in the soil around the CPWE. The primary soil contaminant of concern is HCBD.

Several other potentially localised sources of contaminants have been noted in the area surrounding the CPWE. These included the presence of impacted fill material along the eastern embankment, observed to contain pieces of old drums, plastic drum liners and dark stained material (URS 2005). A fuel transfer pipeline with documented failure is also noted to be in the vicinity of the northern boundary of the subject site, where gasoline range hydrocarbons have been detected in the subsurface (Woodward-Clyde 1998).

8.7.2 Potential Impacts

There is potential for contaminants in the CPWE to be transferred to surrounding soil during remediation works, however this potential also exists under the current site conditions. Remediation would require excavation of contaminated materials from the CPWE, as well as some soil surrounding the CPWE which potentially contains contaminated material.

Potential impacts, during both construction and operation, include sedimentation and erosion associated with earthworks and site establishment, construction of internal roads on the Site and sedimentation and erosion resulting in transfer of contaminants to surrounding soil.

Site establishment, including construction of plant and treatment buildings, Site offices, sheds, decontamination units etc. has potential impacts associated with soil erosion and sedimentation. Soil erosion and sedimentation could also potentially result from removal of vegetation surrounding the CPWE, earthworks and construction during Site establishment, stockpiling of treated materials and movement of heavy vehicles.

Internal haul roads would be established on the Site to accommodate vehicular traffic associated with proposed works, where required. This has the potential to increase soil erosion and sedimentation during construction. Erosion and sedimentation can also be exacerbated by wind and rainfall, which can aid the mobilisation of sediment particles.

The mobilisation of contaminated material through erosion and sedimentation during excavation also has the potential to transfer contaminants to the soil surrounding the CPWE. Furthermore, the soil surrounding the CPWE have previously been found to contain low concentrations of HCBD. The disturbance of this soil during site establishment, earthworks and the movement of heavy vehicles has the potential to result in the mobilisation of potentially contaminated materials to uncontaminated soil within the BIP and surrounding area.

8.7.3 Environmental Safeguards

Mitigation and management measures would be implemented and maintained on the Site throughout the duration of works. These include sediment and erosion controls, controls to reduce dust and leachate generation and spill and incident management procedures.

Sediment and erosion controls would be implemented and maintained on the Site throughout the duration of plant construction, excavation of contaminated materials and treatment works to ensure that contaminants are contained within the Site until treated. The implementation of sediment and erosion controls would also mitigate impacts associated with sediment-laden runoff being transported away from the Site and into the local stormwater system. Sediment and erosion control measures would include:

- installation of silt fences prior to any Site preparation or construction;
- installation of silt fences around areas such as treated soil stockpiles to prevent migration of mobilised sediments;
- stockpiles of treated soil, sand, or other material capable of being mobilised by water flow to be stored clear of any drainage line or easement, natural watercourse, or road surface;
- stabilisation of soil stockpiles to minimise dust generation;
- vehicular access shall be controlled so as to prevent tracking of sediment onto adjoining roadways;
- dust minimisation and suppression measures during earthworks such as the use of water spray, or ceasing work if dust suppression methods become inadequate; and
- wheel wash facilities at the ESB and FSB to minimise the spread of soil across the Site.

Sediment and erosion controls would also be implemented on internal haul roads to provide all weather access for vehicles, protect underground services, suit drainage requirements, minimise environmental impact and minimise transit times. If required, haul roads would be constructed using clean, imported materials, which might include crushed concrete, crushed brick and rock. Barriers and marker posts would be erected along haul road margins to prevent erosion of adjacent sections of the Site.

There is also the potential for transfer of contaminants to surrounding soil through dust and leachate generation. Measures to minimise the transfer of contaminants through dust or leachate generation may include:

- Use of coating materials such as PVA spray;
- Non-odorous soil cover; and
- Polyethylene sheet covers.

Spill and incident management procedures would be implemented for the duration of works. DTD Plant, buildings and decontamination units would be bunded and appropriate emergency response and incident management procedures would be in place on the Site at all times for the duration of the works.

8.7.4 Residual Impacts

The potential for contaminants in the CPWE to be further transferred to surrounding soil would be minimised through the implementation of mitigation and management measures, including sediment and erosion controls, throughout the duration of the works to ensure that contaminants are contained within the Site until treated.

Appropriate spill and incident management procedures would further ensure that environmental impacts are minimised. Given that the purpose is to remediate the contaminants in the soil contained within, and surrounding the CPWE the proposal would have a positive impact upon soil both within and surrounding the CPWE.

The material will be treated such that it meets the risk-based Remediation Goals as defined in the RAP. In addition, the Director-General's EARs noted that the following should apply to treatment of materials:

- A statistical average dioxin, furan and dioxin-like PCB WHO-TWQ of less than 1 µg/kg determined with a methodology acceptable to the DEC;
- An aggregate concentration of SCW constituents of less than 2 mg/kg; and
- A PCB concentration of less than 2 mg/kg.

These concentrations nominated in the Director-General's EARs, are more stringent than criteria currently in force in the relevant NSW CCOs. This is because they do not consider practicability (technical and economical) which is considered in the CCOs. The dioxin criterion is below that in the current dioxin CCO (1986).

It should be noted that the treatment standards nominated may not be achievable due to operational or practicability constraints. Accordingly, treatment standards to address the compounds highlighted in the Director-General's EARs, will be ultimately determined following optimisation trials in the context of practicability (technical and economical) as allowed (with the DEC's approval) in the applicable CCOs.

8.7.5 Conclusion

The EA has identified that during Site establishment and excavation and/or treatment of contaminated soil, there are a number of issues to be considered. Provided that appropriate environmental safeguards such as sediment and erosion control devices, construction measures and spill and incident management procedures are implemented, the issues identified are not expected to be a significant restraint to the project.

8.8 Hazards and Risk

8.8.1 Introduction

Community consultation has been undertaken as a part of the planning process for the proposed project, and hazard and risk has been highlighted as an area of potential concern. A PHA was consequently undertaken by Sherpa Consulting Pty Ltd (Sherpa) using the standard NSW DoP methodology.

The objectives of the PHA were to:

- Develop a comprehensive understanding of the hazards, risks and adequacy of the safeguards associated with proposed CPWE remediation facility.
- Determine whether the risk levels associated with the project are acceptable when compared to appropriate criteria.
- Prepare a report that documents the identified hazards and risk assessment (in accordance with Hazardous Industry Planning Advisory Paper (HIPAP) no 6).

In accordance with standard PHA methodology, the PHA focuses on effects of potential accident or plant upset scenarios, i.e. acute exposure events. The PHA is appended in its entirety in **Appendix G** of this EA.

8.8.2 Existing Environment

The BIP is a well-established chemical manufacturing site. Existing BIP and Orica infrastructure and services, which are already in place, would help minimise potential safety or environmental impacts associated with the proposal. These are briefly outlined below.

Emergency Response
Each operating plant on the BIP has an ERP linked to the overall BIP integrated ERP. The basic philosophy is that local incidents are handled at the plant level by staff trained to implement measures such as spill containment and first aid firefighting (e.g. use of extinguishers or monitors). Incidents more severe than this would involve response by the Botany Emergency Response Team (BERT) via alert to Gate 3 security, and the emergency services, initiated by alarms to the Fire Brigade.

Fire Protection
Firewater piping, hydrants and monitors supplied by firewater from the existing BIP firewater supply system (storage tanks, ring main and pumps, with top up from town water) already exist in the former Propathene Plant area proposed for the processing areas of the remediation facility.

Effluent Collection and Treatment
The BIP has existing stormwater and effluent handling facilities, which ensure that BIP effluent complies with relevant EPL and Trade Waste licence conditions.

The closest hazardous process operations to the former Propathene Plant area and proposed location of the DTD Plant and FSB is the Qenos Olefines facility propane (C3/C4) storage bullet area, approximately 70 m immediately south of 9th Street. Qenos Olefines has a number of controls in place around the propane storage bullet area reducing the likelihood and severity of a gas release and subsequent fire or explosion, including mechanical integrity, gas detection around pumps, emergency shutdown with isolation valves at storages and tanker unloading and co-ordinated emergency response. Clean soil stockpiles would be located along the boundary

with Olefines to provide some mitigation against an explosion pressure wave in the unlikely event that it would occur.

8.8.3 Potential Impacts

Due to the presence of HCB, the CPWE material is classified as Schedule X Waste under Australia's national approach to regulating 'intractable waste' (ANZECC, 1994), and is a SCW under the 2004 CCO issued under the EHC Act. It is not a Dangerous Good (DG) under the Australian Dangerous Goods Code.

The hazardous incidents associated with the proposed facility were primarily identified during two workshops held as part of the Orica Hazard Study (HS) 1 and 2 for the project. The hazard studies were supplemented by a review of previous studies associated with the HCB wastes stored on the BIP (which includes other types of HCB waste apart from the CPWE). The information was compiled into Hazard Identification and Risk Assessment Control (HIRAC) tables. The tables show the risk event, causes, consequences, likelihood and controls in place. The compiled information is contained in Appendix 3 of the PHA (refer **Appendix G**). These scenarios included:

- Failures of the ECS for buildings, in the event of a power/mechanical failure, or failure of carbon beds adsorbing contaminants from exhaust air, resulting in release of contaminants to the air;
- Transport incidents (within BIP), resulting from loss of material from a truck transporting solid wastes due to vehicle accident or loss of load cover;
- DTD Plant incidents, including incomplete treatment of contaminants due to DTD Plant malfunction, power failure, HCl scrubber failure, mechanical equipment failure, and internal explosions in gas-fired equipment. These may result in inefficient destruction and emission control, incomplete combustion resulting in unwanted by-product formation, OHS issues for operators, the release of hot relatively dilute gases and risks associated with an explosion on-site; and
- External events, such as a serious flammable gas incident in the area of the Olefines propane storage bullet area which has the potential to damage the remediation facility, and potential cause injury / fatality to operators in the remediation area in the event of a serious incident.

A qualitative assessment of the risks associated with the project was undertaken. Orica's internal risk matrix was used to rank the risk associated with the identified hazardous incidents, and supplemented by quantitative calculations where additional detail was required. This approach is consistent with the Level 2 assessment described in the NSW DoP guidelines *Multi Level Risk Assessment.*

The potentially hazardous incidents identified did not have the potential to have a significant effect (safety, health or environmental) outside the immediate incident area. No incidents were identified with an off-site (i.e. outside Orica property) fatality risk, or an acute injury or irritation effect in any off-site areas, including Qenos the nearest BIP neighbours, and residential areas. A number of scenarios have potential to result in chronic human health effects. These are assessed separately as part of the HHIA prepared by URS. More detailed descriptions of each of the scenarios can be found in the PHA (refer **Appendix G**).

Air dispersion modelling predicts that plant upset scenarios will not cause levels of contaminants at sensitive areas (e.g. residential areas, primary schools etc) sufficient to cause irritation or injury.

There are a number of food manufacturing facilities located in the areas surrounding the BIP, with a bakery located directly north of the CPWE. Therefore potential contamination of food products may be a concern. Based on dispersion model results, the quantity of contaminants that could potentially affect outdoor material / ingredient stockpiles (which are not known to be present at any of the identified food industries) or be drawn into factory air intakes is small (a total of less than 1 g for exposed surfaces up to 1,000 m^2).

It is therefore difficult to envisage any significant contamination in food manufacturing processes given the small quantities of emissions that could occur in a plant upset condition, and the short duration of any such event.

The risk to environment from accident or process upset scenarios occurring at the proposed remediation facility is also regarded as low.

As there are no significant off-site impacts, the quantitative risk criteria suggested by the NSW DoP are satisfied. The risk level is also in the 'acceptable' or 'As Low as Reasonably Practicable' band for identified issues with the potential to have an off-site impact when assessed against Orica's corporate risk matrix.

The risk level to surrounding land users (both to other users on the BIP site and external to the BIP boundary) from the proposed facility is therefore assessed as low.

8.8.4 Environmental Safeguards

For all the identified scenarios as shown in the hazard identification table in Appendix 3 of the PHA (refer **Appendix G**) hardware and procedural safeguards are included in the design, which are aimed at reducing the likelihood and/or consequence of an incident. Key controls include:

- Sophisticated temperature control of the thermal oxidiser and rapid quench to maximise contaminant destruction efficiency and minimise unwanted by-product formation.
- Redundant systems to maintain function of key emission control equipment (cyclone, quench, baghouse and acid gas scrubber) in the event of a utility failure (gas, water and power). This includes a backup power source (diesel generator) and backup water tank.
- Automatic isolation of contaminated soil feed to DTD Plant in the event of a plant upset and controlled shutdown sequence.

These controls would be supported by a management system which covers maintenance and periodic review of the controls to maintain their effectiveness. In addition, the proposal would be subject to existing Orica and BIP infrastructure and services which are already in place and would help minimise potential safety or environmental impacts associated with the proposal, including emergency response, fire protection and stormwater and effluent handling.

The ESB would be staffed approximately 12 hours per day. The existing fencing would be maintained and a security alarm system installed in the ESB, primarily for protection of equipment. Work procedures would include lock up of building and access gates at the end of the day and security patrols overnight. The former Propathene Plant area is within the secure area of the BIP and the FSB would be manned 24 hours per day.

A dedicated ERP for the remediation facility covering the ESB, FSB and DTD operations would be developed prior to commencement of operations. It is advisable that other operators within the BIP whose operations could impact upon the proposed remediation area (specifically Qenos

Olefines) should update their ERPs as required. The integrated BIP ERP would also be updated. It is noted that the recently enacted NSW OHS (DG Amendment) Regulations require that emergency services be consulted about emergency plans. Consultation with the Fire Brigade would be undertaken as part of the preparation of the remediation facility and updated BIP ERPs. The CPWE remediation facility ERP would be based on the ERP in place at the Allied Feeds (Rhodes Peninsula) site.

As a minimum, fire detection and protection required by the Building Code of Australia and relevant Australian Standards will be provided. The Fire Brigade are normally able to attend the Site within 10 minutes of an alarm (nearest station is Banksmeadow). As the detail design phase of the project progresses, a detailed Fire Safety Study that satisfies the NSW DoP's guideline *HIPAP No 2 Fire Safety Studies* would be prepared in respect of the project.

8.8.5 Residual Impacts

The PHA concluded that the project will not increase the off-site fatality risk, and therefore does not increase the societal risk contribution to the area from the BIP.

The hazardous incidents identified did not have the potential to have a significant effect (safety, health or environmental) outside the immediate incident area. No incidents were identified with an off-site (i.e. outside the remediation facility) fatality risk, or an acute injury or irritation effect in any off-site areas, including residential. A number of scenarios have potential to result in chronic human health effects and have been assessed separately as part of the HHIA prepared by URS.

The risk level associated with the proposed facility is therefore considered to be very low, and the quantitative risk criteria suggested by the NSW DoP are therefore satisfied. The risk level is also in the 'acceptable' or 'As Low as Reasonably Practicable' band for identified issues with the potential to have an off-site impact when assessed against Orica's corporate risk matrix.

Whilst any impact on the environment is obviously undesirable, the main concern for risks to the biophysical environment from accident events is the potential effect on whole systems or populations. The potential environmental hazards associated with the project are due to the bio-accumulative properties of the chlorinated compounds in the waste or due to the small quantities of toxic by-products such as dioxins that could be produced in the thermal oxidiser.

The incident scenarios identified involving either a gas emission or an effluent / liquid spill had very limited impact area due to the relatively small quantities of contaminants and short incident durations. The risk to environment from accident or process upset scenarios occurring at the proposed remediation facility is therefore regarded as low.

As the design is still preliminary and a number of options are being investigated specific design recommendations have not been made. To ensure that additional risk reduction opportunities are identified and implemented as the design progresses, the following activities should be completed:

- Conduct a Construction Safety Study (which has been included in Conditions of Consent by the NSW DoP for previous development applications);
- Develop a Fire Safety Study (which has been included in Conditions of Consent by the NSW DoP for previous development applications);
- Complete a HAZOP study once detail design is complete; and

- Ensure that the ERP for the facility is prepared, integrated with Qenos Olefines and BIP ERPs and that the Fire Brigade has the opportunity to provide input as required by the NSW DG regulations.

8.8.6 Conclusion

This EA has assessed the potential impacts pertaining to the management of hazards and risk of the proposal. No events were identified which would impact areas outside the BIP boundary. The project will not increase the fatality risk (hence societal risk) from the BIP. The PHA indicates that the risks to surrounding land uses associated with the proposed remediation project would be low.

The PHA and hazard study process highlighted a number of areas where potential risk levels to personnel working at the remediation plant may be relatively high. While this does not alter the study conclusions with respect to off-site land use planning risks, it is recommended that a more detailed risk assessment be completed to ensure that the operator's duties of care obligations to employees under the NSW OHS Regulations are met.

8.9 Human Health Risk

In response to concerns regarding the potential impacts of the proposal on human health, a HHIA was undertaken by URS. The overall objective of the HHIA is to identify, characterise and evaluate potential risks to human health associated with the operation of the proposed CPWE remediation option. The focus of the HHIA is in areas surrounding the proposed process that includes adjacent work areas used by employees of Orica (associated with other facilities) and other businesses within the BIP, workplaces in areas outside of the BIP, recreational areas and residential areas (including schools).

8.9.1 Existing Environment

The following land uses occur within a distance of 2 km of the BIP:

- Residential (the nearest being Denison Street approximately 160 m to the east/ south east of the CPWE);
- Schools (the nearest being approximately 600 m north west of the CPWE);
- Commercial (including offices and shops);
- Industrial (including a number of food businesses involved in food manufacturing or distribution);
- Recreational (golf courses, playing fields, Penrhyn Estuary, Hensley Park and Botany Bay); and
- Public open space.

At present the CPWE remains an enclosed encapsulation. Potential issues that may be associated with emissions derived from the existing CPWE have been assessed during previous human health risk assessments and ongoing monitoring. In particular, assessments presented with the report, Consolidated Human Health Risk Assessment (referred to as the Consolidated HHRA) prepared by URS (2005) are of most significance with respect to the assessment of risks to human health associated with existing impacts and potential remediation:

The Consolidated HHRA was undertaken to provide an overall review of human health risk issues in areas surrounding the BIP. This included an assessment of the potential for human exposure to groundwater contaminants derived from the BIP as well as emissions from the

CPWE located on the Site. The Consolidated HHRA presents an evaluation of risk to human health on the basis of data collected up until the end of February 2005, with an addendum issued in 2006.

The assessment presented with respect to the CPWE involved quantification of inhalation exposures by recreational users of Hensley Athletics Field, residents living in areas close to the CPWE, workers in areas adjacent to the BIP and workers within the BIP. The assessment was undertaken on the basis of emission data collected from the surface of the CPWE up until the end of February 2005. The data were used within an air dispersion model to provide estimates of potential concentrations in air in recreational, residential and work areas. The key chemicals identified in the assessment were HCBD, HCE and PCE.

The calculated risks to human health associated with emissions to air from the existing CPWE were assessed and considered to be acceptable in all areas.

Following completion of the assessment presented within the Consolidated HHRA, works have been undertaken to remediate the soil along the eastern embankment (above the liner) with additional lining and landscaping installed. Emission testing along the eastern embankment, following completion of these works, has shown a decrease in emissions to air (URS 2006b). Further sampling of emissions from the CPWE (URS 2006b) has provided data consistent with that considered within the calculations presented within the Consolidated HHRA (URS 2005).

The report, HCB Waste Management Plan, Human Health Risk Assessment (Car Park Waste) prepared by URS (2002), presented an initial assessment of risks to human health associated with emissions from the CPWE. The report presented an assessment of risks to human health associated with the existing encapsulation (based on data collected to 2000) as well as issues that may be relevant during the potential remediation and major failure of the encapsulation in accordance with the requirements of the HCB Waste Management Plan (ANZECC 1996).

The assessment concluded that risks to off-site residential, recreational, industrial and on-site industrial workers associated with emissions to air from the existing CPWE do not represent an unacceptable risk to human health. In addition, potential risks associated with accidental damage or failure of the CPWE have been evaluated and are not expected to represent an unacceptable risk to human health.

Through a review of available soil gas data collected from within the CPWE, the following chemicals were identified as future chemicals of potential concern for the assessment of risks associated with the proposed remediation works:

- PCE;
- TCE;
- 1,2-dichloroethene (cis- and *trans* –isomers);
- 1,1-dichloroethene;
- vinyl chloride;
- 1,1,2-trichloroethane;
- 1,1-dichloroethane;
- 1,2-dichloroethane;
- chloroform;
- methylene chloride (dichloromethane);
- chloromethane;

- HCB;
- HCBD;
- HCE;
- OCS;
- Pentachlorobenzene; and
- PCBs

These chemicals were considered as part of the HHIA.

8.9.2 Potential Impacts

Potential human health impacts that may be associated with the proposed CPWE remediation project have been assessed by evaluating the following:

- Emissions and exposures associated with construction of the FSB and DTD Plant that will be constructed on the BIP in the former Propathene Plant area. During construction there is the potential for exposure to dusts that may be generated during this phase of the project.
- Emissions during operation of the proposed CPWE remediation project – there is potential for emissions to air from the following sources:
  - ESB stack venting treated air from the ECS on the ESB building;
  - FSB stack venting treated air from the ECS on the FSB building;
  - DTD Plant stack emissions;
  - Fugitive chlorinated organic compounds emitted from the ESB during relocation of the enclosure between stages;
  - Fugitive chlorinated organic compounds emitted from covered trucks transporting waste from the ESB to the FSB;
  - Fugitive dust emissions from the treated soil stockpiles;
  - Fugitive dust emissions from the trucks transporting treated soil from the stockpiles to the car park for reinstatement; and
  - Fugitive dust emissions from the treated soil reinstatement activities at the car park.
- Emissions to air that may occur during abnormal operating scenarios.

Construction Impacts
A review of dust emissions was undertaken as part of the PAE (2007) Air Quality Impact Assessment (see **Section 8.1** and **Appendix E** of this EA) which concluded that dust emissions from the construction phase of the project would not be expected to result in off-site nuisance impacts. As such, provided dust mitigation measures are implemented, there are considered to be no issues associated with the construction phase of the project that warrant further consideration in the context of human health impact.

Operational Impacts
Based on the proposed remediation process and control systems, there is the potential for the following exposures to emissions generated by the project:

- Inhalation exposures (acute and chronic) by workers on the BIP in areas adjacent to the CPWE site;

- Inhalation exposures (acute and chronic) by workers in areas surrounding the BIP;
- Inhalation exposures (acute and chronic) by recreational users of the Hensley Athletics Field and other recreational areas in areas surrounding the CPWE site;
- Exposures by residents to emissions to air. Key issues are expected to be associated with inhalation exposures (acute and chronic) and potential multiple pathway exposures (chronic) to chemicals considered to be persistent and bioaccumulative and that may deposit onto and accumulate in soils and home-grown produce.
- Cumulative exposures in workplace, recreational and residential areas associated with emissions derived from the proposed CPWE project as well as other key emission sources identified in the area. Other key emission sources considered (as modelled in the Air Quality Impact Assessment, PAE 2007) include the following:
  - Background criteria pollutant levels (derived from Randwick data);
  - Orica Sources:
    - GTP Stack;
    - HCl Burner Vent Stack (Chlorine Plant);
    - Weak Gas Vent Stack (Chlorine Plant);
    - Area remaining after removal of decommissioned cells building near the Chlorine Plant (Old Chlorine Plant);
    - Store J Stack (HCB Waste Repackaging Plant); and
    - Store H Stack (HCB Waste Repackaging Plant).
  - Qenos Sources:
    - Two Coal Boiler Stacks (Plant Utilities);
    - Gas Boiler Stack (Plant Utilities);
    - Five Furnace Stacks (Olefines Plant);
    - Two Ground Furnace Stacks (Olefines Plant);
    - Elevated Flare Stack (Olefines Plant); and
    - Ground Flare (Alkatuff Plant).
  - Huntsman Sources:
    - Hot Oil Furnace (Surfactants Plant).

The HHIA draws upon the air quality modelling work done in respect of the proposal (see **Section 8.1** and **Appendix E** of this EA) and as such addresses the potential human health risks at the key receptors modelled as part of the Air Quality Impact Assessment (see **Section 8.1**). The location of these receptors is shown in **Figure 14**.

In addition data relevant to the following areas has also been used in the HHIA:

- Maximum on-site: maximum concentration estimated within the BIP; and
- Maximum off-site: maximum concentration estimated for all areas located off the BIP, typically located on the boundary of the BIP.

The concentrations (and deposition rates) estimated have been evaluated further in the HHIA with respect to potential acute (short-term) and chronic (long-term) health effects.

The characterisation of risk associated with the operation of the proposed CPWE remediation project has identified the following for the key receptors and pathways identified:

- Normal operation of the CPWE remediation project:
  - Short-term, acute, exposures associated with emissions to air derived from the proposed CPWE remediation project only as well as cumulative exposures have been assessed. Impacts to human health associated with acute exposures in all areas surrounding the Site are considered to be low.
  - The evaluation of long term, chronic, exposures has focused on potential inhalation exposure to chemicals of potential concern (COPCs) identified in air following emissions to air in recreational areas (in particular the Hensley Athletics Field) and work areas within the BIP and off-site (including the manufacture of food products) from all aspects of the proposed remediation project and multiple pathway exposures by residents in areas surrounding the CPWE site (inhalation, ingestion and dermal contact with chemicals in soils, ingestion of home-grown fruit and vegetable crops and accumulation of chemicals in breast milk and subsequent exposure by infants).
  - Exposure to emissions derived from the proposed CPWE remediation project only as well as cumulative exposures to emissions from the CPWE remediation project and other emission sources in the area have been assessed.
  - Relevant receptors have been identified as residents (inhalation and multiple pathway exposure), recreational groups (inhalation only) and workers (inhalation only).
  - The total hazard index values for all receptor groups evaluated for all threshold COPCs fall below 1. This indicates that the estimated intake associated with reasonable maximum exposures by all receptor groups to emissions from the CPWE remediation project as well as cumulative exposures, fall below the acceptable intake for the COPCs as defined by the acceptable daily intake (or equivalent including background intakes).
  - The total incremental lifetime risk for all receptor groups evaluated for all non-threshold COPCs associated with emissions from the CPWE remediation project and cumulative exposures falls below the incremental risk level of 10^{-6} adopted as representative of negligible or effectively zero risk.
  - The evaluation of risk to human health associated with emissions during normal operation of the proposed CPWE remediation project, including cumulative risks, is therefore considered to be low and representative of negligible risks.
- Upset Operating Conditions:
  - Short-term, acute, exposures associated with emissions to air derived from worst-case upset condition identified from the proposed CPWE remediation project only, as well as cumulative exposures have been assessed. Impacts to human health associated with acute exposures

during such an event in all areas surrounding the Site are considered to be low.

- Due to the short duration of upset condition identified, no long-term exposure assessment was considered to be necessary.
- On this basis the evaluation of risk to human health associated with emissions during upset operating conditions (worst-case scenario) is therefore considered to be low and representative of negligible risks.

These calculated levels of risk are indicative of acceptable levels of risk for potential exposures to the proposed CPWE remediation project as well as cumulative impacts.

8.9.3 Environmental Safeguards

The safeguards to be implemented in relation to human health risk are largely those associated with the control of fugitive emissions from the Site, as described in **Section 8.1.3** and **Section 8.8.3** of this EA. This includes the following:

- The construction and operation of the proposed CPWE remediation project would be undertaken using an appropriate OHSP for construction workers on the Site as well as long-term employees in the facility. The plan would include the preparation of safe work method statements to address specific activities as outlined within the PHA (Sherpa 2007) (see **Appendix G**);
- Operational procedures and controls noted in the PHA (Sherpa 2007) (**Appendix G**) would be followed; and
- Mitigation measures associated with construction and operation of the proposed CPWE remediation plant noted within the Air Quality Impact Assessment (PAE 2007) (**Appendix E**) would be followed.

8.9.4 Residual Impacts

The proposed remediation of the CPWE would result in some fugitive emissions during the excavation and treatment process. However, the mitigation measures to be implemented as part of the project, including those inherent to the design of the Plant, would ensure that these emissions do not pose an unacceptable risk to human health.

The proposal would result in the remediation of land which is currently contaminated, thereby ultimately removing future risk to human health associated with the contaminants contained on the CPWE site. Therefore, the proposal is considered to have a net positive residual impact in terms of human health risk.

8.9.5 Conclusion

Impacts to human health associated with the construction and operation of the proposed CPWE remediation project have been evaluated using a systematic approach as outlined in guidance provided by enHealth (2002). This includes the identification of key issues, evaluation and quantification of exposure, evaluation and quantification of hazards or chemical toxicity and the characterisation of risk.

The assessment undertaken has indicated that potential exposures (including cumulative exposures) by residents, recreational users of areas surrounding the CPWE and workers are negligible and representative of acceptable risks to human health.

8.10 Other Environmental Issues

Additional environmental issues were identified, however the impacts resulting from the proposed relocation of the facility are predicted to be minimal, and/or confined to the construction period. These additional issues include:

- Flora and Fauna
- Heritage; and
- Economic.

Each of these issues is discussed below in **Table 8-19** and appropriate mitigation measures are identified in **Table 8-20** where required for inclusion in the SoC.

8.10.1 Environmental Risk/Impact

The likely risk and impact profile of each of the abovementioned issues is assessed separately in relation to each component of the project in **Table 8-19** below.

Table 8-19: Other Environmental Issues

Issue	Consideration	Risk/Impact
Flora and Fauna	• The CPWE site comprises a sealed car park which is largely cleared of trees and vegetation with the exception of a small strip of vegetation along Corish Circle. The Site is located within an industrial park, primarily surrounded by industrial uses. • The small landscape strip along the eastern side of the CPWE comprises mainly shrubs and small plants with a few small trees and will need to be removed as a result of the proposed remediation works.	Low
Flora and Fauna (cont)	• This vegetation was originally planted by Orica and replacement planting would be undertaken as part of the CPWE site restoration program in accordance with the TPO applying to the CPWE site. Given the fragmented nature of this vegetation, it is considered unlikely that protected species would exist on the CPWE site. • Given the disturbed nature of the Site, the remediation works are not likely to have a significant impact on threatened species, communities and habitats. • Orica would undertake replacement planting for vegetation that is removed for the proposed remediation works.	
Heritage	• There are no known items of heritage significance on or in the immediate vicinity of the Site which would be potentially impacted by the proposal. • The proposed remediation works are not expected to have an adverse impact on heritage items.	Low

Issue	Consideration	Risk/Impact
Economic	• The economic impacts of the proposal are primarily associated with employment generation and the return of the land to productive industrial use. • During the construction phase, up to 45 jobs are expected to be generated, and the remediation works would require 25 to 30 employees on Site, with subsequent direct and indirect benefits for the local community. • The proposal would result in economic benefits through the return of currently vacant, contaminated land to productive use.	Low

8.10.2 Environmental Safeguards and Residual Impacts

Table 8-20: Environmental Safeguards and Residual Impacts

Issue	Safeguards	Residual Impact
Flora and Fauna	• Replanting will be undertaken by Orica to replace the vegetation that is removed for the proposed remediation works.	• None predicted.
Heritage and Cultural	• None required.	• None predicted.
Economic	• Orica would endeavour to employ local contractors for works associated with the project wherever possible.	• Net economic benefit through return of land to productive use, in keeping with zoning and character of surrounding development.

8.11 Cumulative Impacts

Cumulative impacts on the environment can be considered on a project basis, taking into account each element on a locality or regional basis as well as taking into account the interacting impacts of other projects in the immediate locality and the region.

The cumulative impacts of the proposed remediation project have been considered in relation to each identified environmental issue in **Sections 8.1** to **8.10** of this EA and the cumulative impacts of the proposal especially with respect to air quality, noise, hazards and risks have been considered in each of the technical studies undertaken in respect of this proposal.

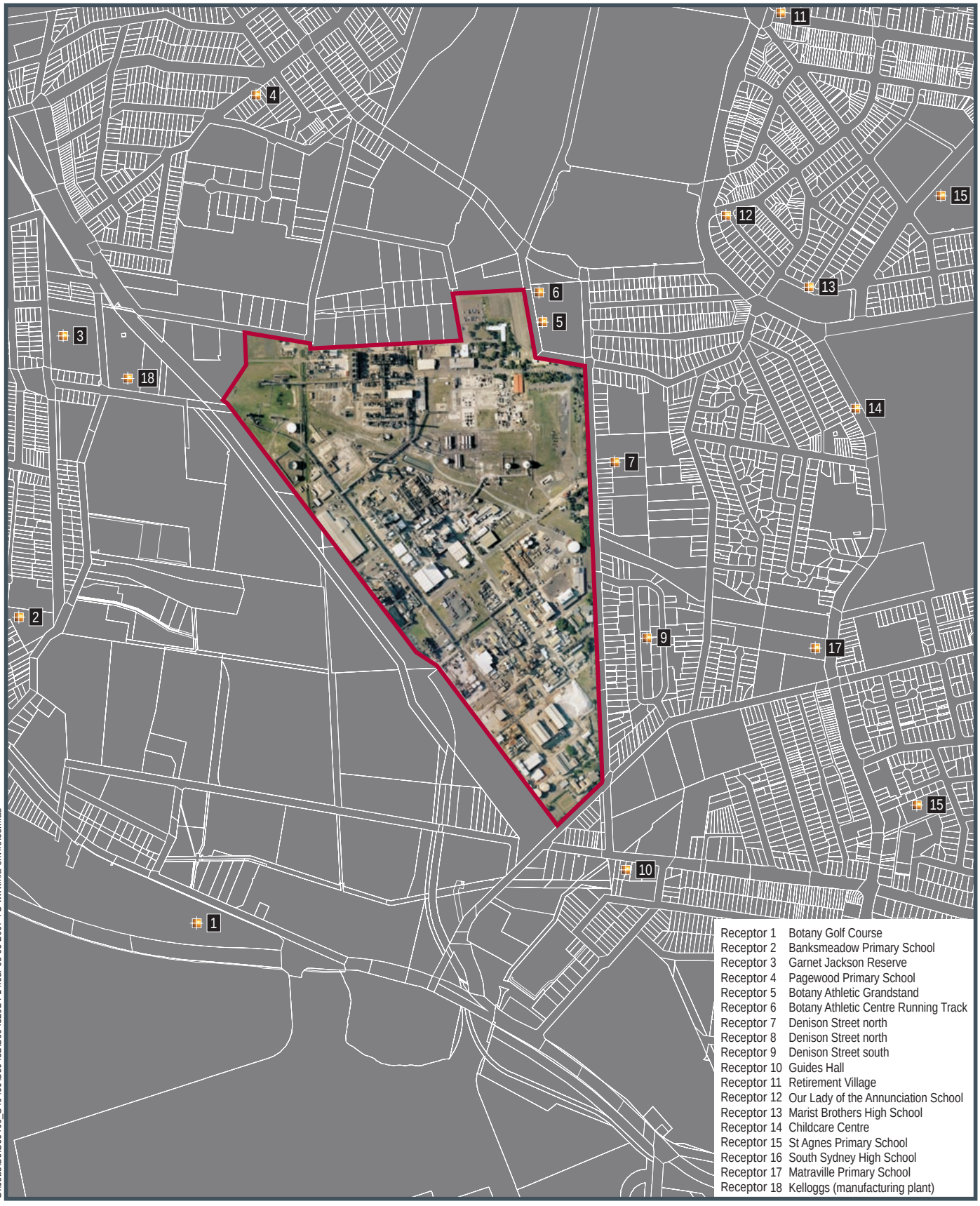
As the potential impacts for each of the environmental factors considered are minimal with the implementation of appropriate mitigation measures as described in this EA, no significant cumulative impact is expected.

The cumulative impacts of the proposal must also be considered taking into account other major projects planned in the local area. Of greatest significance in this case is the expansion of Port Botany.

The Port Botany expansion is to take place in two stages as follows:

- Stage 1 – A 51 ha expansion of Brotherson Dock North providing four additional berths. This stage was approved by the DoP in October 2005.
- Stage 2 – A further 12 ha expansion of Brotherson Dock North to provide a fifth berth. This stage was approved by DoP in August 2006.

The approved expansion of Port Botany would result in certain environmental impacts in the local area including noise, traffic generation and air quality. It is likely that the proposed remediation of the CPWE would overlap with the commencement of the Port Botany expansion, and as such, there is some potential for cumulative impacts. However given that most of the works would be undertaken within the BIP, the potential cumulative impact to offsite areas is anticipated to be minor and temporary.



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HLA

Botany Industrial Park Site Boundary
Sensitive Receptor

Figure 14

Receptor Locations - Air Quality Assessment
Orica Australia Pty Ltd
Remediation of Car Park Waste Encapsulation
Botany Industrial Park
Environmental Assessment