7.2 Potential Impacts and Mitigation Measures (1, 3)

EPA requires that the EIS provide information on the bypass stack parameters, details of emission controls, estimates of the ground level concentrations of emissions from the coke plant and assessment of the impact when waste gases from the ovens are released through the bypass stacks.

The EIS Supplement investigated four operational scenarios of the Coke Plant, to address the operation of the Coke Plant without heat recovery, and operation of the Coke Plant with the addition of Flue Gas Desulphurisation (FGD).

For Stage 1 of the Coke Plant (up to 1.6 Mtpa capacity), it is likely that the plant will operate without heat recovery. This will require venting of the coke oven flue gases through short stacks that are located on the top of the ovens (16 stacks required for the 1.6 Mtpa capacity plant). The flue gases are released at 1,050 °C, with an exit velocity of 12 m/s. This scenario has been modelled as Scenario 1.

Heat recovery (with the Power Plant) will be installed on the Coke Plant once the plant is operating at the initial capacity of 1.6 Mtpa. This will result in the construction of two main stacks (1.6 Mtpa plant) or four main stacks (3.2 Mtpa plant) that will discharge the flue gases at 90 m above ground level. FGD is also being proposed for the Coke Plant once the Power Plant is installed, as it requires the flue gases to be sufficiently cooled before the desulphurisation process.

Continuous operation of all boilers within the Power Plant is not possible throughout the year, as scheduled maintenance and interruptions to the process will require some boilers to be offline. This will also require that the corresponding FGD unit is offline, as it cannot be operated on the coke oven gas at its initial temperature of 1,050 °C. In the event of a failure or maintenance work on the Power Plant, the coke oven gases will be directly vented through the short stacks on top of the ovens. The Coke Plant will continue to operate, as the coking cycle takes approximately 60 hours and cannot be interrupted due to downstream process upsets.

For the purpose of this assessment, conservative assumptions were made regarding the operational availability of the FGD. Scenario 2 is based on the operation of only one of the two FGD units at any one time for 1.6 Mtpa plant (50% availability), while Scenario 4 assumes that only three of the four FGDs will be operational at any one time (75% availability) for the 3.2 Mtpa capacity plant. The expected operational availability of the FGDs is expected to be around 85 to 90% and the maintenance time will tend to be short and apportioned across all the installed FGDs, rather than a single FGD, as has been assumed in this modelling. Power Plant outage time (equivalent to non-presence) is not included in availability calculations but it is treated by Scenario 1 for which all emissions are vented through the 45 m stacks. The third scenario that has been modelled in this assessment is the operation of the Power Plant without any FGD installed. Scenario 3 is unlikely to be adopted.

A summary of the four coke plant operational scenarios modelled for the EIS Supplement is shown in Table 7.1. Full details of the emissions and source parameters for these scenarios are provided in Supplement Appendix C (*i.e.* Appendix 2 of the Katestone Environmental Report).

Table 7.1 Operational Scenarios Modelled for Supplementary EIS

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Capacity (Mtpa)	1.6	1.6	1.6	3.2
Release points	16 (45 m short stacks)	2 main stacks	2 main stacks	4 main stacks
Heat recovery	No	Yes	Yes	Yes
Flue Gas Desulphurisation	No	1 stack yes 1 stack no	No	3 stacks yes 1 stack no

For comparison, the configuration of the Coke Plant that was used in the air quality modelling for the EIS (Section 7 of the EIS) was based on the operation of the plant with heat recovery, with the flue gases vented through four main stacks, and a coke production rate of 3.2 Mtpa. A scenario was included in the EIS that addressed the operation of the Coke Plant without heat recovery, with the gases vented through the main stacks. No FGD was included in the dispersion modelling for the EIS.

The scenario where the 3.2 Mtpa Coke Plant operates without heat recovery and no FGD (*i.e.*, where all emissions are vented through 32 stacks at 45 m) has not been modelled for this supplementary report. The impacts at sensitive receptors can be inferred from the results shown in Table 7.2 of Scenario 1 and the background sources. In-stack conditions and emission rates are identical between Scenario 1 and the venting of emissions through 32 stacks.

Bypass stack parameters and emission rates are listed in detail in Supplement Appendix C (*i.e.* Appendix 2 of the Katestone Environmental Report). Ground level concentration contours for non-heat recovery venting operations are presented as Scenario 1 results in Supplement Appendix C (*i.e.* the main body and Appendix 1 of the Katestone Environmental Report).

Emission controls are described in detail in the text below.

EPA states that the EIS should address the potential interactions between the coke plant emissions and other likely emissions to the air shed. The interactions should be shown as predicted cumulative concentrations of relevant air quality contaminants e.g. oxides of nitrogen, sulphur dioxide.

Background sources included in the modelling were:

- The Stanwell Power Station, assuming peak load and license limit emission rates. This overestimates average SO_2 emissions from this source by approximately 45%, and overestimates average NO_x emissions by approximately 50%; and
- The Stanwell Peaker Plant, assuming constant operation on diesel fuel. This overestimates annual emissions as this power plant is intended to be used in times of excess peak electrical demand, and is not designed to operate for an extended period of time.

Table 7.2 shows expected background and cumulative concentrations for SO_2 and NO_2 for the four operational scenarios described above.

Table 7.2 Predicted Maximum (99.9th percentile) Concentrations of Sulphur Dioxide and Nitrogen Dioxide for Each Operating Scenario at Each Discrete Receptor Location.

Operating Scenario	Stanwell Post Office	School	Stanwell Power Station	Residence-SW	Residence-N	Residence-N	Residence-NW
Sulphur Dioxide, 10 minute average (EPP goal – 700 µg/m³)							
Background sources	*410*	*326*	*562*	*413*	*356*	*342*	*571*
Scenario 1	551	446	591	474	469	539	643
Scenario 2	533	380	576	437	444	500	639
Scenario 3	623	493	587	476	533	566	694
Scenario 4	551	400	578	451	455	526	641
Sulphur Dioxide, 1 hour average (EPP goal – 570 µg/m³)							
Background sources	*208*	*165*	*284*	*209*	*180*	*169*	*289*
Scenario 1	279	226	299	240	237	274	327
Scenario 2	270	192	291	221	225	254	324
Scenario 3	315	250	297	241	270	287	352
Scenario 4	279	202	293	229	231	227	324
Nitrogen Dioxide, 1 hour average (EPP goal – 320 µg/m³)							
Background sources	*67*	*54*	*91*	*66*	*58*	*55*	*90*
Scenario 1	118	93	116	84	98	113	106
Scenario 2	74	57	91	67	63	61	97
Scenario 3	128	112	98	86	123	129	135
Scenario 4	79	58	92	68	70	65	101

Receptor locations (Figure A1.1 (d) of Supplement Appendix C) were selected to be representative of the closest sensitive locations. There are no residential locations where the maximum (99.9th percentile) is predicted to exceed the air quality goals. Only a small incremental increase was predicted for peak concentrations compared to the existing concentrations due to the SPS.

Supplement Appendix C (*i.e.* Appendix 1 of the Katestone Environmental Report) shows contour plots of predicted concentrations, including background sources, for all operational scenarios.

EPA states that the EIS should present concentrations of air pollution contaminants at standard temperature and pressure (i.e. dry, temperature of 273K (0°C) and 101.3 kPa (1 atmosphere)) and specify oxygen content and moisture level of the flue.

Table 7.3 below shows the stack concentrations expected for individual pollutants for a main (90 m) stack. These concentrations represent those that might be expected in the main stacks under normal operating conditions with operational FGD. These concentrations are expected assuming:

- O_2 stack concentration of 8%;
- Dry conditions (the expected operational moisture content is 15%);

- Pressure of 101.3 kPa; and
- Temperature of 273 K.

The expected oxygen and moisture contents is sourced from stack testing conducted on 16 and 17 October 2005 at a Chinese coke plant of the same design proposed by QCE.

Table 7.3 Expected Pollutant Concentrations in the Main Stack during Normal Operation with an FGD (at 273 K, 101.3 kPa, 8% O_2 and dry conditions)

In Stack Concentrations (g/m^3)	Main Stack
TSP	1.45E-03
PM_{10}	1.45E-03
SO_2	9.82E-02
NO_X	1.76E-01
CO	8.30E-03
VOC	3.81E-03
H_2SO_4	5.17E-03
Benzene	8.14E-05
Bromoform	2.04E-07
Bromomethane	9.50E-05
2-Butanone	1.07E-05
Carbon Disulphide	2.71E-06
Chlorobenzene	2.04E-07
Chloromethane	1.29E-04
Chloroform	1.87E-06
Cumene	2.38E-07
Ethyl Benzene	5.43E-07
Iodomethane	1.07E-06
Isooctane	2.71E-06
Methylene Chloride	1.12E-04
n-Hexane	2.55E-06
4-Methyl-2-Pentanone	1.51E-06
2- Methylphenol	0.00E+00
4- Methylphenol/3-Methylphenol	No Data
Phenol	1.20E-05
Styrene	1.17E-06
Tert-butyl Methyl Ether	7.98E-09
Tetrachloroethene	6.96E-08
1,1,2,2-Tetrachloroethane	3.39E-07
Toluene	8.65E-05
1,1,1-Trichloroethane	4.24E-07
1,1,2-Trichloroethane	9.84E-08
Trichloroethene	1.48E-06

In Stack Concentrations (g/m^3)	Main Stack
Vinyl Acetate	1.17E-06
Xylenes	2.75E-06
Total PAHs	4.77E-06
Naphthalene	1.52E-06
Acenaphthylene	2.45E-07
Acenaphthene	3.42E-07
Fluorene	1.08E-06
Phenanthrene	6.36E-07
Anthracene	No Data
Fluoranthene	1.47E-07
Pyrene	4.89E-07
Chrysene	No Data
Benzo[a]pyrene	2.45E-08
Indeno[123-c,d]pyrene	4.89E-08
Benzo[g,h,I]perylene	2.45E-07
Antimony	8.21E-07
Arsenic	6.38E-07
Beryllium	1.84E-07
Cadmium	6.00E-08
Chromium	6.25E-06
Cobalt	No Data
Lead	5.29E-05
Manganese	9.04E-06
Mercury	1.29E-05
Nickel	2.87E-06
Phosphorous	2.10E-04
Selenium	2.10E-06

EPA states that the EIS should identify worst case emissions as may occur during plant upsets, green pushes, start up and shut down. It should also describe the backup measures that would act in the event of failure of primary measures to minimise likelihood of plant upsets and adverse air impacts. The EIS should evaluate the impacts on the receiving environment due to maximum air discharges by specifying and modelling the maximum emissions levels expected from the coke plant.

Worst case emissions during plant upsets, green pushes, start up and shut downs are difficult to quantify. The worst case plant upset emissions are likely to occur when the FGD is not operational and emissions are vented through the shorter waste-heat stacks located on top of the coke batteries. Pollutant emission rates under this scenario are presented in the EIS, and modelling of the impacts is shown in the revised modelling report. This is shown as Scenario 1 results above and in Supplement Appendix C.

Plant Upsets

The worst case plant upset emissions are likely to occur when the FGD is not operational and emissions are vented through the shorter waste-heat stacks located on top of the coke batteries. Pollutant emission rates under this scenario are presented in the original EIS, and modelling of the impacts is shown in the revised modelling report. This is shown as Scenario 1 results above and in Supplement Appendix C.

Green Pushes

Green pushes are rare events in modern-designed plants and refers to coke which when removed from the oven results in emissions due to the presence of unvolatilised coal.

Similar heat recovery (non-by product recovery) coke plants to that proposed have been approved and constructed in the United States of America (US). In the US system, the National Emission Standards for Hazardous Air Pollutants (NESHAP) [40 Code of Federal Regulations (CFR) 63, Subpart CCCCC] establishes work practice standards for minimising green pushes and emission standards for particulate control devices. A primary focus of the pushing NESHAP is to minimise emissions from green pushes.

In the specific case of the Project, the coking reaction will be closely monitored by the operators in the control room by:

- Maintaining the pressure inside the oven to be below ambient atmospheric pressure;
- Monitoring the temperature profile of the ovens to ensure that they meet the plant designers' standard operating conditions; and
- Monitoring the elapsed coking time in each oven.

Prior to pushing the coke-bed out of the oven, each oven will be visually inspected to verify that coking is complete. Complete coking is indicated when the coke bed stops "gassing" (no smoke is visible and the operator can see across the oven). If the coking reaction is not fully complete, the coking time is extended, and the coke is then rechecked for reaction completion. Since pushing occurs after this, flat car pushing will not increase emissions of SO_2, NO_x, CO, and VOCs.

Accidental coke pushes are prevented by a redundant interlocking system. The plant design is such that it is physically impossible for coke to be pushed out of the oven unless all of the following occur:

- The correct oven door has been selected in the operating system;
- The coke receiving car is in place; and
- The oven door is opened.

This control is consistent with the maximum achievable control technology (MACT) standards for coke oven pushing as described in the USEPA rule 40 CFR 63, Subpart CCCC, NESHAPs for Coke Ovens: Pushing, Quenching, and Battery Stacks; Final Rule. The coking reaction will be closely monitored by operators in the control room.

Shut Downs

Coke ovens are designed to be warmed to an operating temperature (using natural gas or diesel) and then maintained at that temperature for the remainder of their operating life. They are not designed to operate in multiple start-up and shut-down cycles. From time to time, individual ovens may require repair to the refractory lining or to the oven doors, which will require individual ovens to be shut down.

The process of shutting an oven (or cooling it to allow maintenance) does not result in any emissions. Once the process of cooling has commenced, no further coal is charged into that oven and by inference, no emissions are possible.

Start-up Emissions

The process of starting a coke plant involves the slow heating of individual ovens to operating temperature, at approximately 1,200 °C. No coal will be charged into the ovens during the warming process, as coking conditions are not optimal unless the required temperature has been reached and is stable. By inference, starting a coke plant does not result in additional emissions from coal combustion, unlike the starting of other industrial processes such as coal power stations. A volume of approximately 16,000 kl of diesel would be required over a period of roughly 180 days (*i.e.* 89 kl/ day). It is proposed that low sulphur diesel be used to heat the coke ovens. The emissions from combustion of this diesel used for start-up can be estimated based on the following assumptions:

- 16,000 kl diesel used across approximately 180 days (*i.e.* approximately 89 kl/ day).
- The energy content of the diesel is 38 MJ/L.
- The sulphur content is 50 ppm (0.005%).
- Diesel will be combusted by an external combustion burner. Therefore, emission factors for boilers are appropriate.
- Low NO_X burners will not be used.
- Particulate controls will not be implemented.
- Assume that at any one time, two consecutive heating units are being operated. This is used to calculate the capacity rating of each unit (in GJ/hr) used in emission estimation.

Emissions based on these assumptions are shown in Table 7.4 below. Start-up emissions are not considered significant given existing emissions into the Stanwell airshed.

Table 7.4 Estimated start-up emissions based on diesel fuel combustion

Emission	Emission Factor (EF)	EF Units	EF Source	Total emissions (kg)	Total emissions (kg/day)
SO_2	0.085	kg/kl	(1), (2), (4)	1,360	7.6
SO_3	0.0012	kg/kl	(1), (3) (4)	19	0.11
NO_X	2.4	kg/kl	(1), (4)	38,400	213
CO	0.6	kg/kl	(1), (5)	9,600	53.3
Total VOCs	0.04	kg/kl	(1), (5)	640	3.6
PM_{10}	0.12	kg/kl	(1), (6)	1,920	10.7
Antimony	No Data	kg/PJ	(1), (7)		
Arsenic	1.7	kg/PJ	(1), (7)	1.03	0.006
Beryllium	1.3	kg/PJ	(1), (7)	0.79	0.004
Cadmium	No Data	kg/PJ	(1), (7)		
Chloride	1.3	kg/PJ	(1), (7)	0.79	0.004
Chromium	1.3	kg/PJ	(1), (7)	0.79	0.004
Chromium (VI)	No Data	kg/PJ	(1), (7)		
Cobalt	No Data	kg/PJ	(1), (7)		
Copper	2.6	kg/PJ	(1), (7)	1.58	0.009
Fluoride	No Data	kg/PJ	(1), (7)		
Lead	3.9	kg/PJ	(1), (7)	2.37	0.013
Manganese	2.6	kg/PJ	(1), (7)	1.58	0.009
Mercury	1.3	kg/PJ	(1), (7)	0.79	0.004
Nickel	1.3	kg/PJ	(1), (7)	0.79	0.004
Selenium	6.5	kg/PJ	(1), (7)	3.95	0.022
Zinc	1.7	kg/PJ	(1), (7)	1.03	0.006

Notes: (1) National Pollutant Inventory Emission Estimation Technique Manual for Combustion in Boilers v1.2, 2 June 2003.
(2) Emission factor = 17×S where S is the sulphur content in % (*i.e.* 0.005%).
(3) Emission factor = 0.24×S where S is the sulphur content in % (*i.e.* 0.005%).
(4) Table 30, boilers < 100 GJ/hr, Distillate oil fired.
(5) Table 31, Industrial boiler (defined in Table 1 as 10 – 100 GJ/hr), distillate oil fired.
(6) Table 32, Industrial boiler (defined in Table 1 as 10 – 100 GJ/hr), distillate oil fired, uncontrolled.
(7) Table 33, Distillate oil fired.

EPA states that the EIS should present, if at all practicable, source specific data such as actual test data from similar equipment and information from equipment vendors in characterising air emissions. If this is not practicable, the limitations of using emissions factors needs to be discussed, including significance for any conclusions drawn from that data.

QCE has access to stack test data from an operational coke plant of the same design as the one being proposed in the EIS. It is not valid to characterise air emissions using this stack test data for the following reasons:

- The coal composition of the operating coke plant is unknown;

- The data are unpublished and have not been peer reviewed; and
- The data consist of a total of four samples taken on two consecutive days and therefore is not statistically representative.

It is standard practice to use published, peer-reviewed emission factors to calculate emissions from proposed projects when source-specific test data are not available or not representative. The Australian National Pollutant Inventory (NPI) contains an extensive list of emission factors for industrial processes. The source of these Australian NPI emission factors, in almost all cases, is the USEPA AP-42 compilation of emission factors (AP-42: Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources).

There are limitations in using emission factors, regardless of their source. These limitations of emission factors are:

- They are based on limited number of sampling tests conducted at a limited number of operating plants; and
- They often do not allow for site-specific variations such as operating conditions and input coal quality.

The QCE inventory was prepared with a hybrid approach. The QCE inventory is fundamentally based on an inventory prepared for the permitting application for a similar coke plant in the US (which exclusively used AP-42 emission factors), but it has taken into account wherever possible as many site-specific variables as possible. The inventory presented in the EIS includes the following:

- Site-specific coal quality data based on the preferred QCE coal blend;
- Site-specific coal sulphur content based on the preferred QCE coal blend; and
- Site-specific operational conditions such as the level of non-heat recovery venting.

The QCE inventory presented in the EIS therefore accounts for as much uncertainty as is possible to account for. Emission factors can overestimate or underestimate emissions, but without a detailed and comprehensive site-specific testing programme, the level of uncertainty in the emission inventory cannot be determined. This would apply to every other industry that relies on emission factors (regardless of source) for permitting applications.

EPA states that the EIS should discuss the potential formation of dioxins and furans in the activity, provide estimated emissions levels for dioxins and furans and advise on likely compliance with and commitments to best practice emission limit (0.1 ng/Nm^3 I(TEQ)).

The USEPA AP-42 does not provide emission factors for polychlorinated dioxins and furans (PCDF) from coking ovens. Permit applications for two similar coking plants in the US do not mention PCDF emissions, and the licence conditions for one plant (Haverhill North Coke Company, Haverhill, Ohio) do not mention PCDF emissions.

In 2004, the Australian Government published a detailed nation-wide PCDF emission inventory (Bawden *et. al.*, 2004) which used the United Nations Environment Programme (UNEP) Toolkit (UNEP, 2003) to

determine indicative PCDF emissions factors for industry classes where source-specific PCDF emission factors were not available. The Australian PCDF inventory clearly states that the inventory and emission factors used are indicative only because of the:

- Methodology by which the UNEP emission factors were derived.
- Inherent uncertainty in operating and site-specific factors.
- Lack of source test data of Australian sources.
- Variability in process technologies.
- Wide range (often several orders of magnitude within the same industry source).
- Very short sampling times involved in sampling processes.

The UNEP Toolkit PCDF emission factor to air for class two coke production facilities (those that have some air pollution equipment installed) is 0.3 µg TEQ/tonne coke produced. It is important to state that this was determined for by-product recovery plants which is not the design utilised by QCE. The QCE plant is a heat-recovery, non by-product recovery plant.

If it is assumed that the Coke Plant produces 3.2 Mtpa of coke, then the PCDF emissions (noting the assumptions and limitations above) could be 0.96 g TEQ per annum. If it is assumed that essentially all of these leave through the main stacks, then the expected PCDF concentration in each stack can be calculated:

- Total PCDF emissions = 0.96 g TEQ per annum.
- Assume there are four stacks for the 3.2 Mtpa coke production scenario. Therefore, PCDF emissions per stack = 0.24 g TEQ per annum.
- Assume that the plant is operational 365 days, 24 hours per day. Therefore the PCDF emissions rate per stack = 7.61×10^{-9} g TEQ/s per stack.
- The flow rate per stack is expected to be 140.4 Nm^3/s per stack (8% O2, 15% H2O)
- The expected PCDF concentration per stack (dry, 8%O2, 273 K) is expected to be 6.38×10^{-11} g TEQ/s per stack (or 0.0638 ng TEQ/Nm^3 per stack).

EPA states that the potential impacts on the receiving environment due to air emissions need to be evaluated against compliance with the Environmental Protection (Air) Policy 1997, which does not allow any exceedance of prescribed air quality goals.

The EPA's issue relates to the representation of dispersion model predictions as the number of exceedances of the air quality goal. Whilst the EPA accepts the use of statistical parameters (such as the 99.9th percentile) for model predictions to filter extreme values, the EPA recommends that the statistical parameter should be validated and that this approach should not be interpreted as allowing harmful air emissions or failure of emission controls.

The Terms of Reference state that: "*Ground-level concentrations at the nearest sensitive receptor(s) based on 1-hour average for maximum (99.9th percentile) and 99.5th percentile values should be estimated.*" The 1-hour average concentration was presented in the EIS and in this Supplement as the 99.9th percentile concentration.

The EIS reported the maximum prediction and the number of events that are predicted to exceed the maximum. This was intended to provide additional context and was not intended to imply that actual ambient concentrations are permitted to exceed the *Environmental Protection (Air) Policy 1997* (EPP Air) goal.

The results of the dispersion modelling assessment included in modelling conducted for the Supplement (refer to Supplement Appendix C) indicates that the Project is unlikely to result in exceedances of the EPP Air goals at nearby sensitive areas.

Justification of the use of a particular statistical parameter based on a validation of the model against measurements is difficult due to the varied nature of emissions from the Stanwell Power Station (SPS). EIS Appendix I compares the model predictions with measurements at three monitoring locations. Predictions for both average emissions and peak emissions are presented. The actual emissions from the SPS for each hour of the simulation are not known. Consequently it is difficult to infer which modelling percentile best represents the measurements. Notwithstanding this, it is evident that the model significantly over predicts the impacts at both Mercy and Kalapa sites for both average and maximum emissions. The statistical parameter that best represents both the highest measured concentrations at these locations is much lower than the 99.9th percentile. Consequently, the air quality assessment presented in the EIS is likely to overestimate ground-level concentrations from the SPS through the use of the 99.9th percentile.

The performance of the model to predict impacts from a tall stack power station source does not necessarily infer the performance for a short stack or fugitive source (such as the potential emissions from the Coke Plant). In the case of modelling a new source in an area where no measurements have been made to validate the performance of the model, typically the 99.9th percentile is taken to represent the maximum. This accounts for possible extreme and unrealistic values generated by the model. For this assessment the 99.9th percentile has been taken to represent the maximum impact in accordance with the Terms of Reference for the EIS.

EPA states that the EIS should evaluate the impact of air emissions on all potential receptors. Charts showing contour plots of predicted air contaminants should include all potential receptors. Where premises are within contours delineating unacceptable air quality, specific predictions for these points should be made.

The modelling undertaken for this Supplement (refer Supplement Appendix C), presents impacts at receptor locations representative of the closest sensitive locations. There are no residential locations where the maximum (99.9th percentile) is predicted to exceed the air quality goals.

EPA states that the EIS should clarify the derivation and practicality of stack process gas efflux velocities and gas exhaust temperatures used in evaluating air impacts and advise whether these constitute the commitments for minimum efflux velocities and minimum exhaust temperatures.

The main stack exit velocities are derived from the following methodology:

- The total volumetric flow was obtained from engineering design documents and in-stack monitoring from the coke oven designer. In this case, the total volumetric flow of gas leaving the main stacks in a 3.2 Mtpa coke capacity plant is approximately 560 Nm^3/s (8%O_2, 15% H_2O).
- Assuming that a 3.2 Mtpa coke capacity plant has four stacks, the flow per stack is 140 Nm^3/s (8%O_2, 15% H_2O).
- Given a design stack diameter of 4.3 m, the exit velocity can therefore be calculated to be approximately 13 m/s under actual operating temperature conditions. This is the value that has been entered into the dispersion modelling conducted in this EIS Supplement.

A similar process was used to determine the exit velocity from the multiple 45 m stacks in non heat-recovery mode, with full details provided in Supplement Appendix C.

These exit velocities represent the best available assumption of actual operating conditions and do not constitute commitments for minimum efflux velocities. However, it is important to state that these are target operating conditions for the Coke Plant and operating at conditions leading to lower efflux velocities implies that the coking process is not operating as efficiently as possible. Therefore, there is significant advantage to maintaining these efflux velocities.

EPA recommends that measurements of odour obtained from dynamic olfactometry are used in the assessment rather than trying to estimate odour from odour detection thresholds, as this is more likely to be reliable. If there is no alternative but to use odour detection thresholds, use odour threshold data from the literature preferably that has been determined in recent years using dynamic dilution olfactometer techniques and provide references. Odour likely from hydrogen sulphide and reduced sulphur compounds should be included in assessments. For combined odour impact, "peak to mean ratio" should be included in the equation to provide an allowance for fluctuations in concentration within one hour.

The air quality modelling for odour emissions was based on the use of odour thresholds for each of the emission types from the proposed Coke Plant. There is no information regarding the odour emission rate from a heat-recovery coke plant measured using dynamic olfactometry. Odour thresholds have therefore been used in accordance with the alternative approach for single chemical species recommended by the EPA in their comments on the EIS.

Table 7.5 presents the odour thresholds that have been used for this study and the literature references. Care has been taken to use the most current data on odour thresholds. Reference has been given to data collected using dynamic detection olfactometer techniques, however, data collected using such techniques is limited. The odour impacts predicted for the Coke Plant are dominated by sulphur dioxide emissions. The odour threshold value used here is within the range of odour thresholds determined for the local

community during previous odour studies conducted in the Stanwell region. Table 7.5 shows odour thresholds used in the odour modelling for the Coke Plant.

Table 7.5 Odour Thresholds Adopted for Odour Modelling

Pollutant	Odour threshold (µg/m³)	Reference Number (refer below)
Sulphur dioxide	1,175	1
Nitrogen dioxide	246	2
Nitric oxide	360	1
VOC	3,000	3
Hydrogen sulphide	0.7	1
Benzene	4,500	1
Bromoform	5,300,000	1
Bromomethane	80,000	1
2-Butanone	738	1
Carbon Disulphide	24	1
Chlorobenzene	980	1
Chloromethane	21,000	1
Chloroform	250,000	1
Cumene	39	1
Ethyl Benzene	8,700	1
Iodomethane	21,500,000	1
Isooctane	29,320	4
Methylene Chloride	540,000	1
n-Hexane	84,178	4
4-Methyl-2-Pentanone	410	1
2- Methylphenol	1.24	1
4- Methylphenol/3-Methylphenol	0.01	1
Phenol	179	1
Styrene	202	1
Tert-butyl Methyl Ether	209	4
Tetrachloroethene	21,000	1
1,1,2,2-Tetrachloroethane	21,000	1
Toluene	17,500	1
1,1,1-Trichloroethane	542,857	1
1,1,2-Trichloroethane	2,978	5
Trichloroethene	1,134	1
Vinyl Acetate	360	1
Xylenes	348	1
Naphthalene	1,500	1
Acenaphthene	505	1

Notes: 1. Ruth (1986) 'Odour thresholds and irritation levels of several chemical substances: a review'. *American Industrial Hygiene Association Journal* vol 47, pages A142.
2. Yoshio Nagata (2003) 'Measurement of odour threshold by triangle odour bag method'. *International Symposium on Odour Measurement.* Hosted by Ministry of the Environment, Government of Japan, October 2003.

3. *'European Collaborative Action Indoor Air quality and its Impact on Man, Environment and Quality of Life*". Report No. 19. Total Volatile Organic Compounds (TVOC) in indoor air quality investigations EUR17675 EN www.inive.org/medias/ECA/ECA_Report19.pdf.
4. US Occupational Health and Environmental Safety Division http://solutions.3m.com/wps/portal/3M/en_US/Occupational-Health/Environmental-Safety/Training-Tools/Software/
5. Haz-map Occupational exposure to hazardous agents, http://hazmap.nlm.nih.gov/.

The EIS accounted for short-term (sub 1-hour) fluctuations in odour concentration in accordance with the methodology specified in the EPA's odour guideline (EPA, 2004). This assessment showed that adverse odour impacts are unlikely to occur due to the Coke Plant.

Additional assessment of the odour impact using peak-to-mean ratios and the odour criteria published by the NSW Department of Environment and Conservation (2005) was conducted for this Supplement. For this assessment, the maximum concentration of odour for stack sources occurs during A and B class stability (Pasquil Gifford Stability Classes). For fugitive emission sources the maximum concentration of odour occurs during neutral conditions. The residences were conservatively considered to be near field (as opposed to far-field). Therefore, for the stack sources a peak-to-mean ratio of 17 was adopted while for the fugitive sources a peak-to-mean ratio of 2.5 was adopted. The result of the revised odour assessment indicates that adverse impacts are unlikely to occur at nearest residences due to the Coke Plant. Details are presented in Supplement Appendix C (specifically, section 3 and Appendix 1 of the Katestone Environmental Report).

There are no published emission factors for hydrogen sulphide (H_2S) emissions from quenching processes and it is not possible to reliably estimate how much H_2S will be released from the Coke Plant. It is also important to note the following, regarding odour from coke plants:

- Odour from quenching has not been highlighted as an issue by the State of Ohio EPA in granting the environmental license to the Haverhill North Coke Company plant in Haverhill, Ohio. This is a plant using a similar design to that proposed by QCE; and
- Despite multiple site visits by QCE personnel, odour has not been noticed at a Chinese plant with substantially the same design as that proposed by QCE.

There are differences between the proposed QCE plant design and that of the Corrimal Coke Plant (Illawara Coke Company). Odour potentially comes from quenching of the coke bed in the quench towers. It is likely that the source of sulphur is the water and that the extreme heat from the coke reduces the sulphate components in the water to H_2S and other reduced sulphur species. This reaction would be a function of quenching time, water quality and the exposed surface area of the coke.

The proposed Coke Plant will utilise stamp charging and pushing where the coal will be compressed into a single large compact brick and charged into the oven. Once the coking process is complete, the entire coke brick is pushed onto a flat-bed car as a single, solid block of coke. The exposed surface area of the coke brick will be significantly less than that of the coke charge from the Corrimal plant, in which the coke is broken into smaller lumps as it falls from the oven into the coking transport.

Additionally, the quenching process and quench towers in the proposed Coke Plant have been designed to minimise H_2S formation by limiting the amount of water and its rate of application. The quenching tower

is designed such that a small amount of water is used to rapidly quench the coke bed. The released steam is trapped by the quench tower design and further cools the coke bed. An additional water sprinkler is used to cool the steam released during the quenching process to minimise H_2S emissions. Further to this, there are known abatement measures available to the proponents such as additional water treatment and additives to minimise the risk of H_2S formation from quenching.

Therefore, it is expected that odour from quenching will not be an issue at the Coke Plant. However, should complaints be received regarding odour from the plant, QCE will implement an odour and water monitoring program to ascertain the source and extent of the problem. Depending on the outcome of the monitoring, mitigation measures will be implemented where possible.

The EPA states that one would expect impacts from nitrogen dioxide to be higher than predicted if ratios are higher than 0.3 (i.e. 30%) as appears likely from Figure 10 a, but the degree is not clear. Likely impacts at higher ratios e.g. 0.5 should be discussed to show whether such differences would be significant or not to conclusions about nitrogen dioxide. The EIS should explain the likely impact on nitrogen dioxide concentrations if higher nitrogen dioxide to nitrogen oxide ratios occur as have been measured.

Various NO_2:NO_X ratios were investigated for this Supplement. With higher NO_2:NO_X ratios, there are no exceedances of 1-hour (99.9th percentile) at nearest residences for both the EPA goal (320 µg/m^3) and NEPM standard (200 µg/m^3) (Table 7.6).

Table 7.6 Predicted NO_2 Ground Level Concentration (1-hour, 99.9th percentile µg/m^3) at Nearest Sensitive Receptors using Various NO_2:NO_x Ratios for Scenario 1

NO_2/NO_X Ratio	Receptor						
	Stanwell Post Office	School	Stanwell Power Station	Residence-SW	Residence-N	Residence-N	Residence-NW
30%	118	93	116	84	98	113	106
40%	158	123	154	112	131	151	141
50%	197	154	193	140	163	189	176

EPA states that the EIS should specify the coke plant increment in the loading of SO_2, NO_x and particulate emissions to the air shed.

This has been described above.

EPA states that the EIS should provide estimated ground-level concentration from the Stanwell Power Station in isolation at all receptors and discuss a strategy for effectively controlling the emissions from the coke plant taking into account the major sources in the air shed.

This has been described above.

EPA states that the EIS should review the international best practice pollution control technologies and emission standards and consider applying these technologies to the proposed plant. The capacity of the air shed for assimilation and dispersion of emissions in view of existing and future users should

be evaluated once best practice emission levels have been determined. EPA states that the EIS should incorporate techniques to minimise particulate emissions in the coking process flue gases, pushing, and charging off-gases, consistent with international best practice methods for coke plants. EPA states that the EIS should demonstrate adoption of techniques to minimise sulphur dioxide emissions from the coking process flue gases consistent with international best practice methods for coke plants. EPA states that the EIS should describe and adopt techniques to minimise fugitive emissions during travel of the coke car/quench car consistent with international best practice methods for coke plants. EPA states that the EIS should explain the minimum degree of coke oven negative pressure needed to maintain control of fugitive emissions, and how this will be monitored and maintained, particularly when the power plant is not operational. The EIS should discuss sealing and monitoring of coke ovens doors. The EIS should include a commitment to zero percent visible emissions from doors and off-takes in line with best practice standards.

There are several pollution control technologies used in the Coke Plant design that are representative of best practice. These pollution control technologies are:

- Flue gas desulphurisation units installed on the main stacks;
- Stamp-charging of the coal into the ovens;
- Negative pressure ovens; and
- Flat-bed pushing of the coke.

Flue Gas Desulphurisation (FGD)

QCE commits to not proceeding beyond 1.6 Mtpa coke capacity without committing to the installation of a FGD unit on the main stacks. FGDs work by injecting a chemical reagent, usually calcium hydroxide (slaked lime) or calcium carbonate (limestone), directly into the flue gas. These react with the gaseous sulphur dioxide (SO_2) and transform it into a solid waste that can then be safely disposed or beneficially used. FGD units typically remove 90% of the SO_2 in the flue gas stream.

The particular design QCE is considering is a dry FGD system. In the most common form of dry FGD systems, a slaked lime slurry is sprayed into the flue gas and the resulting by-product is collected in a particulate control device such as a baghouse. The baghouse also acts to trap particulates from the coking process, significantly reducing the emissions of particulates metals and dioxins from the main stack.

The main constituents in dry FGD by-product are calcium sulphites and sulphate (approximately 10,063 t/a for Stage 1 and 20,126 t/a for Stage 2) and calcium carbonate (4,190 t/a for Stage 1 and 8,380 t/a for Stage 2). Dry FGD by-products can be used in construction, engineering, and agricultural applications; however, most of this material is stored in landfills. FGD by-products are non-hazardous, according to a 1993 determination by the U.S. Environmental Protection Agency.

The emissions inventory prepared for this assessment includes the contribution of the FGD. A 90% SO_2 collection efficiency and the following (conservative) operational availability have been assumed:

- For the 1.6 Mtpa scenario, it is assumed that one of the two FGDs is not available due to maintenance. In reality, a conservative availability is expected to be 75%.
- For the 3.2 Mtpa scenario, it is assumed that one of the four FGDs is constantly not available due to maintenance, reflecting a conservative 75% availability. In reality, maintenance of the FGDs will be conducted on a rolling basis such that each of the FGD units will be unavailable for short periods of time. Therefore the assumptions built-in to the emissions inventory are conservative.

FGD system reliability will be maintained by:

- Standard operation procedures that detail the requirements for ongoing and preventative maintenance and operation of the FGD. These will include procedures and schedules for inspection and testing of FGD reliability; and
- Hardware-based back up systems such as the use of back-up electricity supplies (*e.g.* quick-start generators and back-up fan systems).

Coal Stamp-Charging

Coal is hydraulically compacted into a solid brick, or "stamped", for charging into the ovens. The stamping is carried out in an enclosed structure and there are no particulate emissions from this process. The cross-sectional area of the stamp is approximately the same as the cross-sectional area of the oven doors, ensuring that there is minimal leakage of VOCs or particulates as the stamp is pushed into the hot oven. This is representative of the best available pollution minimisation technology for coal charging.

In the overwhelming majority of current-design coke plants, coal is charged loosely via a conveyor system, either through the top of the ovens (top charging), or pushed as a loose pile of coal into the side of the oven (side-charging). Particulate emissions are inevitable from this charging design, and in this situation, pollution control devices such as cyclones are often installed.

It is important to state that there will be minimal, if any, particulate emissions in a stamp-charging design as the possibility for emissions has been, in effect, designed out of the charging process. The emissions inventory presented for the EIS has been prepared assuming that stamp charging is not available in order to be conservative and because accepted, peer reviewed monitoring data does not exist for this activity.

Negative Pressure Ovens

Another best-practice pollution control mechanism is the use of "negative pressure" ovens. The gas pressure inside the coke ovens in the QCE design will be constantly maintained at lower than ambient atmospheric pressure (*i.e.* negative pressure). Negative pressure ovens have three significant advantages over traditional coke oven designs currently used worldwide:

1. Gases released from the coal during the coking process are maintained inside the oven chamber and not vented to atmosphere.
2. There is less opportunity for gases and particulates to escape from the oven doors during the charging and pushing processes. This is assisted by the fact that the cross-sectional area of the coal

and coke stamp is approximately the same as that of the oven doors, which forms a seal that maintains the negative pressure difference between the ovens and the ambient air.

3. It allows for the VOCs released during the coking process to be fully combusted rather than be released as emissions. The coking process with this plant design takes approximately 60 hours, approximately 12 hours longer than coke oven technology which does not employ stamp charging methods. Conventional coking times approximate 16 hours. The negative pressure, the length of the coking process, the high temperatures in the oven (approximately 1,200 °C) and the degree of mixing of gases within the oven ensures the destruction of the great majority of VOCs released during the coking process.

Negative pressure ovens are representative of the best currently-available pollution control technology. The emissions inventory presented for the EIS has been prepared assuming that negative pressure ovens are not available in order to be conservative.

Flat-Bed Pushing of the Coke.

Flat-bed pushing of the coke bed is another example of best pollutant control technologies that will be implemented by QCE. In traditional ovens, the coke is pushed out of the ovens and allowed to break into lumps as it falls into a receiving car or wagon. Because the coke breaks into smaller pieces and is exposed to air, particulates and VOCs are released.

In the flat-bed pushing process, the coke is pushed as a solid "stamp" onto a flat-bed receiving surface at the same level as the ovens. The coke does not break up and the structural integrity of the coke stamp is maintained. A significant advantage over the traditional pushing techniques is that the surface area of the coke that is exposed to air is minimised. Once the surface of the coke stamp oxidises upon exposure to air, the coke stamp remains protected from further oxidation by a thin layer of ash, preventing VOC or particulate releases.

Flat-bed pushing is representative of the best available pollution control technology available. The emissions inventory presented for the EIS has been prepared assuming that flat-bed pushing is not available in order to be conservative and because accepted, peer reviewed monitoring data does not exist for this activity.

Summary

The design of the proposed Coke Plant will result in significantly lower fugitive emissions per tonne of coke produced than either of the latest plants in the USA (Haverhill – constructed, Cambria – proposed), due to the stamp charging, negative pressure ovens and flat-bed pushing of the coke bed.

The EIS inventory does not account for these technologies as little peer-reviewed data quantifying their emissions exists. In order to allow for a conservative margin of error, the emissions inventory presented in the EIS assumes that these designs are not implemented in the Coke Plant. Fugitive emissions from the coking process are expected to be significantly lower than what has been presented in the EIS inventory.

EPA requires more detail on management of fugitive emissions from coke stockpiles and conveying at the port facility.

Fugitive emissions from the coke stockpile and resulting from conveying coke are expected to be minimal. The composition of coke makes it inherently less prone to fines production and not as prone to breakage when compared to coal. The coke product will be sized and screened at Stanwell prior to being transported to Fisherman's Landing. The screening process will remove the vast majority of fines less than 6 mm in diameter. In addition, the coke will handled carefully through the use of soft loading, slow conveyor speeds, potential lining of wagons and feeder loading into train wagons using a belt feeder in order to maintain the integrity of the coke. These measures will reduce the generation of fines and therefore emissions, and ensure the coke meets the required size specifications for sale.

EPA states that the EIS should clarify how water demand for dust suppression is catered for in the plant water balance to provide confidence that sufficient water will be available for dust suppression, particularly during dry times. How the dust suppression system will be managed should also be clarified so that it may be compared to best practice measures.

Table 5.1.8 of the EIS presents data on the volume of water required for dust suppression at the Stanwell project site coke and coal stockpiles. The volume of water required for dust suppression was estimated using a simplified relationship between rainfall and evaporation as a component of water balance modelling carried out for the Conceptual Stormwater Management Plan (EIS Appendix F). Whenever evaporation was greater than rainfall, the difference between these figures (in mm) was applied to the coal and coke stockpile areas to give a total volume of dust suppression water required. Average annual demand was calculated to be between approximately 100 and 200 ML/year dependent on the final configuration. This will be supplied, where possible, from re-use of water in the settlement and evaporation pond.

Water balance modelling suggests that, on average, between 55-60% of annual dust suppression water demand can be supplied from re-use of water from the settlement and evaporation ponds. The remainder of the demand will be supplied from external raw water supply. Due to the ephemeral nature of runoff patterns in the area however, it is likely that in dry years these values will be far less and there will be additional requirements of external raw water to supply any deficit. Dependent on the final configuration of the plant, the maximum annual requirement for dust suppression water assuming no re-use of water from the settlement and evaporation ponds would be equivalent to approximately 1-5% of the total water demands of the Project.

Although the configuration of dust suppression measures is yet to be finalised, it is likely that the preferred method for application of water to the stockpiles will be via fixed sprinklers. The rate of addition will be largely dictated by conditions at the stockpiles but will also take into account environmental factors associated with water usage and discharges to the environment. For example, under persistent dry conditions where the volume of water available from the settlement and evaporation pond may be limited, the rate of application will be equal to the minimum volume necessary to prevent dust emissions. Where the settlement and evaporation pond is considered to present a potential risk of

overflow to the environment due to the volume of water contained within it, water will be applied to the stockpiles at the maximum rate possible without creating runoff.

A range of other dust suppression measures may also be employed as part of the overall dust suppression strategy including limiting the height and slope of the stockpiles and limiting drop heights from conveyors. Wet suppression via sprinklers may also be utilised at conveyor transfer points.

EPA states that the EIS should specify the accuracy of estimates of fugitive emissions from material handling and storage facilities (or the degree of uncertainty) and the assumptions that have been considered in calculation of emissions. The EIS should explain and provide information supporting the low estimates adopted.

The following fugitive emission sources from material handling have been included in the emissions inventory (Table 7.7).

Table 7.7 Fugitive Emissions Sources

Activity	TSP (t/year)	PM_{10} (t/year)	Control Efficiency/Technique
Coal loadout from Queensland Rail	1.16	0.54	95%, fully enclosed + wet suppression
Coal storage piles	4.52	2.80	50%, wet suppression
Loading to charging machine	0.39	0.18	90%, travelling hood and baghouse
Loadout from quenching	0.79	0.37	70%, partial enclosure
Coke stockpile	1.55	0.77	No controls
Loading to train	0.79	0.37	70%, partial enclosure
Emergency coke stockpile	0.29	0.14	50%, wet suppression
Total	**9.46**	**5.18**	

The level of uncertainty in these estimates is likely to be at least ± 30%, based on a combination of:

- Uncertainty in emission factors;
- Uncertainty in control efficiencies; and
- Uncertainty in the exposed area of the coke and coal stockpiles.

EPA states that the EIS should include a commitment to avoid any dust nuisance and also to meeting a dust deposition of 120 milligrams per square metre per day, when monitored in accordance with Australian Standard AS 3580.10, 2003.

The proponents commit to a dust deposition monitoring program in accordance to Australian Standard AS 3580.10, 2003 *Methods for sampling and analysis of ambient air - Determination of particulate matter - Deposited matter - Gravimetric method.* This monitoring program will consist of up two sampling locations at nearby residences. The proponents will implement strategies to minimise the potential for dust nuisance. Dust deposition is a regional phenomenon and it is not easily possible to isolate the contribution of any one source from background dust deposition. It is possible that the commonly accepted deposition nuisance guideline in Queensland of 120 $mg/m^2/day$ could be exceeded due to localised effects rather than specifically due to project operations.

EPA suggests that the EIS detail proposed monitoring of air emissions, operational surrogates of effective air emission control and ambient air quality to enable appropriate conditioning.

The proponents undertake to measure air emissions from the main stack in the first production phase (800,000 Mtpa) of Coke Plant operations. Results from this first phase will be used in refining the monitoring program for subsequent project stages. The stack measurement campaign will be conducted by a specialist NATA accredited stack testing company and will be consistent with USEPA and Australian Standards isokinetic stack testing standards. The stack testing campaign will specifically analyse:

- Particulates (TSP. PM_{10});
- Metals;
- CO, SO_2, NO_X;
- Speciated PAH (16 PAH, typically); and
- Speciated VOCs.

The proponents undertake to monitor ambient concentrations of air pollutants. Given the other significant sources of air emissions in the Stanwell region, it is not likely that any monitoring station will identify the contribution from the Project in isolation. Nonetheless, the proponents will install an ambient monitoring station. The station will be used to measure hourly concentrations of criteria pollutants (SO_2, NO_x and PM_{10}). It will be operated in accordance with AS 2922-1987: *Ambient air - Guide for the siting of sampling units*. Pollutant concentrations will be measured according to the following standards:

- AS 3580.4.1-1990: *Methods for sampling and analysis of ambient air - Determination of sulfur dioxide - Direct reading instrumental method.*
- AS 3580.7.1-1992: *Methods for sampling and analysis of ambient air- Determination of carbon monoxide – Direct reading instrumental method.*
- AS 3580.5.1-1993: *Methods for sampling and analysis of ambient air - Determination of oxides of nitrogen - Chemiluminescence method.*
- AS 3580.9.8-2001: *Method for sampling and analysis of ambient air - Determination of suspended particulate matter - PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser.*

EPA states that the EIS should compare Queensland coke plant emissions against the recently built best practice US plants and consider reducing PM, PM_{10}, NO_X, SO_2 and lead emissions from the proposed Queensland coke plant.

Table 7.8 below shows emissions (per tonne coke produced) of total particulate matter, PM_{10}, NO_x, SO_2 and lead for the proposed Coke Plant and two coke plants overseas. This includes all emissions including fugitive emissions.

Table 7.8 Relative Emissions of Selected Pollutants

Pollutant	QCE[1] (tonnes/million tonnes coke)	Cambria[2] (tonnes/million tonnes coke)	Haverhill[3] (tonnes/million tonnes coke)
TSP	299.3	314.7	567.3
PM_{10}	235.3	230.0	231.8
SO_2 [4]	1544.7	2152.9	909.1
NO_x	844.2	802.9	824.5
CO	91.6	220.0	240.9
Lead [5]	0.8	0.2	0.2
VOC	29.1	28.5	199.1

Notes: [1] Assuming a production of 3.2 Mtpa coke

[2] Cambria Coke Company Application for Plan Approval December 2004, Commonwealth of Pennsylvania Department of Environmental Protection, Southwest Regional Office. Air Quality File PA-11-00513A. Production of 1.54 Mtpa coke. (Not operational).

[3] Request for Administrative Amendment - Haverhill North Coke Company. Permit to Install 07-00511, Facility ID 0773000182. Haverhill, Ohio, USA. Production of 1.0 Mtpa coke. (Operational).

[4] SO_2 emissions have been calculated assuming that the FGD scrubs 90% of all SO_2 from the gas stream and that the FGDs are operational 75% of the time.

[5] Lead emissions have been calculated conservatively assuming that the FGD baghouse scrubs 90% of all particulates from the gas stream and that the FGDs are operational 75% of the time. In both the Cambria and Haverhill inventories, 100% operability of the FGDs was assumed. Under this assumption, QCE's lead emissions would be 0.27 tonnes per tonne of coke produced. Further to this, the proposed coal blend for QCE is approximately 14% higher in lead content than the coal blend on which the Cambria and Haverhill inventories has been based.

The proposed Coke Plant is representative of best available emission control technologies when viewed in comparison to similar existing and proposed plants internationally.

QH states that compliance with the sulphur dioxide criteria is important to protect outdoor workers and those in the community with respiratory disorders. QH states that a monitoring program will be required to assess compliance with air quality criteria. If measurements during the early operational stages of the project indicate that contaminant levels will exceed 50% of the criteria levels, QH recommends that the proponent be required to undertake a health risk assessment of the air emissions and implement appropriate controls if necessary.

The proponents commit to installing an ambient air monitoring station as described above, noting it is difficult to exclusively identify the source of emissions in the Stanwell airshed.

QH states that fugitive emissions from stockpiles and ovens may pose a problem due to the movement of dust to off-site locations. Non-health related impacts of dust should be considered in the EIS and mitigation measures implemented to minimise complaints.

Fugitive emissions from stockpiles and ovens have been estimated and included in the impact assessment modelling. There are no exceedances of environmental guidelines for particulates. It is important to note that particulate emissions from ovens will be next to negligible given the control measures proposed by the proponents. These are described in detail above.

8.2 Potential Impacts and Mitigation Measures (1, 16)

EPA states that the EIS should explore strategies for avoiding, mitigating or offsetting greenhouse gas emissions prior to commissioning the Power Plant, and implement them as part of the project. EPA suggests that the proponents develop a greenhouse gas emissions strategy and identifying what actions will be undertaken to avoid, mitigate or offset greenhouse gas emissions.

There are several options that are being investigated by the proponents to manage the Project's greenhouse impacts before the cogeneration Power Plant becomes operational. These include the following:

- Purchasing of Green Power accredited electricity through Ergon Energy's Clean Energy program. Ergon Energy would be QCE's retailer. Its Clean Energy program is accredited to the government Green Power program. Purchasing electricity through an accredited Green Power program ensures that the purchased load is generated via renewable and sustainable methods. This has the potential to partially offset QCE's greenhouse gas emissions from purchased electricity.
- QCE is investigating the viability of abating some of the Project's pre-power plant greenhouse gas emissions via carbon sequestration in plantation forests.

EPA states that the EIS should provide more detail about the construction and operation timetable for the Power Plant, including details about the Plant's feasibility requirements. Emission calculations for average annual greenhouse gas emissions over the project life in the absence of the Power Plant need to be estimated and a contingency plan for avoiding, mitigating or offsetting these emissions developed.

The financial feasibility of the Power Plant is commercially sensitive and not for discussion in this document. QCE has committed to not proceeding beyond 1.6 Mtpa coke production capacity without committing to building the Power Plant. The Power Plant would generate up to 250 MW of electricity per year. Greenhouse gas emissions in the absence of the Power Plant will be approximately 1.44 Mt CO_2-e for 1.6 Mtpa coke production and approximately 2.88 Mt CO_2-e for 3.2 Mtpa coke production.

EPA states that the EIS should provide more detailed analysis and description of options available to reduce the long-term greenhouse emissions from the project.

The final design of the Power Plant is still subject to detailed financial and engineering studies. There are two possible options for its design: either a single turbine; or dual turbines. Either of these options could abate up to approximately 2.5 Mt CO_2-e per annum once operational by generating emission-free electricity.

FBA suggests that carbon dioxide release during the period prior to construction of the Power Plant be minimised through making the construction of the Power Plant as high a priority as the construction of the coke plant, making the Power Plant available for operation as soon as there is enough waste heat to enable it's efficient operation, or develop alternative mitigation strategies for coke plant emissions until such time as the power plant is constructed. FBA recommends that the point at which it will be viable to operate the Power Plant should be ascertained and supplied in the EIS, and that an

expected Power Plant completion date be provided in the EIS, in line with the ethos of the message provided in the objectives of the Executive Summary.

The financial feasibility of the Power Plant is commercially sensitive and not for discussion in this document. QCE has committed to not proceeding beyond 1.6 Mtpa coke production capacity without committing to building the Power Plant. The timetable for the construction of the Coke Plant suggests that early 2009 will be the latest time to begin construction of the Power Plant, with construction anticipated to take approximately 27 months.

9.2 Potential Impacts and Mitigation Measures (1, 3, 6)

The EIS provides estimates of noise emissions for some noise sources only. EPA suggests that the EIS should, wherever practicable, utilise actual measurements from a similar coke plant (e.g. of sound power) used as this increases confidence in the conclusions.

Information used in the EIS and also in this Supplement is the best available, determined in the absence of definitive data applicable to the Project. Actual noise measurements were not able to be sourced from existing coke plants for use in the EIS as each coke plant has a different configuration and design and therefore different noise emissions. Instead, engineering practice has been used to estimate the sound power levels, based on available data from similar noise sources of other plants, but not coke plants.

EPA recommends that the EIS should re-evaluate the potential for stack roar to cause noise impacts based on expected coke plant process gas flows.

Since the EIS was prepared, changes to the emissions from stacks have been made, including the efflux velocities. The maximum exit velocities from the stacks have been significantly reduced to 12 and 13 m/s. At these exit velocities, stack roar will not comprise a significant noise source. An analysis of the noise impact from individual noise sources indicates that noise emissions from the stacks are not the most critical noise sources, when stack roar is excluded.

EPA states that the EIS should, for items of equipment that are near the limit of practicable noise abatement, nominate specific sound power levels of equipment and appropriate abatement measures.

Revised sound power levels of equipment with attenuation measures are presented in Table 9.1 (refer Supplement Appendix D). Abatement/mitigation measures adopted in the noise assessment are presented further on in this section in response to the EPA recommendation to clarify inconsistencies between the air and noise abatement measures, and in Appendix D.

Table 9.1 Sound Power Levels of Equipment with Attenuation Measures

Item	Sound Power Level in dB at Octave Band Centre Frequency (Hz)								Overall dB	Source of Data
	63	125	250	500	1000	2000	4000	8000		
Quench car	88	83	95	85	84	80	79	79	97	Electric motor, rolling on track.
Quench tower	98	94	91	90	90	87	77	67	101	Based on noise source of material falling into metal hopper, and then attenuated to allow for coke being pushed onto concrete sloping wharf structure.
Coal Conveyor from stockpiles, stockpiles to crush/screen, crush/screen to ovens	90	91	91	93	87	82	73	65	98	Data from published Clermont Coal EIS report for open coal conveyor. Based on other data sources, we recommend using low noise idlers to achieve this sound power level. The sound power level for the conveyor is on a per 1 m basis.
Coal Conveyor from rail	95	96	96	98	92	87	78	70	103	As above.
Coke Conveyors	88	89	89	91	85	80	71	63	96	Data from published Clermont Coal EIS report for open coal conveyor less 7 dB(A) as coke conveyor run with significantly less tonnage at lower speed. The sound power

Item	Sound Power Level in dB at Octave Band Centre Frequency (Hz)								Overall dB	Source of Data
	63	125	250	500	1000	2000	4000	8000		
										level for the conveyor is on a per 1 m basis.
Coal transfer point – out of coke ovens	100	94	83	82	79	80	75	74	101	Based on noise measurement from transfer point at a limestone transfer station, and adjusted to account for expected reduced noise impact of coal. Assumes open plant without walls or enclosure
Coke screen	103	102	102	101	91	86	77	70	108	Based on noise measurements of similar items of plant.
Nut bin/breeze bin	104	101	95	90	91	91	88	87	107	Based on noise measurement at another project, with material falling into a metal chute/hopper
Stacker reclaimer	103	99	99	101	97	93	91	90	108	Based on published data for a reclaimer at Wagerup.
Coal Crush and Screen	103	102	102	101	91	86	77	70	108	Based on noise measurements of similar items of plant.
Rail loader	118	109	99	98	95	94	92	85	119	Data from published Clermont Coal EIS report.
Cooling tower (4/8 fans running)	109	99	107	93	89	83	75	69	112	Fan noise calculation, using algorithms in Bies and Hansen (1997).
Air handling fan (main stacks)	103	93	96	77	68	57	47	38	104	Fan noise calculation, using algorithms in Bies and Hansen (1997). No attenuation downstream.
Turbine house	109	108	101	104	103	99	96	85	113	Based on noise measurement at Stanwell Power Station less 2 dB(A), as Coke Plant turbine house is half the size of Stanwell Power Station (*i.e.* 200MW v 350 MW)
Stacker	98	98	99	97	96	92	86	79	105	Based on published data for a stacker at Wagerup
Coal transfer point – into coke ovens	105	98	86	83	77	76	69	67	106	Based on noise measurements of similar items of plant.
Coal transfer point – out of stockpiles	105	98	86	83	77	76	69	67	106	Based on noise measurements of similar items of plant.

EPA states that the EIS should ensure that emissions at night time do not exceed 45 dB(A) [as Max_{LpA}] in equivalent sound pressure levels in EIS Table 9.14.

The following sleep disturbance criteria are taken from the WHO Guidelines for Community Noise (1999): "*Sleep disturbance* is a major effect of environmental noise. It may cause primary effects during sleep, and secondary effects that can be assessed the day after night-time noise exposure.... For a good night's sleep, the equivalent sound level should not exceed 30 dB(A) Leq for continuous background noise, and individual noise events exceeding 45 dB(A) Lmax should be avoided." The WHO Guidelines also recognise that lower noise limits may be required in areas where background noise levels are particularly low or where the noise contains significant low frequency noise.

The existing background noise levels during the night are above 30 dB(A) in Stanwell, so that the noise levels cannot be described as being particularly low. The predicted external noise levels would result in the internal noise limits of 30 dB(A) Leq and 45 dB(A) Lmax being able to be met. The typical noise reduction of a building façade is 5 dB(A) with windows wide open, 10 dB(A) with windows partially

open, and 20 dB(A) with windows closed. Higher noise reduction is possible with upgraded façade treatment (*e.g.* upgraded windows and/or insulated walls).

At locations away from Stanwell township, lower background noise levels prevail but these locations are also further removed from the proposed plant so that the noise levels due to the proposed plant would be lower. Therefore, it is expected that the WHO guidelines would be able to be met.

EPA states that the EIS should evaluate the impact of noise emissions on all potential receptors. Charts showing contour plots of noise emissions should include all potential receptors. Where premises are within contours delineating unacceptable noise impacts, specific predictions for these residences should be made.

The noise level predictions in terms of Leq (as required by the Ecoaccess guideline (EPA, 2004a)) for two meteorological scenarios have been modelled. The first scenario represents a neutral atmosphere with no wind. These conditions are commonly experienced both during the day and during the night. The second scenario represents temperature inversion atmospheric conditions. These conditions are conducive to enhancement of noise levels, since the noise waves tend to bend back towards the earth rather than bend upward as normally occurs. Temperature inversions only occur during the night in the cooler months when there is little or no wind under clear skies. It has been assumed that the wind speed is 1 m/s from the south-west and that the strength of the temperature inversion is 3°C/100 m.

Figures 9.1 and 9.2 present the revised noise contours for the Project along with potential receptors for neutral and inversion conditions respectively. The residences denoted as red squares in these figures are classified as 'rural-residential'. Other properties zoned as 'residential' are located in the Stanwell township. Table 9.2 shows the predicted noise levels for the residences shown in Figures 9.1 and 9.2. The last two digits for each residence refer to the night-time noise limit. A comparison of these figures indicates that the predicted Leq noise levels under inversion conditions are somewhat higher than those predicted under neutral conditions, typically by 5 dB(A) in Stanwell, as expected.

A number of residences are within contours delineating noise levels exceeding criteria (Table 9.2).

Table 9.2 Predicted Noise Levels due to Project

Residence	Noise Limits (dBA)			Predicted Noise Levels (dBA)	
	Day	Evening	Night	Neutral (day/evening/night)	Inversion (night only)
A31	36	37	31	31	30
B31	36	37	31	29	29
C31	36	37	31	29	28
D31	36	37	31	29	29
A33	44	41	33	**37**	**43**
B33	44	41	33	**36**	**42**
C33	44	41	33	**35**	**42**
D33	44	41	33	**34**	**41**
E33	44	41	33	33	**40**
F33	44	41	33	32	**39**
G33	44	41	33	32	**39**

Residence	Noise Limits (dBA)			Predicted Noise Levels (dBA)	
	Day	Evening	Night	Neutral (day/evening/night)	Inversion (night only)
H33	44	41	33	**42***	**45**
A36	41	40	36	36	**38**
B36	41	40	36	36	**39**
C36	41	40	36	36	**39**
D36	41	40	36	35	**38**
E36	41	40	36	**39**	**43**
F36	41	40	36	**37**	**43**

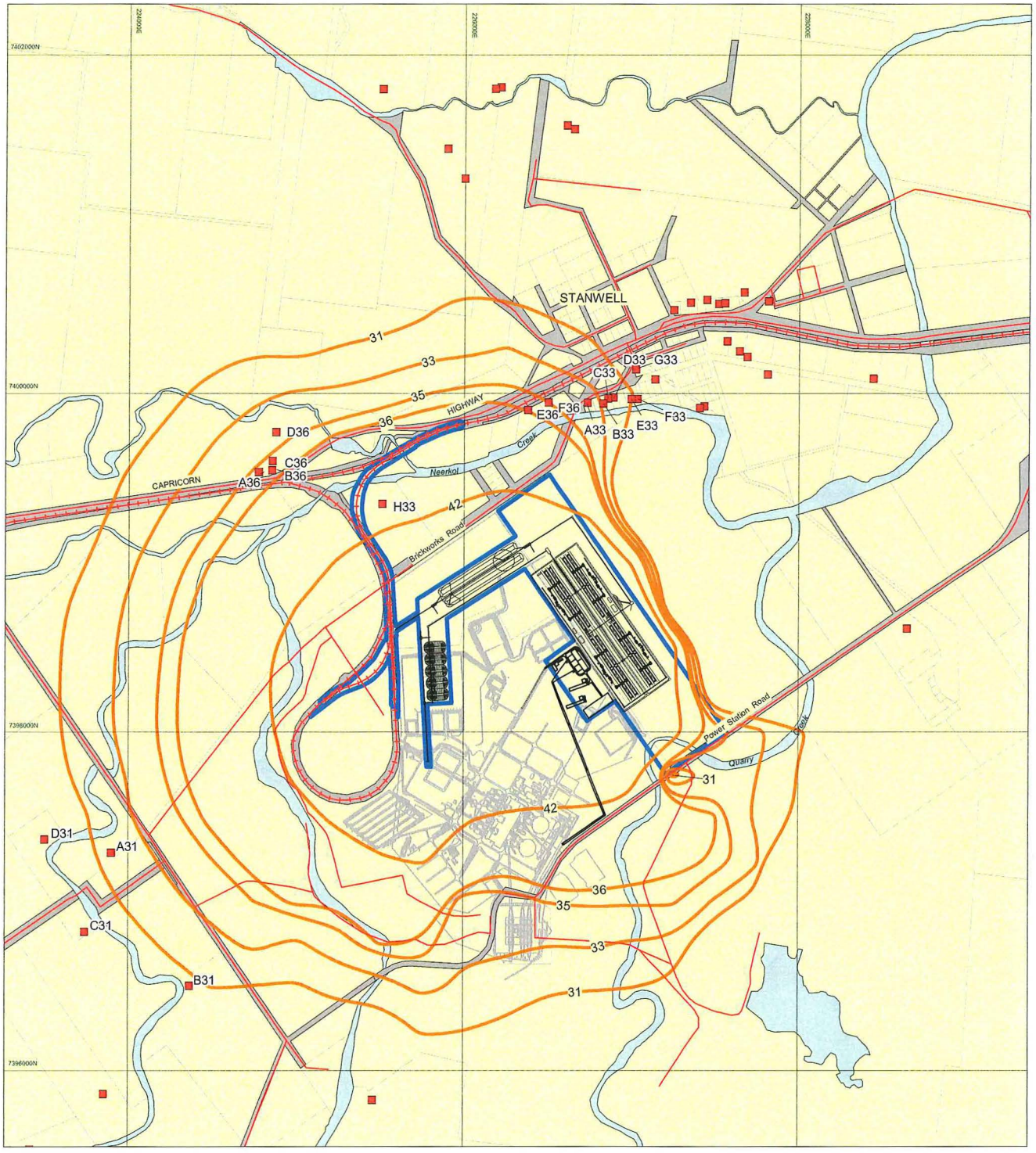
Notes: Bold noise level indicates exceedance during the night.
Bold noise levels with one star (*) indicates exceedance during the evening and night

Noise limits during the day and evening would be readily met, with the exception of residence H33, where during the evening there is an exceedance of 1 dB(A). The bold noise levels in Table 9.2 indicate predicted exceedances of the noise limit during the night. For neutral conditions during the night exceedances are predicted for residences A33 to D33 of between 1 and 4 dB(A). The main reason for these exceedances is the relatively low noise limit derived from the Ecoaccess guidelines which is based on the current somewhat elevated background noise levels. At residence H33 the exceedance is quite large and is due to its relatively close proximity to the proposed Coke Plant. The noise impact at this residence would be significant. For temperature inversion conditions during the night the predicted noise levels at all of the residences other than A31 to D31 exceed the noise limit.

It is instructive to compare existing Leq noise levels with the Ecoaccess Leq noise limits (refer Supplement Appendix D – Tables 4 and 5). The Ecoaccess noise limit at residences A31 to D31 (measured at location B2 – Figure 9.3) are predicted to be met. At location B1 the existing Leq's are rather high because of its proximity to the Capricorn Highway. Nevertheless, the differences between the existing Leq noise levels and the Ecoaccess Leq noise limits at residences A36 to F36 would be expected to be at least 15 dB(A). This means that the noise limit is some 15 dB(A) below the existing Leq noise levels at these residences. The maximum excess beyond the Ecoaccess noise limit under inversion conditions is 6 dB(A) at residence F36 with a predicted noise level of 43 dB(A). This predicted noise levels is still some 8 dB(A) below the existing noise level. This means that the noise impact of the Project at residences A36 to F36 would be insignificant and would not represent a diminution of acoustic amenity.

Within the township of Stanwell itself the differences between the existing Leq noise levels and the Ecoaccess Leq noise limits are 6 to 10 dB(A) during the day, 11 to 16 dB(A) during the evening, and 17 to 24 dB(A) during the night. The highest predicted noise level under temperature inversion conditions in Stanwell is 43 dB(A) at residence A33. This is some 24 dB(A) below the average Leq noise level during the night. This means that the noise impact of the Project at residences A33 to G36 would be insignificant and would not represent a diminution of acoustic amenity.

It should be noted (as discussed in EIS Section 3.4.1) that several structures comprising two houses and two sheds, line Brickworks Road along the northern boundary of the project site. These structures are owned by SCL and remain unoccupied. Plans to demolish these structures are being considered. For



LEGEND

- 42 — Noise Contour and Value (dB)
- A33 — Residence Noise Criteria
- Proposed Development Footprint
- Proposed Coke and Power Plant
- Existing Stanwell Power Station
- Road
- Railway

N

0 500m 1000m

Scale 1:35 000 (A)

Horizontal Datum GDA94 Zone 56

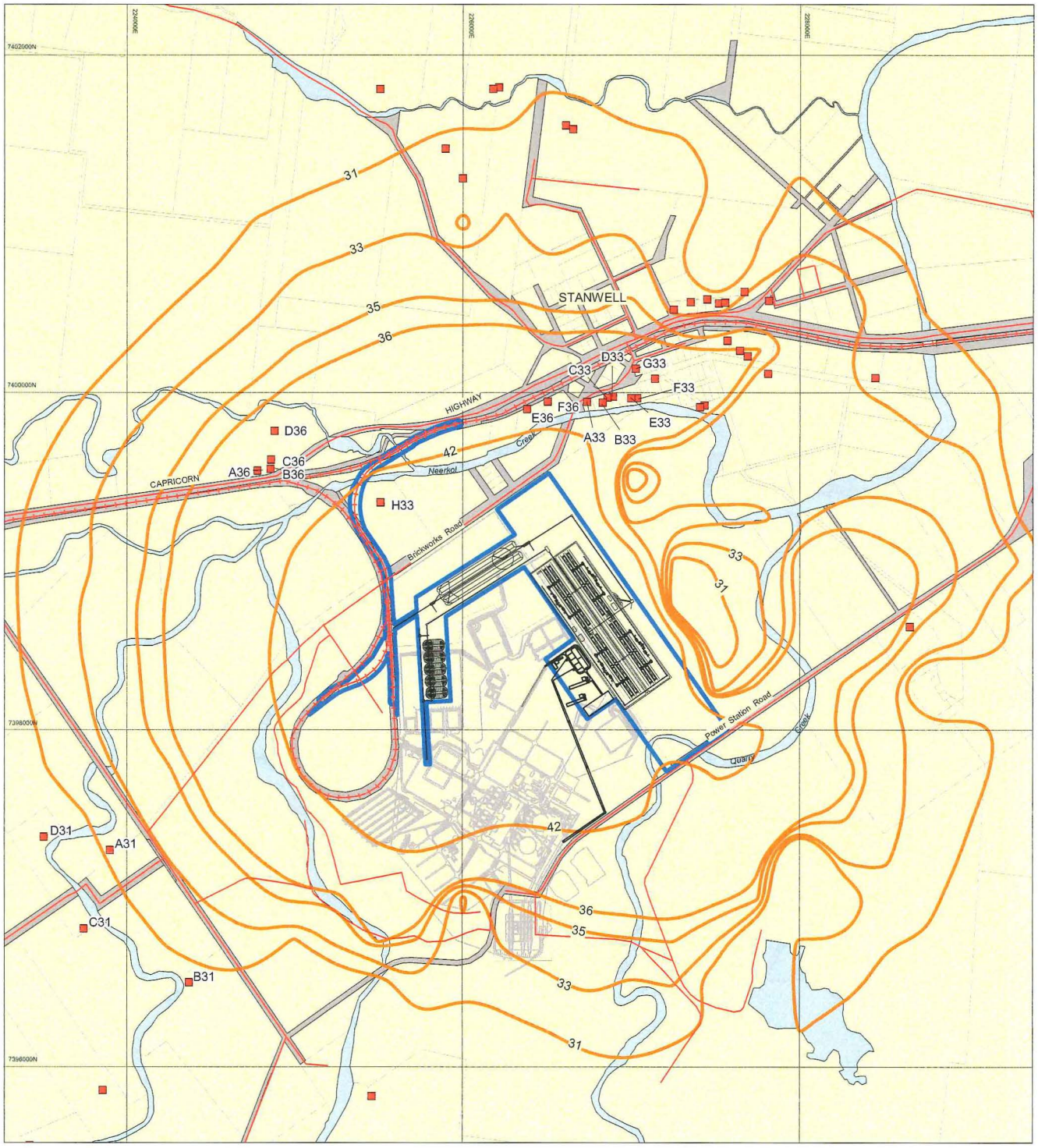
STANWELL CORPORATION LIMITED | QUEENSLAND COKE & ENERGY

URS

QUEENSLAND COKE AND POWER PLANT PROJECT EIS SUPPLEMENT

NOISE CONTOUR - NEUTRAL

Drawn: VH	Approved: JMcD	Date: 29-06-2006	Figure: **9.1**	Rev:C
Job No: **42625626**	File No: 42625626-g-073.wor			**A4**



LEGEND

- 42 — Noise Contour and Value (dB)
- A33 — Residence Noise Criteria
- Proposed Development Footprint
- Proposed Coke and Power Plant
- Existing Stanwell Power Station
- Road
- Railway

N

0 500m 1000m

Scale 1:35 000 (A)

Horizontal Datum GDA94 Zone 56

STANWELL CORPORATION LIMITED

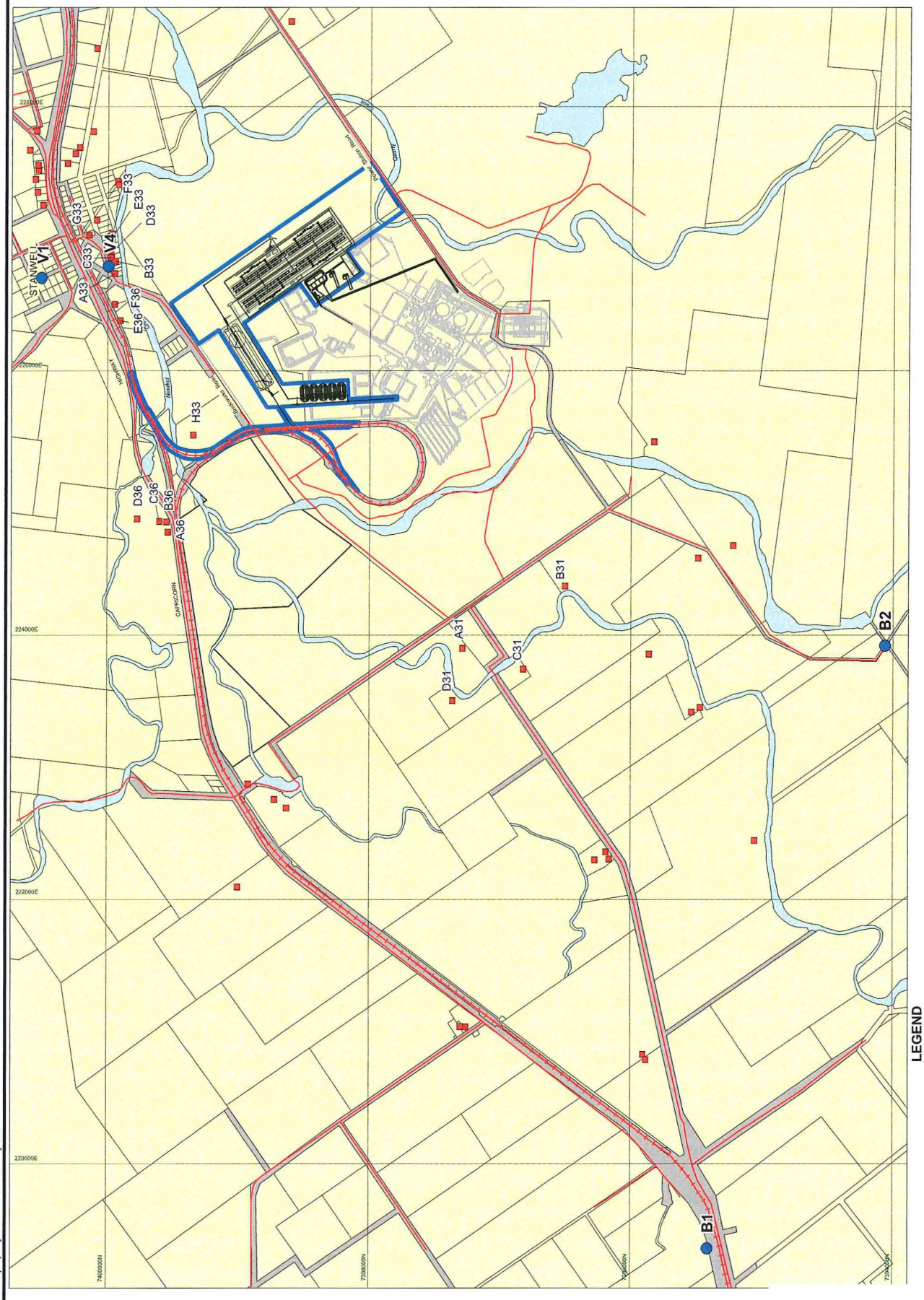
QUEENSLAND COKE & ENERGY

URS

QUEENSLAND COKE AND POWER PLANT PROJECT EIS SUPPLEMENT

NOISE CONTOUR - INVERSION

Drawn: VH	Approved: JMcD	Date: 29-06-2006	Figure: **9.2**	Rev:C
Job No: **42625626**	File No: 42625626-g-074.wor			**A4**



STANWELL CORPORATION LIMITED

QUEENSLAND COKE & ENERGY

URS

QUEENSLAND COKE AND POWER PLANT PROJECT
PUBLIC ENVIRONMENTAL REPORT

NOISE MONITORING LOCATIONS

Drawn: VH	Approved: JMcD	Date: 29-06-2006	Figure: **9.3**	Rev: B
Job No: **42625626**	File No: 42625626-g-072b.wor			**A4**

these reasons the structures are not identified as potential receptors for the purposes of the EIS and are not presented in EIS Figure 3.4 (although they may be visible on aerial photographs).

EPA states that the EIS should advise on current noise levels to determine if previously measured nuisance noise levels have been abated, and predict the combined noise impact of proposal and existing noise sources. Where exceedance of noise criteria is found or predicted, the assessment should evaluate which noise source is primarily responsible for the exceedance viz. the Stanwell Power Station, the proposal or both.

Additional noise monitoring has been carried out in and around Stanwell during March 2006 and June 2006 to provide an update to the August 2000 background noise levels reported in the EIS. Emphasis has been placed on the night-time period since this is the critical time in terms of noise impact. The results show that if the night-time noise limits are met, then the day and evening noise limits will also be met.

Night-time background noise levels (L_{90} noise levels) were obtained between 10 pm and 7am. Additional data was collected at location B1, B2, V1 and V4 (Figure 9.3) over a period of seven days in March 2006 and seven days in June 2006. For each of these monitoring periods the L_{90} value was calculated as per the EcoAccess guideline (Table 9.3 and refer to Supplement Appendix D for detail of these calculations).

Table 9.3 Night-time Background Noise Levels (L_{90}) calculated as per EcoAccess Guideline

Location	Area Description	August 2000	March 2006	June 2006	Average March/June 2006
B1	Several kilometres west of Stanwell. Representative of background noise levels away from the SPS, but near the highway.	27	31	25	28
B2	Several kilometres south of Stanwell. Representative of background noise levels away from the SPS and the highway.	28	28	24	26
V1	Stanwell township, north of highway.	32	32	32	32
V4	Stanwell township, south of highway.	--	33	34	33

The results indicate that the background noise levels at locations B1 and B2, which are several kilometres away from Stanwell township and the SPS are generally less than 30 dB(A). At location V1 the background noise level on all three occasions was 32 dB(A). At location V4, to the south of the highway in Stanwell, the noise levels are also quite constant at 33/34 dB(A). The slightly higher background noise levels at location V4 compared to those at location V1 reflect the presence of the SPS to the south-west and closer proximity to road and rail.

Noise levels predicted to occur as a result of the Project are discussed above (refer Table 9.2). The materials handling aspect of the Project is considered to be the likely dominant noise source due to the processes involved and the closer proximity to Stanwell township. The noise data for the coke oven component of the development is based on theoretical calculations of sound power associated with expected noise sources. At this stage, no measured noise data has been obtained for the coke oven component of the development. Some of the handling facilities have been relocated to the eastern part of

the site in close proximity to Flagstaff Hill. The hill will provide some acoustic shielding for these noise sources.

A comparison of existing Leq noise levels with Leq noise levels due to the Project indicates that existing noise levels are significantly higher than those predicted due to the proposed plant.

SCL has engaged specialist noise consultants to undertake an evaluation of the compliance of SPS noise imissions with relevant legislative requirements for environmental noise. On advice from SCL's noise consultants, SCL supports the inclusion of noise from the SPS in the determination of existing background noise for the purpose of setting noise limits for this Project. The EPA will be provided with a copy of the assessment report.

The proposed noise compliance levels for homes nearer to the site are considered too high. EPA states that the EIS should use representative background noise levels and land uses in determining noise compliance levels for nearby residences.

The procedure prescribed by EcoAccess in terms of receiver land use and receiver area dominant land use (description of neighbourhood) has been followed in the updated report. Full details are provided in Supplement Appendix D.

EPA states that the EIS should clarify inconsistencies between the air and noise abatement measures. Where enclosure of a noise source is the recommended treatment method, this needs to be practicable from air pollution control and practicable viewpoints.

To reduce the noise emission levels from the Project, a number of noise mitigation measures have been incorporated into the design. These are presented below along with their corresponding reduction effect:

- Enclosure of the coal crusher and screening station. Construction may consist of a sheet metal wall lined internally with 100 mm insulation and perforated metal/foil, mounted on vibration isolation mounts around the sides of the station: 10 dB(A) reduction; located on the N/NW part of the plant.
- Relocation of the crushing and screening station further west towards the stockpiles: This results in reductions in noise levels for residences to the north-east due to increased distance from this noise source; located on the N/NW part of the plant.
- Enclosure of the conveyors, aside from those required to be open for coke stacker/reclaimer and coal stacker: 5 dB(A) reduction; located on the N, W and E parts of the plant.
- Reduction in speed of coal conveyor from stockpiles to crusher/screener to coke ovens and use of super low noise idlers: 5 dB(A) reduction; located on the N, W and E parts of the plant.
- Stacker – Adoption of noise minimisation techniques such as (i) controlled trajectory chute at the tripper discharge, (ii) fully enclosed tripper discharge chute; (iii) low height tripper transfer discharge; (iv) fully enclosed boom conveyor load skirts; and (v) low noise electric motor on the boom conveyor drive (Mills *et. al.*, 2000):8 dB(A) reduction; located on the W part of the plant.
- Reclaimer – Adoption of noise minimisation techniques such as (i) ball bearing type chain guide rollers; (ii) vibration absorbing rubber plates attached to chain guide liners; (iii) large diameter chain

sprockets and guide rollers and tumblers; (iv) low noise motors on harrow sled drive; and (v) fully enclosed impact loading table at discharge to yard conveyor (Mills *et. al.*, 2000): 4 dB(A) reduction; located on the N part of the plant.

- Maintain a bed of coke in the Breeze and Nut bins such that new material is not falling onto bare metal (Mills *et. al.*, 2000): 10 dB(A) reduction; located on the E part of the plant.
- Construction of enclosures leading into and out of the rail load-out facility, upgrade of overall construction in terms of wall and roof transmission loss performance and maintenance of a bed of coke in the rail-load out bin: 10 dB(A) reduction; located on the W part of the plant.
- Installation of high performance attenuators on the cooling tower fans and coke oven stack fans: 15 dB(A) reduction; located on the SE part of the plant.
- Modification of Dozer D11 with assistance of Caterpillar using treatments to tracks and muffler; 5 dB(A) reduction; located on the E part of the plant.

A number of these noise mitigation measures have no impact on air emissions. Those that do impact on air emissions (as assumed in Appendix C) comprise modifications (ii) and (iv) to the stacker, and the construction of enclosures leading into and out of the rail load-out facility. The enclosure of the coal crusher and screen stationing for noise mitigation will have a positive outcome on emission levels (*i.e.* there will be some additional reduction) as will its relocation to the west away from Stanwell township.

Views of potentially affected persons are a prescribed matter under the Environmental Protection (Noise) Policy 1997. These would include any complaints as well as favourable views. No views are mentioned in the EIS. EPA states that the EIS should present views of potentially affected persons, including any noise complaints.

Section 14 of the *Environmental Protection (Noise) Policy 1997* identifies matters to be considered by the administering authority when evaluating noise relevant activities. Subsection (c)(iv) provides that the views of "affected" persons about noise from the noise relevant activity be considered. Views of "affected" persons were identified in the socio-economic impact assessment for the Project, carried out by the Institute for Sustainable Regional Development, Central Queensland University and presented as Appendix K of the EIS.

The assessment identified that during consultation with residents and businesses in Gracemere, Kabra and Stanwell, the most frequently mentioned response to the question about what people value about the area in which they lived was its quietness/small town feel/peacefulness (14 out of 57 – it should be noted that 36 respondents either did not answer or were not asked this question). Twelve of the 57 respondents (mostly from Stanwell) mentioned a busier railway as being a negative repercussion from the Project, with an element of that being noisy trains. Losing the small country feel/country life endangered was mentioned as an issue three times by respondents. Six respondents of 57 (mainly from Stanwell) stated that they would like to see quietness preserved in the area.

Public consultation carried out by the proponents allowed for enquiries in relation to the Project through a number of contact methods, such as via email, telephone and feedback forms. Of the total enquiries, 1.9% related to noise. General interest was expressed regarding the degree of noise to come from the operation

of the plant as well as noise from increased rail use. The majority of enquiries related to employment (25.6%), benefits (23.7%), other (18%) and air emissions/odour/dust (10.9%).

A search of the EPA's complaints database (which records data back to late 1997) has revealed that there are no noise complaints recorded with the Stanwell Power Station (SPS) as the alleged source. To date, SPS itself has also not recorded any noise complaints.

EPA states that the EIS should evaluate tonality and impulsiveness of noise sources in assessing noise impacts and compliance.

The tonality and impulsiveness of noise sources at the Project are likely to cause minimal impact if appropriately treated during detailed design, due to the number of noise sources associated with the Project, as well as existing background noise sources to some extent acting as a masking agent. A number of measures have been proposed that will reduce the impact of tonality and impulsiveness including relocating the coke handling, screening and sizing facilities to the eastern part of the project site near Flagstaff Hill and minimising the noise of loading into bins by adding enclosures, lining the metal surfaces with a layer of sound-absorbing material (*e.g.* the reclaimer) and/or maintaining a layer of material in the bin (*e.g.* breeze and nut bins). As a result no allowance for either tonality or impulsiveness has been allowed for in the noise model.

EPA states that the EIS should evaluate mitigation measures for mobile noise sources to ensure these do not cause adverse noise impacts.

Noise from mobile sources has not been assessed in detail at this stage, however, potentially annoying noises from industrial projects include reverse beepers from mobile equipment. It should be noted that all of the mobile noise sources are to the south or south-west of the township of Stanwell. The following noise controls will be considered:

- Use of background noise detecting reverse beepers;
- Designing vehicle paths to minimise time spent reversing;
- Use of flashing lights in lieu of reverse beepers; and/or
- Noise barriers and/or bunding around areas where reverse beepers are used.

QH states that it is critical that the final design includes the proposed coke plant noise attenuation measures. Other equipment that will require careful selection and use are conveyor alarms, plant communication systems and reversing alarms on mobile equipment to minimise impacts on nearby residents.

Noise attenuation measures of the dominant noise sources are described above (refer to the EPA comment on air and noise abatement measures). Suitable selection will be made of conveyor alarms, communication systems and reversing alarms on mobile equipment to minimise noise impacts.

QR states that legislative target planning noise levels for rail operations in Queensland are absent from the EIS. The more stringent 'sleep disturbance criteria' are specified although these have no legal

basis. QR suggests that is be made repeatedly clear in the EIS that the sleep disturbance criteria are by no means compulsory and that the less stringent legislated criteria be used as the measure of acceptability of otherwise of rail noise. QR states that it is unclear whether the predicted noise levels for shunting or wagon banging during loading/unloading activities include adjustments for noise characteristics as set down in AS1055.

Under the *Environmental Protection (Noise) Policy 1997* (EPP Noise) the target noise levels for rail operations are 87 dB(A) as a single event maximum noise level and 65 dB(A) as the average noise level over a 24 hour period. These noise limits are met by the Project, as are the more stringent sleep disturbance noise limits. The predicted noise levels do not include adjustments for impulsiveness, since neither the EPP Noise nor the sleep disturbance approaches require such an adjustment.

Since the predicted rail noise levels are below the applicable noise limits, no specific noise mitigation measures would be required. The potential effect on the noise environment from increased rail operations would be separately assessed as part of the access agreement process administered by QR.

QR has requested that an additional sentence be added into Section 9.2.5 Mitigation Measures.

Initial predictions of rail noise levels as a result of the Project fall below the applicable criteria and at this stage, no specific noise mitigation measures are proposed for rail operations. However, the potential affect on the noise environment from increased rail operations would be separately assessed as part of the access agreement process administrated by QR, should they prove to be the rail infrastructure provider. Depending on the results of this assessment, mitigation measures may be proposed.

10.5.2 Solid Wastes (13)

The EIS identifies that 50% of waste output is to be transported via Gracemere and 25% to Rockhampton and 25% to Gladstone. FSC requests information on what volume this represents.

It is anticipated that more like 80% of general waste (approximately 1,100 t per year) produced by the Coke and Power Plants will be transported via Gaval-Gracemere Road in Gracemere for disposal at the town's landfill (corner of Lucas and Allens Roads). The calcium sulphate component of the FGD waste will be sold for agricultural or other commercial uses where possible. However, should commercial sale not be realised, the FGD waste will be disposed of at Gracemere Landfill (FGD waste confirmed as suitable for general landfill disposal by USA studies). The volume of FGD waste proposed to be generated by the Coke Plant approximates 15,340 t/a for Stage 1 (2 trucks per day), and 30,680 t/a for Stage 2 (4 trucks per day). Recyclable wastes (approximately 275 t per year) will be transported to Rockhampton and/or Gladstone depending on the location of recycling facilities. It should be noted that only heavy vehicles requiring access to the landfill and those required to transport quarry fill from Gracemere will use this route. More specifically, the volumes of industrial type wastes anticipated to be generated for the Project approximates the following per annum (Table 10.1), depending on the reuse and recycling measures to be implemented on site:

Table 10.1 Estimated Annual Waste Volumes

Waste Type	Approximate Annual Generation	
	Power Plant	Coke Plant
Synthetic mineral fibre	2.5 t	10 t
Steel	7.5 t	50 t
Cardboard	24 m^3	160 m^3
Waste absorbents	12 drums	25 drums
Waste oil	5,000 L	< 10,000 L
Waste grease	340 L	< 2,000 L
Oily water	630 L	< 4,000 L
FGD waste (comprising 2% dust, 5% other insert waste, 27% $CaCO_3$, and 65% hydrated $CaSO_3$ and $CaSO_4$)		15,340 t for Stage 1 30,680 t for Stage 2

As discussed in Section 10 of the EIS, the proponents commit to minimising waste generation wherever possible.

FSC states that under no circumstances would FSC agree to heavy vehicles travelling through the main street of Gracemere to access the briquette making factory at Bouldercombe. The alternative route would be the Capricorn Highway – Bruce Highway – Burnett Highway. The briquette factory should be located adjacent to, or in close proximity to, the plant within the Stanwell Energy Park. Advice was also received by FSC that the coal fines/coke breeze will not be transported to Bouldercombe as the most cost effective and satisfactory solution is for the material to be heated on-site. If this is in fact the proposal, FSC has no issue with the waste disposal aspect of the project. However, it would be advisable for FSC to receive written confirmation of these issues.

It is proposed that coal fines and coke breeze separated from coal and coke during screening will be disposed of by bleeding slowly into the SPS feed. No transportation of coal fines or coke breeze through Gracemere is envisaged. Should the opportunity arise in the future, the coal fines and coke breeze will be supplied to a local briquetting industry. A briquette factory is outside the scope of the EIS and would undergo an independent approval process should it be considered further.

No submissions made

12.2.2 Demographic Profile (4)

In Table 12.1 General Demographic Characteristics, the terminology 'Aboriginal Origin' should be changed to 'Aboriginal and Torres Strait Island People' if both groups are included in this category. If the table only refers to Aboriginal people, DATSIP recommends adding Torres Strait Island People demographic statistics to the list.

Table 12.1 below incorporates statistics on people of Torres Strait Island origin as requested, sourced from the 2001 Census.

Table 12.1 General Demographic Characteristics

Characteristic	Fitzroy LGA		Rockhampton LGA		Livingstone LGA		Mount Morgan LGA		Rockhampton SSD		Calliope LGA		Gladstone LGA		Queensland	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
General																
2001 Population	9,554	100.0	58,382	100.0	27,017	100	2,776	100	61,019	100	15,091	100	26,835	100.0	3,655,139	100.0
Residency Rate*	5,081	53.24	27,005	46.26	11,865	43.92	1,424	51.30	27,820	45.59	6,561	43.48	11,437	42.61	1,584,873	43.36
Males	4,659	48.82	28,433	48.70	13,774	50.98	1,386	49.93	29,693	48.66	7,744	51.32	13,671	50.94	1,807,730	49.46
Females	4,894	51.28	29,949	51.30	13,243	49.02	1,390	50.07	31,326	51.34	7,347	48.68	13,164	49.06	1,847,409	50.54
Aboriginal Origin	310	3.25	2,591	4.44	641	2.37	279	10.05	2,816	4.61	307	2.03	751	2.80	87,322	2.39
Torres Strait Islander Origin	8	0.08	205	0.35	78	0.29	0	-	209	0.34	36	0.24	79	0.29	16, 415	0.45
Born Overseas	475	4.98	3,696	6.33	2,615	9.68	236	8.50	3,706	6.07	1,774	11.76	2,672	9.96	616,168	16.86
Labour Force																
Persons 15+ Years	6,941	72.73	45,554	78.01	20,857	77.20	2,227	80.22	47,457	77.77	11,102	73.57	20,117	74.97	2,884,181	78.9
Labour Force	4,370	45.79	26,754	45.83	11,149	41.27	800	28.82	28,281	46.35	6,878	45.58	13,292	49.53	1,709,612	46.77
Persons Employed	4,068	42.62	24,277	41.58	10,196	37.74	614	22.12	25,703	42.12	6,357	42.12	12,033	44.84	1,568,864	42.92
Unemployment Rate		7.0%		9.3%		8.6%		23.4%		9.11%		7.7%		9.5%		8.2%

Source: 2001 Census (ABS, 2002).
Notes: *Indicates the number of persons residing at the same address 5 years prior.
LGA – Local Government Area
SSD – Statistical Sub District

12.3.2 Government Agencies and other Service Providers (9, 10, 15)

DLGPSR states that the need for significantly increased services from the State in the areas of health, education, emergency services and police does not seem to have been quantified despite the project having an extended five year construction phase at the Stanwell site. Commitments are needed from the proponents as to how they can contribute to the provision of such services.

The socio-economic impact assessment conducted by the Institute for Sustainable Regional Development, Central Queensland University (CQU) and provided as Appendix K of the EIS involved consultation with agencies and service providers, including emergency services, to determine the potential impact of the Project on service provision.

Discussions with Queensland Health indicated that the planning program for health is moving towards a more regionally focused model, where continuing development of the Rockhampton Base Hospital and associated medical services will provide a core of facilities and services in the region. A major upgrade of emergency service facilities at the Base Hospital is planned, so that the facility has more capacity and integrity as a stand-alone facility. These factors suggest that there is a core level of health facilities available, and that there is potential for facilities and services to expand in line with population increase. Access to third party counseling and assistance services and "well-being" programs is currently provided by SCL for all its' operational staff. This service will be extended to operational workers at the proposed Power Plant.

Police stations situated close to the project site are located in Gracemere and Rockhampton and ambulance and fire services that service the site are in Rockhampton. It was confirmed that in the case of an emergency, the services in Rockhampton and Gracemere will respond. On-site facilities will be provided as part of the Project's workplace safety and risk management strategies, or arrangements will be made to share the facilities and services already in place at the SPS. This could include the stationing of an ambulance and ambulance officer at the site during project construction, as currently occurs at SPS during major outages. The proponents will develop appropriate emergency response plans that include staff training and regular inspections to ensure the maintenance of plans and equipment.

Discussions with education providers indicate that only one public school in the Rockhampton, Gracemere and Livingstone LGA areas is at capacity.

The result of the consultation indicates that the potential impact of the Project on health, education and emergency services including police is expected to be minimal with no significant increase in services required. The proponents commit to ongoing consultation with agencies, service providers and the major contractor to ensure that services are able to accommodate the Project as it develops over time and any impact of the Project is addressed.

DC suggests that the proponents take a partnership role in funding the development of community infrastructure via the establishment of a community benefit fund to be expended in the location surrounding a SPQ. DC suggests that the proponents enter into close liaison with stakeholders involved in building and maintaining safer communities. Consideration should be had to making available to project employees, a community involvement package, that funds workers' active

involvement in community based activities as an alternative to adopting less community acceptable activities. DC recommends that the proponents purchase human support services through the provision of brokerage funds in order to alleviate any strain on community services and improve service responsiveness to workers' needs.

Where applicable, the proponents will consult with relevant stakeholders, including DC to develop appropriate strategies to ensure any impacts of the Project on services are addressed. The above suggestions from DC are noted and will be considered as part of this process.

It should be noted also that the accommodation facility proposed for Gracemere will not be 'single person's quarters'. The accommodation, proposed to be located on the corner of Johnson Rd and Lucas Street, Gracemere, will be appropriate for the partners and families of the project workers as will be reflected in amenities provided and overall location, design and layout, thereby reducing some of the potential impacts identified by DC, such as isolation and demand for housing.

RCC asks that the proponents be requested to hold discussions with RCC and Education Queensland about the increase in public primary and secondary school facilities and identify their future strategic direction. RCC also asks that the proponents discuss with RCC about ways in which they can contribute to Rockhampton City to help offset the results of some of the project's impacts.

The requests by RCC are noted by the proponents and, where appropriate, relevant stakeholders will be contacted to discuss impacts educational facilities.

12.3.3 Employment (4, 7, 9, 10, 15)

DATSIP encourages the proponent to develop a strategy for the employment of Aboriginal and Torres Strait Islander people as part of the training and employment strategy for the project as a whole.

DET recommends that consideration be given to a strategy for minimum level training and employment outcomes, similar to the State Government Building and Construction Contracts Structured Training Policy and the Indigenous Employment Policy for Queensland Government Building and Civil Construction projects, at the tendering and selection phase of the Project.

DC recommends that the proponents introduce affirmative action for a variety of disadvantaged groups in its recruitment and training programs.

RCC asks that the proponents be requested to hold discussions with RCC and DET about additional training for youth, unemployed and over 40's residents to meet the demand that the project imposes.

The proponents are currently working with several privately owned employment and training organisations in the Rockhampton area, as well as with representatives of several State and Federal Government agencies, to develop a structured whole of project training strategy. An advisory group has been formed which includes agencies such as the Department of Employment and Training, Central Queensland Institute of TAFE, Department of State Development Trade and Innovation, Tradestart and the Department of Employment and Workplace Relations. The focus of the advisory group will be to

address skills and employment issues for the life of the Project, including employment strategies for targeting disadvantaged groups.

SCL, as a Government-owned corporation, is committed to the implementation of the "State Government Building and Construction Contracts - Structure Training Policy" (10% Policy) (DET, 2002) and the Indigenous Employment Policy for Queensland Government Building and Civil Construction Projects (20% Policy) (DET, 2004) as they apply to the Project. The proponents commit to maximising training and employment opportunities for local communities in both the construction and operational phases and will strongly encourage its contractors to commit to the same.

DLGPSR states that the EIS needs to quantify the potential impact on existing industries in the region of significant impacts on low income families as a result of increases in rental prices, and impact on local employers as a result of higher salaries offered by the project.

It was identified in the socio-economic impact assessment conducted by CQU that key potential social and economic impacts could arise from (a) impacts on housing markets and subsequent increases in rental prices and (b) increases in wage levels and the price of other factors to local businesses. While the potential for these impacts exist, the effects have not been explicitly modelled because the number of other influencing variables makes accurately quantifying such impacts difficult. Any estimate of such detail could prove misleading and inaccurate and therefore would hold little overall value.

Impacts on Housing Markets

It is noted in the EIS that the strength of the housing market is dependent on a number of factors, including demographic trends, income levels, and a variety of supply factors. On the demand side, the housing market has strengthened in Rockhampton over recent years due to:

- The strength of the national housing market and the influx of investors from other regions (particularly southern states). This demand is sensitive to the investment climate, particularly in relation to interest rates;
- The demographic trends of population migration to regional centres and coastal areas. This has also been influenced by changes in shift work patterns in many mining communities, which has led to more families being based in the Rockhampton region. The current upturn in mining activity and associated infrastructure construction has generated increases in the regional labour force, with subsequent flow-on effects into housing markets; and
- Increasing wealth in the region which is largely driven by the primary industries of mining and agriculture being at the top of the commodity cycles. Declines in these industries might flow through to housing markets.

On the supply side, there are some factors to consider, including:

- Availability of land suitable for development. Consultation with the four local councils identified a large potential supply of housing lots; and

- Availability of builders and tradespeople. This is dependent on the level of construction activity at local, regional and state levels, but the supply of builders is likely to remain tight.

The variability in these factors makes it difficult to predict impacts on housing markets with any degree of certainty. It was pointed out in the EIS that the community faces an interesting trade-off for at least the construction phase of the Project. If impacts on housing markets are to be minimised then, as proposed, an external construction workforce would be housed in purpose-built accommodation and very limited supplies would be purchased from local businesses. Greater local involvement in the construction phase and the subsequent operating phase of the Project will increase the positive economic impacts from the Project, but an automatic consequence of this may be increased pressure on the housing market.

Despite the difficulties of predicting the actual impacts on the housing market, the design of the Project has focused on ways of minimising potential impacts. The extended length of construction, as compared to many other construction projects, will make it attractive for housing to be constructed and meet additional demands. As well, the reliance on a non-local workforce for most construction activities and the proposed accommodation facility in Gracemere will help to limit housing market impacts.

Impacts on Labour Markets

Increased competition for labour may make it difficult for existing businesses to retain staff, particularly if they have little opportunity to increase wage levels. To some extent this may confirm existing patterns where some workers already move from Rockhampton businesses to work in the coal fields because of the higher wages. The difficulty in predicting the impacts with any degree of certainty is that the net impact on local businesses will depend on the combined impact from a number of factors, including the patterns of development in the coal industry and infrastructure construction activities as well as the labour demands from the Project. Other variables to consider are the potential supply of labour from other areas and people's willingness to move to Rockhampton (which is likely to be a function of economic conditions at the time) and the potential success of local firms in sub-contracting activities from the project construction activities.

While impacts on labour markets can be expected, the outcomes are generally positive for the local population. Workers moving to new jobs are likely to benefit from higher wages, new training, and the generation of additional sets of skills. Not all workers will automatically move to new jobs, and the reality that many skilled employees in the region could already have shifted to mining towns for higher wages, and have chosen not to do so, suggests that the extent to which labour shortages become acute may not become intense.

12.3.4 Housing and Accommodation (9, 10, 11, 13, 15)

DLGPSR states that the social impacts arising from the circumstances where a significant proportion of staff may need to remain in 'non-residential/temporary' accommodation for a long period does not seem to have been recognised and there is no commitment from the proponent to address such impacts.

The issue of using temporary accommodation was discussed with FSC and a number of agency staff. The main concerns were to ensure that the initial placement of the accommodation facility was not in an area

where there would be adverse social impacts. Given that the issue of placement would be addressed through planning requirements of local government, other potential impacts were expected to be minimal assuming appropriate management.

Accommodation facilities and other temporary accommodation arrangements have become a feature of many mining towns since the expansion in activities from 2004, and many of them appear to be well-run with little adverse social impacts. The main criticisms appear to be ones of omission: accommodation facility residents often don't become involved in community events and add to social capital. Given the larger pool of recreational opportunities and travel options for temporary workers in Gracemere and Rockhampton when they may have time off work, as compared to temporary workers in many mining towns, major problems arising from the use of temporary accommodation are not expected.

The proponents will review management actions that minimise accommodation facility problems in other areas as a way to ensure that any potential problems are minimised. The proponents commit to ongoing consultation with relevant stakeholders to develop appropriate strategies to ensure any social impact resulting from workers residing the accommodation facility at Gracemere is addressed.

DLGPSR states that the negative social impacts from the project are likely to be significant and should be acknowledged in the EIS and particularly within the Executive Summary.

While the statement "Minimal environmental impacts of the Project are expected and the proponents will implement mitigation measures through project design, operation and management to avoid or minimise these where possible" is contained in ES3 Conclusion to the Executive Summary, details of the negative social impacts likely as a result of the Project are presented in the Executive Summary at ES2.10 Social Environment. The socio-economic impact assessment conducted by CQU has been summarised in Section 12 Social Environment of the EIS and provided as EIS Appendix K. In terms of negative social impacts, the assessment concludes that:

- The project construction and development may result in an increase in local wage levels and exacerbate existing skill shortages;
- Flow-on effects from the Project will mean that a large proportion of locals gaining employment will need to be replaced. There will be longer-term demographic impacts resulting from the upstream and downstream economic development;
- Population growth due to the Project may result in an increase in rental and house prices as the rental market tightens further, resulting in low income families being forced out of the private rental market;
- Proposed grouped accommodation arrangements at Gracemere may limit the economic impact of those workers on the local economy as most disposable income will flow back to the area of residence; and
- The Project may alter regional migration patterns leading to community dislocation and social isolation.

DC suggests that the proponents enter into negotiations with government authorities, existing community-based housing cooperatives, local Councils and other relevant stakeholders in developing a joint response to the expected housing and rental market impacts of the project.

The proponents note this suggestion and where appropriate will consult with the relevant stakeholders regarding impacts on housing and accommodation resulting from the Project.

The EIS outlines three affordable housing strategies that seek to address the potential shortage of affordable housing throughout the Rockhampton region. DH provides advice to which options it supports.

This advice will be considered in consultation with DH when addressing any impacts on housing and accommodation in the region that will result from the Project. It should be noted that the accommodation facility proposed for Gracemere will not be 'single person's quarters'. The accommodation is proposed to be located on the corner of Johnson Road and Lucas Street and will be appropriate for the partners and families of the project workers as will be reflected in amenities provided and overall location, design and layout.

FSC suggests that any negative impacts be softened by providing infrastructure that will provide a community benefit. Consideration should be given to providing recreation and community facilities that are needed to cater for the increase in population that the project will bring to the area. FSC states that it is desirable that any substantial structures proposed for the accommodation village (such as a recreation hall etc) be constructed as a permanent building and not a demountable type.

The suggestions from FSC are noted. It is proposed that service infrastructure to the accommodation facility site in Gracemere will be permanent and will be designed and positioned to maximise long-term benefit. During the design of the accommodation facility consideration will be given to the type of facilities to be provided, the most appropriate construction method and any proposed future uses of the site.

RCC asks that the proponents be requested to hold discussions with RCC, the Department of Housing and the Department of Public Works about additional affordable housing for Rockhampton.

The request is noted and where appropriate the proponents will consult with relevant stakeholders to discuss affordable housing matters.

12.3.6 Direct Community Impacts and Mitigation Measures (6)

QR states that the proponents consider cross referencing Section 9 - Noise and Vibration and Section 12.3.6 on page 12-31 of the EIS.

It should be noted that page 12-31 contains cross referencing to Section 9 - Noise and Vibration for details on monitoring results. When reading Section 12.3.6 of the EIS, the reader is also referred to Section 9 for further details on baseline noise conditions, potential impacts and mitigation measures.

13.2. Potential Impacts and Mitigation Measures (2)

DMR states that the results of the socio-economic impact assessment including input-output analysis do not appear to be well integrated or linked with the rest of the EIS. DMR states that the EIS should consider the socio-economic issues associated with the regional transport sector.

The difference in the results presented in different sections of the EIS is largely a consequence of the methodologies employed. The input-output analysis technique was used to assess the potential economic consequences of the Project, and was conducted as a desktop modelling exercise. By comparison, the social impact assessment exercise relied on interviewers with key stakeholders and members of the general public. The focus of the EIS stage of the Project was on 'impacts', and many of the people interviewed tended to concentrate on potential negative effects. The result was a different focus for the economic and social sections of the EIS, which exacerbated apparent differences in results without necessarily meaning that either approach was invalid. Similar outcomes were generated for other components of the EIS, where underlying technical specialisations for the issue of concern gave the appearance that results were not well integrated with social and economic considerations.

A separate issue raised was the potential social and economic impacts associated with the transport sector. The Project is not expected to have major impacts on transport as a discrete sector, so these types of impacts were not modelled specifically, although the additional labour involved in rail transport was modelled. However, the additional economic activity and demographic changes will have wider impacts on transport infrastructure and congestion, and these impacts were considered in three main ways.

First, estimates were included in the EIS about projected residential locations for construction and operating staff, and the potential implications for vehicle movements were then considered. The use of an accommodation facility in the construction phase with bus transport to the project site will help to minimise the number of vehicle movements. Second, current highway congestion rates were considered in the Rockhampton and Gracemere areas. Results indicated that there was excess capacity available on the Capricorn Highway section between Rockhampton and Stanwell to handle additional traffic. Third, the results of the community interviews were analysed to identify whether increased traffic was a major concern of local residents. Results indicated that increased traffic densities would be a concern to some residents, but few people considered this to be a major potential problem.

While the modelling and survey work did not indicate that increased traffic flows would cause major traffic densities, there is the possibility that the confluence of the project construction with faster economic development in the region, particularly if the coal industry expansion continues at a high rate, will generate higher than expected levels of traffic. The proponents will work closely with DMR, FSC and other stakeholders to ensure that bottlenecks and other adverse traffic impacts will not be generated.

14.3.1 [*Roads*] Existing Infrastructure (2)

DMR require further analysis in relation to road works, with likely improvements being required at the intersection of Power Station Road/Capricorn Highway and also access from the construction camp at Gracemere to the Capricorn Highway. The proponent should amend paragraph 2 to reflect the need to carry out works on the network and compensate for bringing forward the need for future works to address the project traffic impacts. Specific works can be referred to once further analysis is carried out.

Capacity analysis has been carried out for a number of intersections including Power Station Road/Capricorn Highway and intersections with the Capricorn Highway that may receive construction workers travelling from the accommodation facility in Gracemere to the project site. Intersection operation was assessed using the aaSIDRA modelling software for all intersections. This analysis is presented in Supplement Appendix E Part 5 and summarised below.

Power Station Road/Capricorn Highway

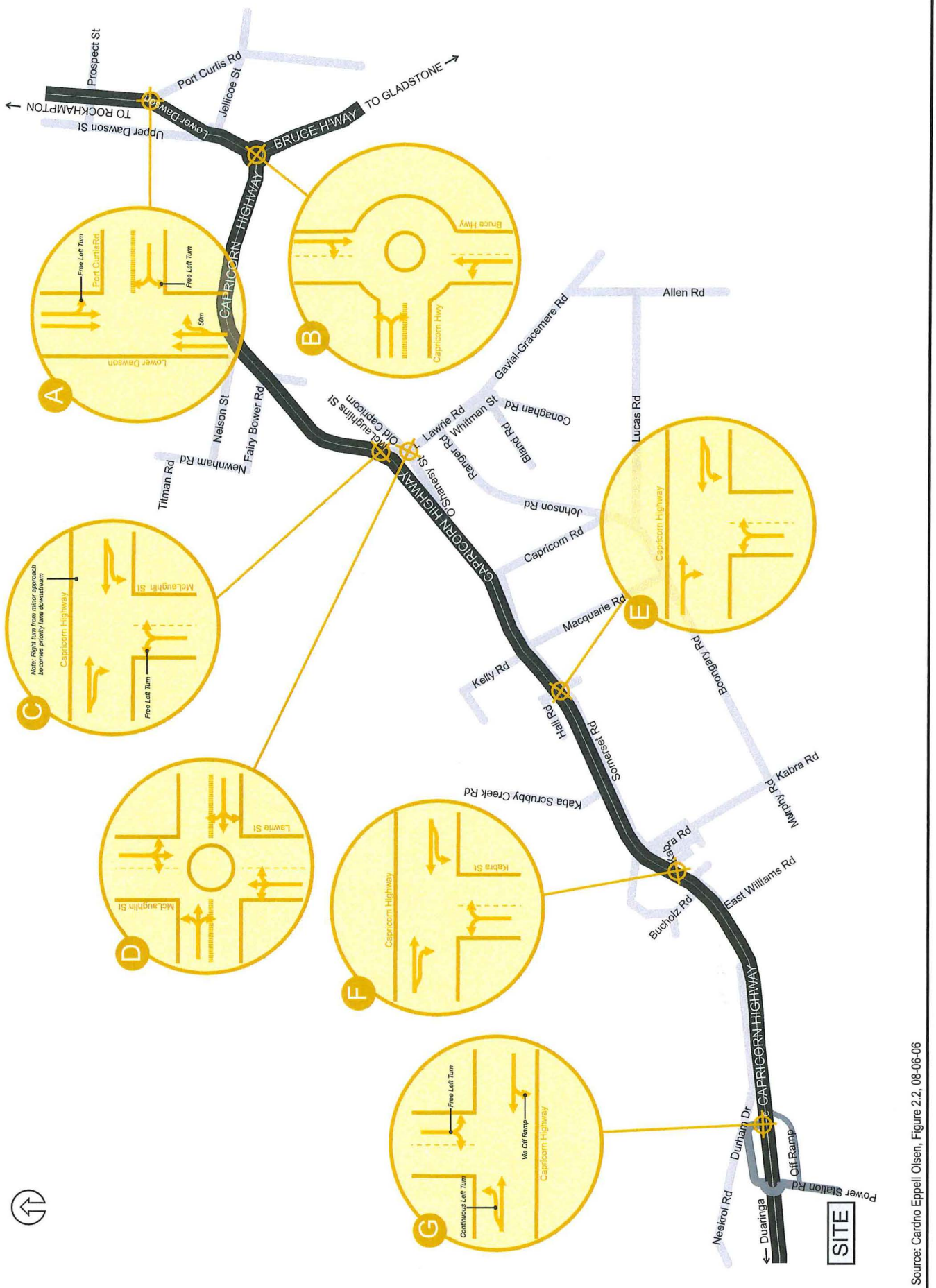
Access to Power Station Road from the Capricorn Highway is partially grade-separated via a flyover ramp. Westbound left-turning vehicles are provided with an off ramp with sufficient deceleration length prior to an unsignalised T-intersection. Vehicles turning into Power Station Road from the west first turn left at the unsignalised Capricorn Highway/Power Station Road T-intersection and then travel via the overpass to a stop control with the westbound left turn vehicles (*i.e.* vehicles leaving the Capricorn Highway via the off ramp). Eastbound traffic from Power Station Road uses the overpass and then a left-turn acceleration lane onto Capricorn Highway. Outbound westbound traffic turns right out of Power Station Road onto the Capricorn Highway. Existing traffic includes a number of large road vehicles (*i.e.* greater than 12 axles) traveling to and from the west entering Power Station Road. The Capricorn Highway in this section is posted at 100 km/h and consists of a two lane, 6.5 m wide undivided carriageway with 1.8 m to 2.3 m wide sealed shoulders (Intersection G on Figure 14.1).

The interchange at Capricorn Highway/Power Station Road was built especially to service the Stanwell Energy Park and the heavy vehicles that are generated by the development therein. The existing form accommodates the existing and projected traffic volumes adequately beyond the 2020 horizon. However, the acceleration lane for eastbound traffic from the Power Station Road overpass onto the Capricorn Highway is considered to be too short. The current form has a 220 m acceleration lane (including taper) which will require be extended by approximately 200 m to conform with the Department of Main Roads (DMR) Road Planning and Design Manual. This is an existing deficiency irrespective of the development of the proposed Project.

Access from the Construction Worker Accommodation to Capricorn Highway

Possible access routes from the construction worker accommodation facility (proposed to be located on the corner of Lucas and Johnson Roads, Gracemere) to the Capricorn Highway are shown on Figure 14.2 and comprise:

- Boongary Road and Kabra Road;



Source: Cardno Eppell Olsen, Figure 2.2, 08-06-06

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EXISTING LANE CONFIGERATIONS

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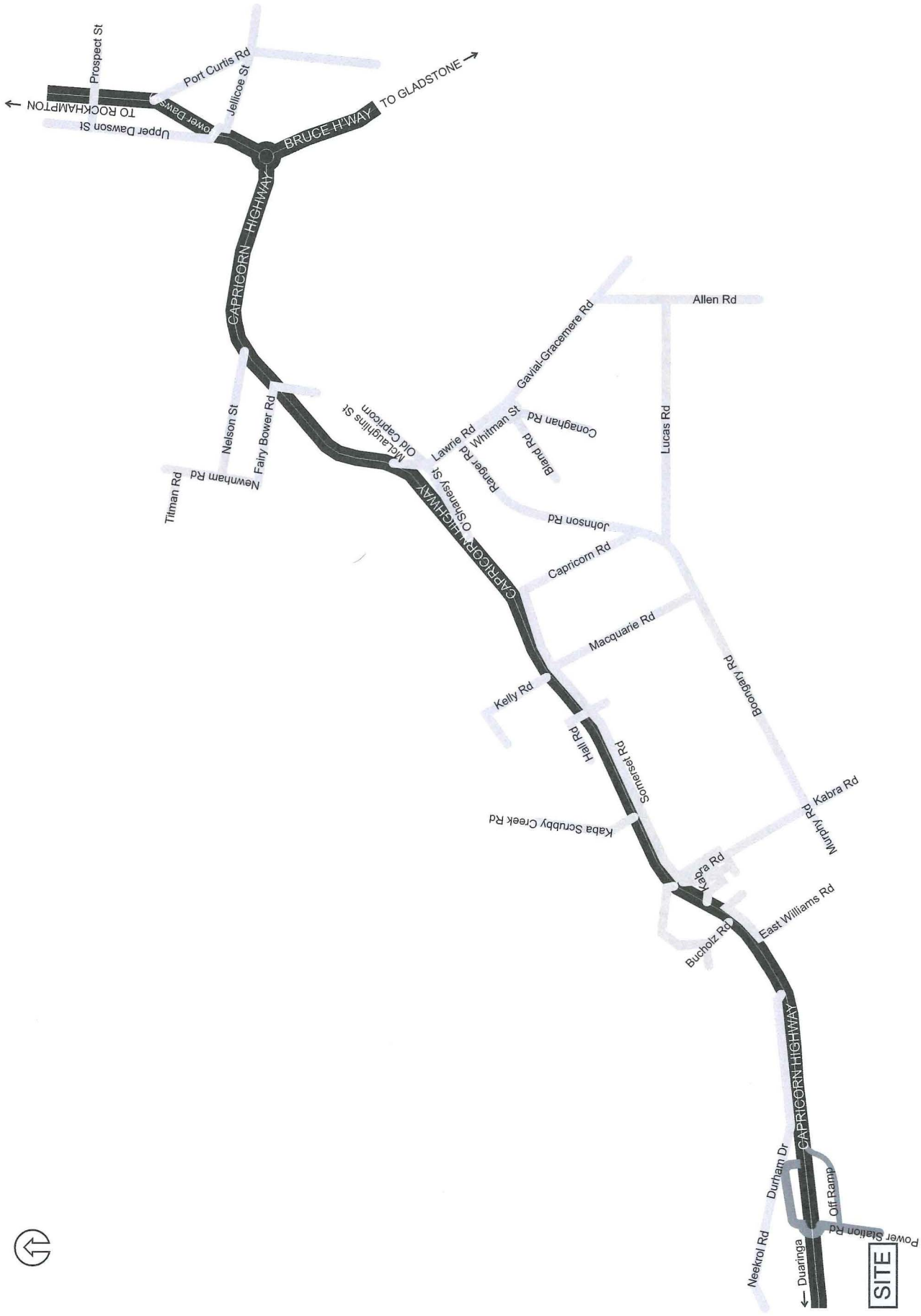
Job No.: **42625626**	File No. 42625626-g-066.cdr			A4



Source: Cardno Eppell Olsen, Figure 2.1, 08-06-06

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ROAD NETWORK

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- Macquarie Road and Somerset Road; and/or
- Johnson Road, Ranger Road, Lawrie Road and O'Shanesy Street.

For these routes, intersection capacity analysis results are as follows.

Capricorn Highway/O'Shanesy Street

The intersection of the Capricorn Highway and O'Shanesy Street is a potential secondary access to Lawrie Street in Gracemere and allows for traffic between Stanwell and Gracemere to bypass the Capricorn Highway/Gavial-Gracemere Road intersection. A deficiency in this intersection currently exists irrespective of the Project. A primary school is located on O'Shanesy Street in Gracemere and as such additional traffic past the school to give access to Capricorn Highway will be actively discouraged. No project traffic has been assigned to this route.

Capricorn Highway/Somerset Road (West of Kelly Road)

With the projected volumes of traffic turning right into Somerset Road from the Capricorn Highway, the existing Type A right turn treatment is not suitable under the AUSTROADS or DMR turn treatment warrants. Therefore, the provision of a Type C channelised right turn treatment may be/should be considered/investigated for this particular intersection.

Capricorn Highway/Hall Road

At this intersection, Type C turn lanes already exist on Capricorn Highway. No project traffic has been assigned to make turns at this intersection. Even with project traffic, no upgrading of these turns is required.

Capricorn Highway/Kabra Road

At this intersection, project traffic will contribute to turning movements to and from the Capricorn Highway. The existing volumes and additional development traffic are not so significant that capacity analysis is required. The intersection currently incorporates Type C (auxiliary) turn lanes on Capricorn Highway. As such, no intersection upgrading is considered necessary.

Bring Forward Times

The conclusions of the Road Traffic Assessment (Supplement Appendix E Part 6) in terms of bring forward times are as follows:

- Bruce Highway/Capricorn Highway – bring forward cost of upgrading to a two lane roundabout by 2 years;
- Lower Dawson Road/Jellicoe Street – contribution to the cost of signalising the intersection;
- Capricorn Highway/Gavial-Gracemere Road – contribution to the cost of upgrading to a two lane roundabout;

- Capricorn Highway/Somerset Road – construction of a Type C (auxiliary) right turn lane into Somerset Road from Capricorn Highway west;
- Capricorn Highway/Power Station Road – contribution to extending the eastbound acceleration lane;
- Bruce Highway (Capricorn Highway – Burnett Highway) northbound pavement – bring forward cost of pavement rehabilitation by 1 year;
- Capricorn Highway (Gracemere to Kabra) westbound pavement – bring forward cost of pavement rehabilitation by 3.4 years;
- Capricorn Highway (Gracemere to Kabra) eastbound pavement – bring forward cost of pavement rehabilitation by 1.3 years;
- Capricorn Highway (Kabra to Power Station Road) westbound pavement – bring forward cost of pavement rehabilitation by 2.3 years;
- Gavial-Gracemere Road (Ranger Street to Bland Street) northbound pavement – bring forward cost of pavement rehabilitation by 1.9 years.

The proponents undertake to consult with DMR regarding their role in mitigating the impact of the project development on the local road network.

DMR states that the proponent should re-evaluate the impacts on all intersections to provide a more thorough and realistic approach to assumptions with respect to trip generation.

In addition to the intersections above, the following were considered for the impact of project traffic on their capacity (Figure 14.1):

- Lower Dawson Road/Port Curtis Road;
- Lower Dawson Road/Jellicoe Street;
- Capricorn Highway/Gaval-Gracemere Road; and
- Bruce Highway/Capricorn Highway.

Full details of the methodology and results for the intersection capacity analysis are provided in Supplement Appendix E - Part 5.

Lower Dawson Road/Port Curtis Road

For both the AM and PM peak periods, the Degree Of Saturation (DOS) at the Gladstone Road/Lower Dawson Road/Port Curtis Road intersection is approaching or exceeding the theoretical capacity (*i.e.* DOS = 1.0) and requires upgrade irrespective of the presence of project-related traffic. The critical movement at the intersection is the right turn out of Port Curtis Road, which is opposed by through movements along Gladstone Road in the order of 1,650 vph and 1,900 vph during the AM and PM peak hours respectively. At the base year of 2006, the intersection has already exceeded the desirable DOS of 0.80, and therefore the intersection's operation is already deficient. The intersection has been assessed as a signalised intersection with geometry similar to what currently exists. At the ultimate design horizon of

2020 plus Coke Plant operations, as well as at the 2008 base year plus Scenario 2, the intersection operation is acceptable with the DOS being well below 0.9. The project impact is very minor at this intersection and it requires upgrading irrespective of the development.

Lower Dawson Road/Jellicoe Street

The critical peak experienced at the Lower Dawson Road/Jellicoe Street intersection is the PM Peak when existing right turning volumes from the side streets are the highest. The intersection operates at the desirable maximum DOS of 0.8 at the Base 2010 Year without development. The addition of project traffic increases the DOS to 0.85 at the 2010 design year. The intersection was assessed as a signalised intersection at the ultimate design scenario of 2020 background traffic plus project traffic. The geometry adopted in the analysis was similar to the existing intersection geometry. The intersection is able to operate acceptably under both the AM and PM peaks at the ultimate design horizon. Capacity failure occurs irrespective of the development traffic.

Bruce Highway/Capricorn Highway

The existing Bruce Highway/Capricorn Highway roundabout will reach its maximum desirable capacity (0.85) at approximately 2011 under background traffic volumes alone. The critical movements at the intersection are Capricorn Highway (west) to Bruce Highway (north), inbound during the AM peak and outbound during the PM peak. With the project traffic, the intersection capacity (0.85) is exceeded at approximately 2009. The intersection has been assessed as a two lane roundabout, with two circulating lanes and two lane approaches on each leg. With the adopted geometry the intersection operates acceptably at the ultimate design horizon of 2020. It would appear that the high background growth assumptions required by DMR (refer to Section 14.3.2 below) are a key cause of the capacity failure. Nonetheless, the impact of the Project is to initiate "failure" approximately two years earlier than otherwise expected.

Capricorn Highway/Gaval-Gracemere Road

The intersection currently exceeds the desirable DOS of 0.8 for a priority controlled intersection, and therefore the intersection operation deficiency is existing. The strong right turn movement out of Gavial-Gracemere Road combined with the opposing volumes from the eastern approach result in a high DOS for the intersection. The intersection has been tested as a single lane roundabout at the design horizon of 2020, and was not able to function acceptably. The intersection was subsequently tested as a two lane roundabout with two circulating lanes and two lane approaches on each leg. With this geometry the intersection is able to function acceptably under the design volumes. It is clear that the high background growth assumptions (6%p.a. on Capricorn Highway) are a significant contributor to the future capacity upgrade needs. Project traffic is also a contributor to the latter. It should be noted that capacity failure has occurred under existing traffic irrespective of the Project.

Other Intersections

For other intersections the following was concluded. The volumes anticipated to travel to and from Gladstone are minimal and only during the construction phase will there be any heavy vehicles traveling

from Gladstone to the project site in any notable volume. As part of the Project all heavy vehicles with an origin or destination of Gladstone will travel to the site via the Bruce Highway/Capricorn Highway roundabout and not along Gavial-Gracemere Road. No light vehicles relating to construction are anticipated to travel from Gladstone. The volumes estimated do not represent considerable increases in vehicular traffic and therefore unlikely to be of detriment to the road network. It is considered therefore that no further assessment of the impacts is warranted. The estimated volumes traveling along the Bruce Highway to and from Gladstone are listed below in response to CSC comments and in Supplement Appendix E Part 5.3.

DMR states that the proponent should provide information (including maps) on the wider road network and indicate all roads proposed to be used for haulage of materials, haulage of equipment, transport of workers, movement of sub-contractors and service vehicles. Information should also be provided on the various route options evaluated by the proponents and the reasons for choosing the preferred routes.

The wider road network and routes proposed to be used by construction and operational vehicles (including workers and for the transport of construction vehicles) are presented on Figures 14.2 to 14.5.

For the impact assessment, the Project has been divided into three scenarios with each scenario corresponding to various stages of the Project. The scenarios are as follows:

- Scenario 1: Construction of Stage 1 of the Coke Plant and Materials Handling Facility (approx 2006 commencement);
- Scenario 2: Construction of Stage 2 Coke Plant, Construction of up to 250 MW Power Plant, Operation of Stage 1 Coke Plant (approx 2008 commencement);
- Scenario 3: Operation of Stages 1 and 2 of Coke Plant, and operation of up to 250 MW Power Plant (approx 2010 commencement).

The worst case scenario for the Project in terms of traffic impacts is Scenario 2. The construction of the Stage 2 Coke plant is anticipated to generate in the order of 250 heavy vehicle movements to the site a week, with the construction of the Power Plant resulting in the order of 135 heavy vehicle movements to the site a week. For the peak hour analysis, a peak hour heavy vehicle volume of 16vph (8 in/8 out) for both the AM and PM Peak analysis periods resulted. Routes options for this scenario were based on the following:

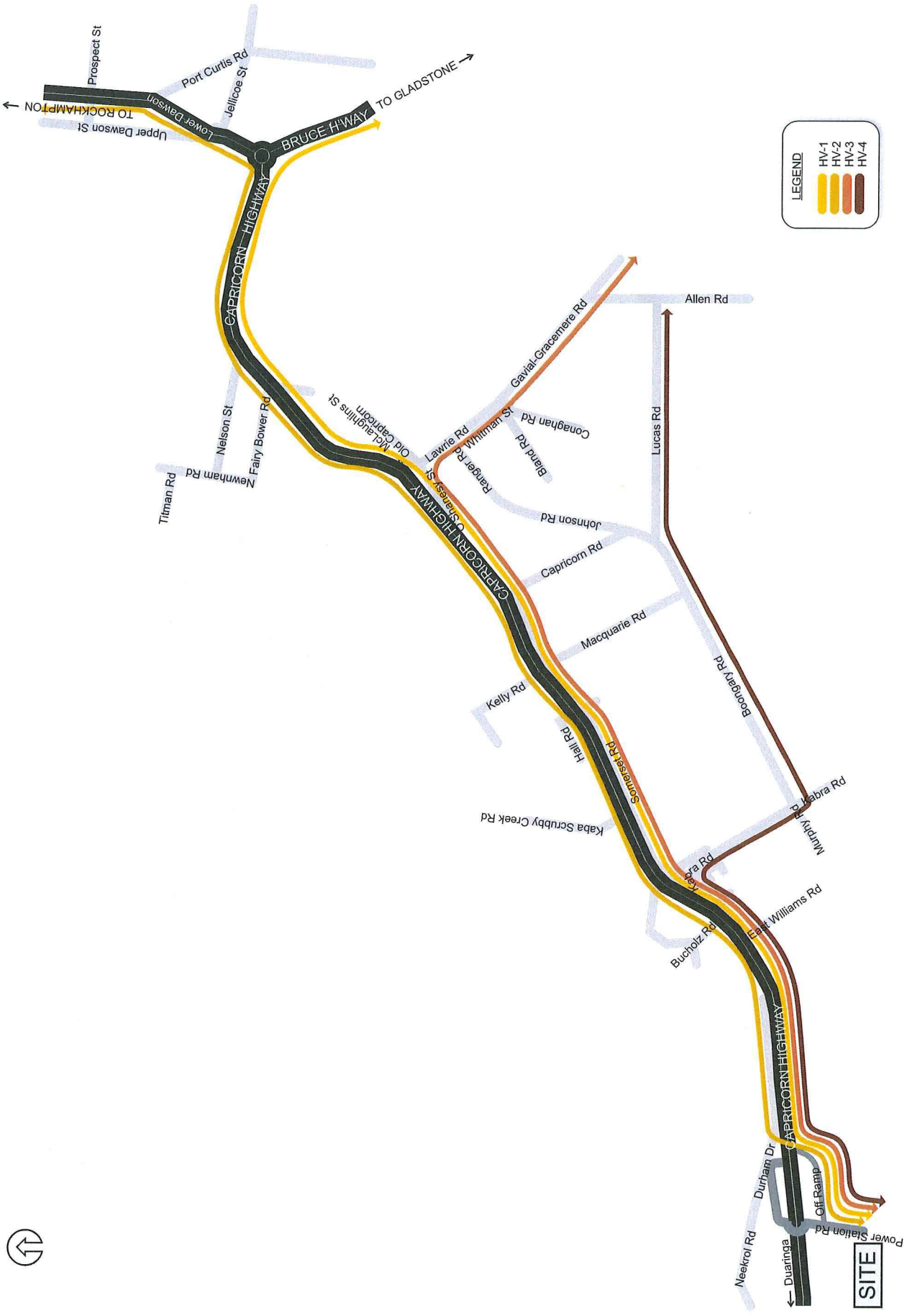
Construction Personnel

A peak average construction workforce personnel number of 1,080 was adopted resulting in the following volumes for the analysis hour:

- Rockhampton vehicle volumes:

- Buses: AM Peak Hour (2 in/2 out), PM Peak Hour (2 in/2 out);

- Private Vehicles: AM Peak Hour (108 in/0 out), PM Peak (0 in/108 out);



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CONSTRUCTION HEAVY VEHICLE ROUTES

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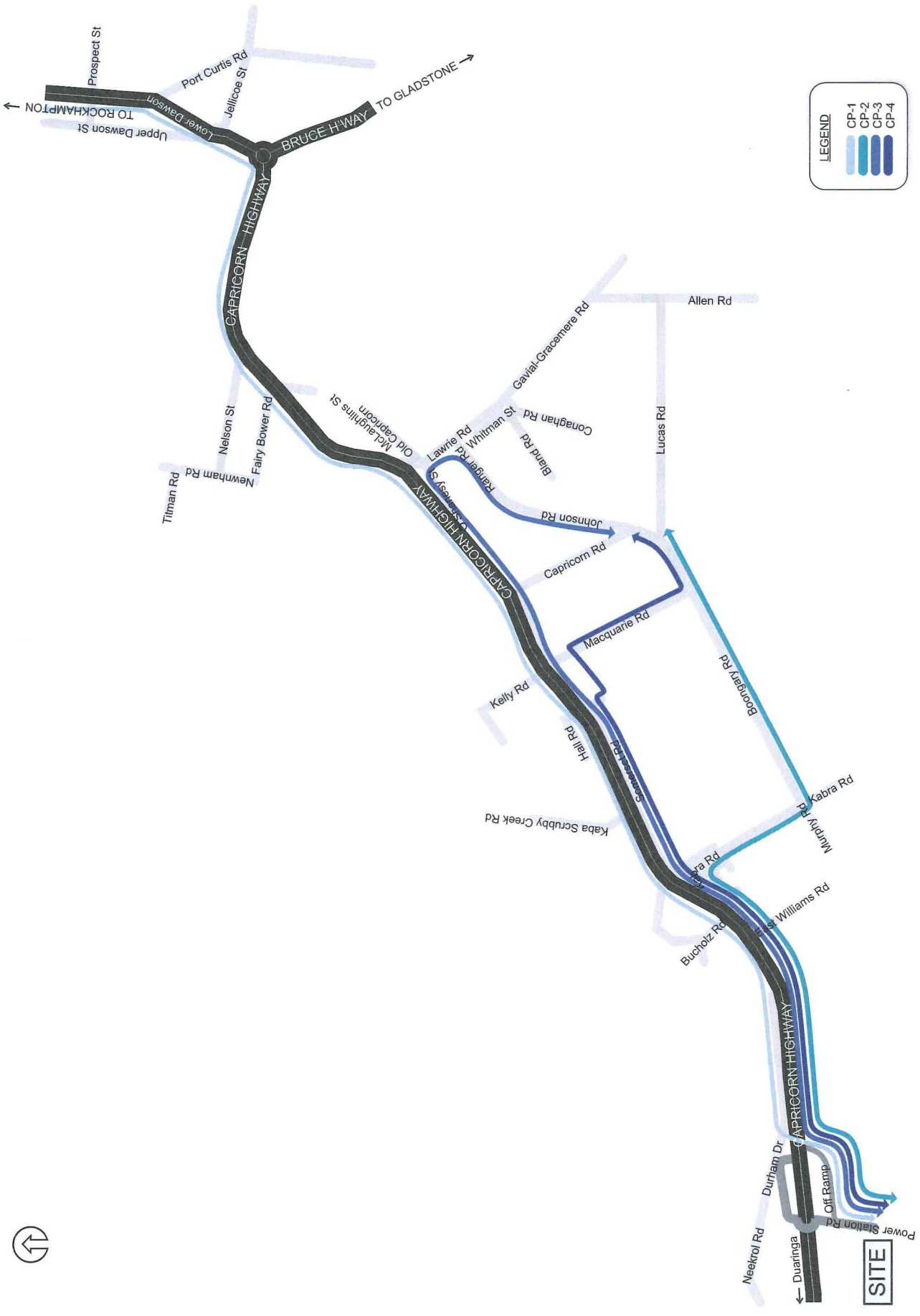

Source: Cardno Eppell Olsen, Figure 3.2, 08-06-06

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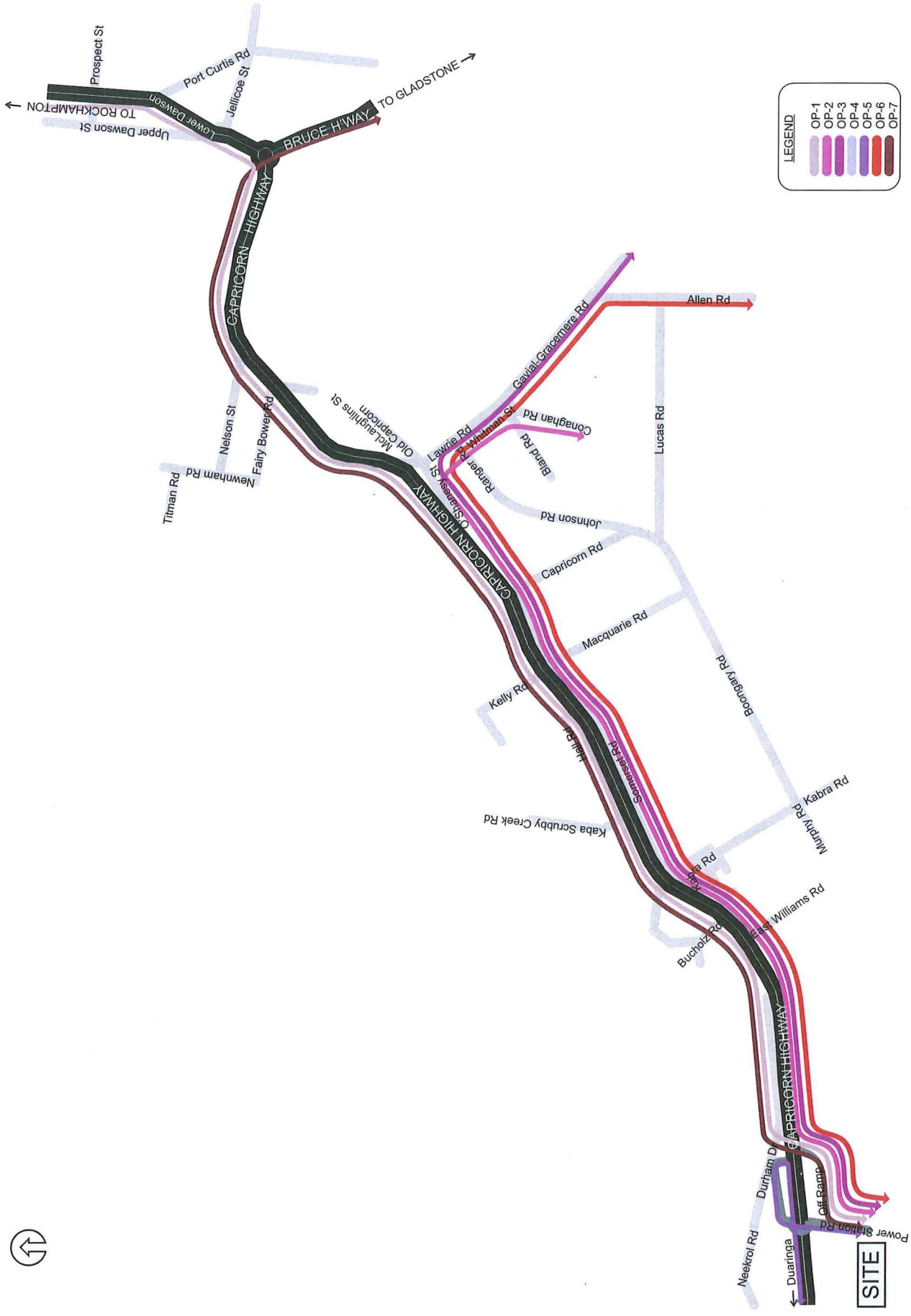
CONSTRUCTION PERSONAL ROUTES

Drawn: VH	Approved: JMcD	Date: 29-06-2006	Figure: **14.4**	Rev. A
Job No.: **42625626**	File No. 42625626-g-068.cdr			A4



Source: Cardno Eppell Olsen, Figure 3.3, 08-06-06

STANWELL CORPORATION LIMITED

QUEENSLAND COKE & ENERGY

URS

QUEENSLAND COKE AND POWER PLANT PROJECT EIS SUPPLEMENT

OPERATIONAL PERSONAL ROUTES

Drawn: VH	Approved: JMcD	Date: 29-06-2006	Figure: **14.5**	Rev. A
Job No.: **42625626**	File No. 42625626-g-069.cdr			A4

- Gracemere Vehicle Volumes:

- Buses: AM Peak Hour (6 in/6 out), PM Peak Hour (6 in/6 out);

- Private Vehicles: AM Peak Hour (81 in/0 out), PM Peak (0 in/81 out).

Personnel located within the Rockhampton environs who choose to use private transport are assumed to be split between Rockhampton and the greater area (such as Yeppoon) and Allenstown. It is assumed 20% of the personnel will be located in Allenstown with the remaining 80% located in the greater area. Construction personnel located in the personnel camp in Gracemere are assumed to access the Capricorn Highway by one of three access points (Figure 14.1):

- 30% of vehicles are assumed to access the Capricorn Highway via the Capricorn Highway/McLaughlin Street intersection (Route CP-3);
- 30% via the Capricorn Highway/Somerset Road access point (Route CP-4); and
- 40% of the traffic is assumed to travel to Kabra and access the Capricorn Highway via Kabra Road (Route CP-2).

Buses from Rockhampton will travel along route CP-1, with buses from Gracemere traveling along route CP-2. These characteristics were used for the assessment of both intersection capacity and pavement impacts.

Stage 2 Coke Plant - Construction Materials Input

Heavy vehicles carrying materials for the construction of Stage 2 of the Coke Plant are anticipated to travel to and from the project site from one of three locations (Figure 14.3):

- From Gladstone using route HV-1;
- From Rockhampton using Route HV-2;
- From Gracemere using Route HV-3.

The adopted inputs, distribution and total number of vehicles over the life of the scenario for the Stage 2 Coke Plant construction are reported in Table 14.1.

Table 14.1 Stage 2 Coke Plant Heavy Vehicle Volumes and Distribution

Material	Distribution			Adopted Total Number of Vehicles	Approx Average Weekly Volume (One Way)
	Rockhampton (Route HV-2)	Gracemere (Route HV-3)	Gladstone (Route HV-1)		
Aggregate	0%	100%	0%	1,373	13
Cement	50%	0%	50%	645	6
Reinforcing Steel	50%	0%	50%	1,121	11
Refractory Bricks	0%	0%	100%	5,714	55
Structural Steel	50%	0%	50%	857	8
Conveyor Units	50%	0%	50%	83	<1
Cabling	50%	0%	50%	10	<1

The adopted 250 vehicle movements a week to the site has then been assumed to be evenly distributed over the working week (*i.e.* over 5 days, with a 10 hour workday). The adopted hourly volumes were distributed over the study network, in approximately the same final distribution pattern that would result at the end of the scenario.

Power Plant - Construction Materials Input

Vehicles carrying materials related to the construction of the Power Plant are anticipated to travel to site from origins similar to materials for the construction of the Coke Plant. The volumes adopted for this component of the Project are shown in Table 14.2.

Table 14.2 Power Plant Heavy Vehicle Distribution and Volumes

Material	Distribution			Adopted Total Number of Vehicles	Approx Average Weekly Volume (One Way)
	Rockhampton (Route HV-2)	Gracemere (Route HV-3)	Gladstone (Route HV-1)		
Plant and Construction Materials	50%	0%	50%	4,000	38
Sundry Plant	50%	0%	50%	2,500	24
Operational Supplies	50%	0%	50%	1,500	14
Aggregate	0%	100%	0%	3,600	35
Cement	50%	0%	50%	1,800	17
Reinforcing Steel	50%	0%	50%	600	6
HRSG Units	0%	0%	100%	32	<1

Stage 1 Coke Plant - Operational Personnel

The number of personnel required for the operation of Stage 1 of the Coke Plant has been assumed to be 80, with all assumed to be travelling via private transport. An occupancy of 1.2 passengers per vehicle was adopted, as well as the assumption that a complete operation personnel change over is undertaken within an hour (*i.e.* all operation personnel are replaced within an hour). The above assumptions are very conservative and result in operations personnel vehicle volumes of: AM Peak Hour (67 in/67 out); and PM Peak (67 in/67 out).

The above generated traffic has then been distributed to the network according to the distribution in Table 14.3 (Figure 14.5).

Table 14.3 Operational Personnel Volume Distribution

Source	Percentage of Traffic	Route
West of Site (Towards Duaringa)	5%	OP-5
Mount Morgan (Via Kabra)	5%	OP-4
Rockhampton	65%	OP-1
Gracemere	20%	OP-2
Gladstone (Via Gracemere)	5%	OP-3

A nominal amount of visitor trips were adopted, with visitor trips assumed to represent an additional 5% of personnel trips. This represents an additional six vehicles (3in/3out) during both the peak AM and PM periods. All visitor trips are assumed to originate from Rockhampton, and utilise route OP-1.

Stage 1 Coke Plant – Input and Waste Output Heavy Vehicles

As the main input raw material and final finished product will be transported to and from the plant via rail, minimal heavy vehicle traffic will be generated during the operations of the various components of the Project. A nominal amount has been adopted for the purposes of the road impact assessment.

The operations of the Stage 1 Coke Plant have been assumed to generate 4vph (2in/2out) for operational inputs, with 2vph (1in/1out) adopted for operations outputs (*e.g.* general wastes). An assumed 50% of the operations input vehicles will originate from Rockhampton (using route OP-1), with the remaining 50% originating from Gladstone (using Route OP-7). All operations outputs vehicles (such as waste) were assumed to originate from Gracemere using route HV-4. The total daily input and output heavy vehicles are assumed to all travel to site during only the AM Peak. The above assumptions have been used for both intersection capacity and pavement impacts.

General Construction Materials – Fill

It is proposed that approximately 100,000 t of fill material will be needed at the project site per stage. Whilst the majority of fill is anticipated to be sourced from areas in close proximity to the worksite and therefore the majority of traffic transporting fill will not feature on major highways or roads, a portion of the fill has been conservatively assumed to be sourced from further a field. For pavement impacts, it has been assumed that 35% of the fill material may be sourced from the vicinity of Gracemere (likely to be via Gaval-Gracemere Road), with the volume and distribution shown in Table 14.4.

Table 14.4 Fill Vehicle Distribution and Volume

Material	Distribution			Adopted Total Number of Vehicles	Approx Average Weekly Volume (One Way)
	Rockhampton (Route HV-2)	Gracemere (Route HV-3)	Gladstone (Route HV-1)		
Fill	0%	35%	0%	1750	103

The fill is anticipated to be hauled over a period of approximately 4 months, and therefore a higher weekly volume for haulage of fill vehicles for this four month period results. The above volumes were used for the calculation of pavement impacts for the scenario.

The impacts on the road network assuming this worse case scenario are discussed in Supplement Appendix E.

The statement "The Project will primarily generate private vehicle traffic relating to the operation and construction of the facility….." is inconsistent with the second paragraph which states "Construction staff are likely to be housed in village style or private accommodation to the east of the project site (e.g. Gracemere and Rockhampton) and transported to the site via 45-seat passenger buses". DMR states that the proponent should revise the EIS construction traffic along more realistic lines.

The project construction traffic has been revised as requested by, and in consultation with DMR. The results are presented in Supplement Appendix E.

The EIS does not provide sufficient road link traffic information to cover all of the links that will be used for the project. DMR note that the Kabra Road is indicated as a significant point within the traffic system, which appears inconsistent with omitting it from the intersections. DMR states that the proponent should amend Section 14 once all the transport and travel routes are designated.

Link volumes used for the road impact assessment are detailed below. Incorporation of these volumes in the impact assessment is as presented in Supplement Appendix E.

Average Annual Daily Traffic (AADT) link volumes for various sections of the study road network were obtained from DMR traffic counts collected in 2003/2004. These results are summarised in Table 14.5.

Table 14.5 2003 AADT Link Volumes

Link	Road	Point 1	Point 2	AADT*
1	Lower Dawson Road	Capricorn Highway	Port Curtis Road	15,909
2	Capricorn Highway	Bruce Highway	Gavial–Gracemere Road	10,969
3	Capricorn Highway	Gavial–Gracemere Road	Kabra Road	3,586
4	Capricorn Highway	Kabra Road	Power Station Road	3,137
5#	Bruce Highway	Capricorn Highway	Burnett Highway	6,504

Notes: * AADT measured in vehicles per day (vpd).
2004 Data Shown

Table 14.6 presents the existing (2003/2004) breakdown by vehicle type for the road sections along the haulage in Table 14.5 (using the same link information as in Table 14.5).

Table 14.6 2003 AADT Vehicle Classification along Haulage Route

Link	Classified Vehicle Volumes (vpd)					
	Light	Rigid Truck	Articulated	B Doubles	Heavy Vehicle Percentage (%)	Total
1	14,205	876	625	202	10.7	15,909
2	10,064	516	265	122	8.3	10,969
3	3,062	244	174	105	14.6	3,586
4	2,615	224	181	116	16.6	3,137
5#	5,471	1,033	458	233	15.9	6,504

The Capricorn Highway/Kabra Road intersection has been analysed for capacity as presented above in response to the DMR comment on access from the construction accommodation facility at Gracemere to the Capricorn Highway.

14.3.2 [*Roads*] Potential Impacts and Mitigation Measures (2, 5, 13, 14, 15, 17, 19)

DMR suggests that the EIS clearly outline the extent and origin/destination of all construction materials and equipment associated with the project.

The extent and origin/destination of construction materials is discussed above and also is presented in Table 2.1 (Supplement Appendix E). Figures 14.3 to 14.5 show the haulage routes proposed for the transport of construction materials and travel routes of construction and operational staff.

DMR states that the EIS should clarify the staging of the project and the consequent employment traffic generation associated with each stage.

Construction of the Coke Plant in two 1.6 Mtpa stages is proposed to commence in the last quarter of 2006. The second stage of construction will likely begin in the last quarter of 2008 with construction anticipated to be complete by the last quarter of 2010. Should the four 800,000 Mtpa option be adopted, each stage will take approximately 1.25 years to construct, with work due to be completed within five years. Construction of the Power Plant will take approximately 27 months. The construction date has not yet been determined, however it is likely to commence at a similar time as the completion of the first stage of the Coke Plant. The accommodation facility for the construction workforce is proposed to be located on the corner of Johnson Road and Lucas Street, Gracemere. The proposed route for access to the site would be Boongary Road and Kabra Road. From Kabra, traffic would enter the Capricorn Highway. The worst case employment traffic generated for each stage of the project is discussed above in response to the DMR comment on roads proposed to be used for haulage of materials, haulage of equipment, transport of workers, movement of sub-contractors and service vehicles, and also in Supplement Appendix E.

DMR states that the proponent should provide further information and analysis for each option for origin and destinations of trips, time of travel and trip generation. A more acceptable proportioning of trips between buses and light vehicles should be undertaken. DMR states that the proponent should provide further information and analysis for each option for origin and destinations of trips, time of travel and trip generation, vehicle type, types of materials and plant, volumes etc for each aspect of the construction process and operational phase. This shall include providing adequate information on the proposed rail sidings at Stanwell and Gladstone, and alternatives at Rockhampton and Port Alma. The estimates in Sub-section - Project Traffic Distribution and Assignment appear to adopt very broad-brush assumptions that do not appear to be based on any analysis of the potential workforce nor any clear presentation of options for haulage with respect to materials and equipment for construction, operational inputs and outputs. DMR states that the proponent should provide significantly more work on this area of the EIS to address the above concerns.

The origin and destinations of trips, time of travel and trip generation for construction and operations of the worse case scenario in terms of road impact (Scenario 2 in Supplement Appendix E) is presented above. This information on the other two scenarios considered is provided in Supplement Appendix E. The estimated number of trucks and volumes of construction and operational inputs and outputs are presented in Table 2.1.

The oven bricks will be sourced internationally and shipped to Auckland Point, Port of Gladstone. The rail siding at Auckland Point has the capacity to offload and store the bricks prior to being transported to the project site via semi-trailers or B-doubles in shipping containers. Should oven bricks be required to be shipped to the Port of Brisbane, they will then be railed to Rockhampton and transported via semi-trailer to the project site, although this would be limited to emergency situations only and to a maximum of 20% of the bricks (due to the restricted space for loading the semi-trailers at the Rockhampton rail yard). The utilisation of the Port Alma facility was investigated during the early (pre-feasibility) stages of the Project and it was decided at this time that the facility is not appropriate for use by the Project.

DMR states that the proponent should demonstrate that B-double vehicles can turn from the Capricorn Highway off ramp into Power Station Road without crossing the centre of Power Station Road. The proponent should also demonstrate that B-double vehicles have sufficient acceleration lane length to accelerate to 100km/h before merging with the Capricorn Highway east and west bound traffic streams.

As discussed above, the interchange at Capricorn Highway/Power Station Road was built especially to service the Stanwell Energy Park and the heavy vehicles including B-doubles that are generated by the development therein. Currently B-doubles are not required to cross the centre of Power Station Road when turning from the Capricorn Highway off ramp. The existing form accommodates the existing and projected traffic volumes adequately beyond the 2020 horizon. However, the acceleration lane for eastbound traffic from the Power Station Road overpass onto the Capricorn Highway is considered to be too short for the acceleration of B-doubles to 100 km/hr prior to merging with the Capricorn Highway. The current form has a 220 m acceleration lane (including taper) which will require be extended by approximately 200 m to conform with DMR Road Planning and Design Manual. This is an existing deficiency irrespective of the development of the proposed Project.

DMR states that, in sub-section – Future Traffic Volumes, the proponents should adopt a minimum 6% per annum growth rate for the Capricorn Highway from the intersection with the Bruce Highway to Stanwell, adopt a minimum 3% per annum growth rate for the Capricorn Highway west of Stanwell, and adopt a minimum 4% per annum growth rate for the Bruce Highway south of Port Curtis Road. This may consequently lead to capacity limits being reached at intersections sooner than the proponent has projected.

In terms of future traffic volumes, historic traffic patterns have been reviewed from AADT data provided by DMR. Over the last ten years, background traffic growth on the Capricorn Highway has been recorded as approximately 5 - 6%p.a. between the Bruce Highway and Gracemere, approximately 4% along the Bruce Highway and approximately 2%p.a. west of Stanwell. This level of historic growth on the section of the Capricorn Highway between the Bruce Highway and Gracemere is likely to have occurred as a combined result of the major development traffic at Stanwell Energy Park in addition to increased development activity in Gracemere.

In line with specific requests from DMR the following annual growth rates have been applied to key links within the study road network:

- Capricorn Highway (east Stanwell) - 6%;

- Capricorn Highway (west Stanwell) - 3%;
- Bruce Highway - 4%;
- Gavial-Gracemere Road - 5%.

Application of these growth rates has been applied to all design years (2006, 2008, 2010 and 2020). It should be noted however, that the application of a growth rate greater then 3% per annum for an extended period of time is considered unsustainable.

DMR states that the proponent should amend Tables 14.5 and 14.6 to provide the analysis for Scenarios C and E and provide information not just for the five intersections listed but also for the other intersections identified by DMR.

The study intersections (Figure 14.1) have been assessed for a number of design traffic scenarios:

- **Scenario A** – 2005 Existing traffic volumes;
- **Scenario B** – 2006 Base traffic volumes;
- **Scenario C** – 2006 Base + Scenario 1;
- **Scenario D** – 2008 Base traffic volumes;
- **Scenario E** – 2008 Base + Scenario 2;
- **Scenario F** – 2010 Base traffic volumes;
- **Scenario G** – 2010 Base + Scenario 3;
- **Scenario H** – 2020 Base traffic volumes;
- **Scenario I** – 2020 Base + Scenario 3.

Traffic volumes for each of the above scenarios are documented in Supplement Appendix E. Scenario C has not been considered further as it is the best case scenario from a road impact perspective. The worst case scenario in terms of development impact on the surrounding road network is Scenario E which combines the construction traffic from both the Stage 2 Coke Plant and Power Plant, along with the operational traffic from the Stage 1 Coke Plant (Scenario 2) with the 2008 background traffic. Where the capacity analysis for this scenario shows acceptable operation under the existing intersection layout, the other 'with project' scenarios have not been analysed.

As discussed above, intersection operation has been assessed using the aaSIDRA modelling software for all intersections. Analysis results for the AM and PM peak periods are summarised in Table 14.7 and Table 14.8. For all intersections a theoretical maximum DOS (Degree Of Saturation) of 1.0 is applied with desirable maximum DOS values of 0.90, 0.85 and 0.8 for signalised, roundabout and priority intersections respectively, which have been adopted for this assessment in accordance with AUSTROADS practice guidelines. Where traffic volumes create performance levels above these thresholds, improvements have been considered to maintain acceptable safety and operational conditions.

Table 14.7 AM Peak Network Operation

Intersection	Deficiency DOS	Intersection Degree of Saturation (DOS)								
		Scenario A (2005 Base)	Scenario B (2006 Base)	Scenario C	Scenario D (2008 Base)	Scenario E	Scenario F (2010 Base)	Scenario G	Scenario H (2020 Base)	Scenario I
Gladstone Road/Lower Dawson Road/Port Curtis Road	0.80	0.96	1.0		>1.0	>1.0 0.48[1]	>1.0		>1.0 0.66[1]	0.68[1]
Lower Dawson/Jellicoe Street	0.80					0.38	0.35	0.38	0.76	0.68[4]
Bruce Highway/Capricorn Highway	0.85	0.61	0.65		0.74	0.80 0.39[2]	0.84	0.91	>1.0 0.71[2]	>1.0 0.75[2]
Capricorn Highway/ Gavial - Gracemere Road	0.80	0.82	0.92		>1.0	>1.0 0.49[3]	>1.0	>1.0	>1.0 0.75[3]	>1.0 0.79[3]
Old Capricorn Highway/ Gavial - Gracemere Road/ Lawrie Street/ O'Shanesy Street	0.85	n/a*	n/a		n/a	n/a	n/a	n/a	n/a	n/a
Capricorn Highway/ Power Station Road	0.80	0.06	0.06		0.07	0.11	0.08		0.12	0.14

Notes: [1] DOS for an upgraded signalised intersection.
[2] DOS for a two lane upgraded roundabout.
[3] DOS for a two lane roundabout.
[4] DOS for a signalised intersection with geometry similar to existing intersection.
* Count data not available for this intersection.

Table 14.8 PM Peak Network Operation

Intersection	Deficiency DOS	Intersection Degree of Saturation (DOS)								
		Scenario A (2005 Base)	Scenario B (2006 Base)	Scenario C	Scenario D (2008 Base)	Scenario E	Scenario F (2010 Base)	Scenario G	Scenario H (2020 Base)	Scenario I
Gladstone Road/Lower Dawson Road/Port Curtis Road	0.80	0.95	>1.0		>1.0	>1.0 0.55[1]	>1.0		>1.0 0.77[1]	0.79[1]
Lower Dawson/Jellicoe Street	0.80					0.73	0.80	0.85	>1.0	0.75[4]
Bruce Highway/Capricorn Highway	0.85	0.60	0.63		0.70	0.73 0.41[2]	0.76	0.80	>1.0 0.59[2]	>1.0 0.61[2]
Capricorn Highway/Gavial-Gracemere Road	0.80	0.48	0.51		0.59	0.67 0.36[3]	0.72	0.83	>1.0 0.54[3]	>1.0 0.57[3]
Old Capricorn Highway/ Gavial-Gracemere Road/ Lawrie street/ O'Shanesy Street	0.85	0.35	0.37		0.41	0.44	0.45		0.67	0.69
Capricorn Highway/Power Station Road	0.80	0.09	0.11		0.12	0.39	0.13		0.20	0.30

Notes: [1] DOS for an upgraded signalised intersection.
[2] DOS for a two lane upgraded roundabout.
[3] DOS for a two lane roundabout.
[4] DOS for a signalised intersection with geometry similar to existing intersection

The results summarised above show that the intersections of Lower Dawson Road/Port Curtis Road and Capricorn Highway/Gavial-Gracemere Road currently exceed desirable DOS limits (Scenario A). All intersections with the exception of Gavial-Gracemere Road/Lawrie Street and Capricorn Highway/Power Station Road have exceeded their theoretical capacity in advance of the ultimate design horizon of 2020 irrespective of the proposed development.

DMR states that the proponent should undertake a Road Safety Audit in accordance with Austroads Road Safety Audit requirements and address the issues that arise with infrastructure improvements or through operational controls that would be incorporated in the Road Use Management Plan.

A road safety assessment was undertaken for the road network generally between the project site and key destinations/origins within the broad scope of the traffic network as agreed with DMR in March 2005. In subsequent discussions with DMR (March 2006) it was agreed that a road safety assessment should particularly look at the Power Station Road/Capricorn Highway interchange and auxiliary turn lane requirements at intersections along the Capricorn Highway. In these discussions it was agreed that a full road safety audit was not required. This road safety assessment was undertaken in May 2006. The results of this assessment are presented above in Section 14.3.1.

In the sub-section Pavement Impact Assessment, DMR suggests that the type and mix of traffic and the origin/destination of this traffic should be reviewed. The proponent should put forward engineering logic that indicates how much remaining pavement life could be expected from the existing pavement and how this remaining life will be affected by the proposed project traffic. The revised assessment should include contribution amounts for each segment of the road network impacted on by the various stages of the project.

An assessment of the development heavy vehicle traffic on the state controlled road network has been completed in accordance with procedures documented in the "Guidelines for Assessment of Road Impacts of Development" (DMR, 2006).

The type and mix of traffic and the origin/destination of the traffic used in the Pavement Impact Assessment is based on the project construction and operations scenarios outlined in Supplement Appendix E, of which Scenario 2 (discussed above) is the worst case scenario. The assessment procedure involves determining the development impacts on the timing of pavement rehabilitation works. Key inputs to the analysis include equivalent standard axle (ESA) loadings (both existing and development related) and the pavement roughness. Supplement Appendix E describes the assessment methodology, engineering logic and presents the relevant calculations.

Pavement impact assessment was required for the Stage 1 and Stage 2 construction over the following road sections:

- Bruce Highway – Burnett Highway to Capricorn Highway;
- Capricorn Highway – Bruce Highway to Gracemere;
- Capricorn Highway – Gracemere to Kabra;
- Capricorn Highway – Kabra to Power Station Road;

- Lawrie Street – Capricorn Highway to Ranger Street; and
- Lawrie Street – Ranger Street to Bland Street Roundabout.

Table 14.9 outlines the pavement impacts and bring forward time periods for sections that have a bring forward time of one year or greater resulting from the construction of the proposed Coke Plant and Power Plant.

Table 14.9 Bring Forward for Selected Links

Road	Section	Direction	Bring Forward (years)
Bruce Highway (10E)	Capricorn Highway to Burnett Highway	Northbound (G)	1.00
Capricorn Highway (16A)	Gracemere to Kabra	Westbound (G)	3.40
Capricorn Highway (16A)	Gracemere to Kabra	Eastbound (A)	1.30
Capricorn Highway (16A)	Kabra to Power Station Road	Westbound (G)	2.30
Gavial Gracemere Road (450)	Ranger Street to Bland St and Conaghan St Roundabout	Northbound (G)	1.90

The EIS provides no assessment of environmental issues relating to transport and transport infrastructure. DMR states that the proponent should provide specific proposals with respect to impact mitigation of pavements, intersections, signage, safety and so on. This will include entering into compensation and infrastructure agreements with DMR. The proponent should also incorporate a roads component into their Communication/Consultation Plan

Environmental issues relating to traffic were not specifically assessed in the EIS. Once the project design, scheduling and contractual issues are resolved the proponents will develop a comprehensive Road Use Management Plan (RUMP) in conjunction with the Principal Contractor based on the Guidelines for Assessment of Road Impacts of Development (DMR, 2006) and commitments in Table 16.1. The RUMP will detail mitigation and monitoring measures to ensure environmental impacts from the project traffic are minimised. The proponents will consult with DMR regarding compensation and infrastructure agreements appropriate to mitigating any pavement and intersection impacts, as well as requirements for signage etc. A roads component will be incorporated into the consultation plan for project construction and operations.

QT states that detail is required on what measures are to be taken to ensure that all employees use the proposed buses. The rationale for the split of employees (that is, about 55% Gracemere and 45% Rockhampton) should also be provided.

The rationale for the split of construction employees between Gracemere and Rockhampton (approximately 60% and 40% respectively) is based primarily on the results of the social assessment (refer Section 12 of the EIS). Due to the local skills shortage, many of the workers are anticipated to be sourced from outside the region (*i.e.* Gladstone and beyond). Most of these people will likely be accommodated in the facility at Gracemere, although some may elect to reside in Rockhampton. The majority of local workers will likely live in Rockhampton and immediate surrounds and may commute independently or use the buses provided to travel to the project site.

It is estimated that approximately 70% of the construction workforce residing in Gracemere and 40% of the construction workforce residing in Rockhampton will travel to and from the project site by bus. A peak average construction workforce personnel number of 1,080 was adopted resulting in the following volumes for the peak hour (Scenario 2 Supplement Appendix E):

- Rockhampton vehicle volumes:
  - Buses: AM Peak Hour (2 in/2 out), PM Peak Hour (2 in/2 out);
  - Private Vehicles: AM Peak Hour (108 in/0 out), PM Peak (0 in/108 out);
- Gracemere Vehicle Volumes:
  - Buses: AM Peak Hour (6 in/6 out), PM Peak Hour (6 in/6 out);
  - Private Vehicles: AM Peak Hour (81 in/0 out), PM Peak (0 in/81 out).

Measures proposed to encourage the construction workforce to use the buses proposed to transport them from accommodation in Gracemere and Rockhampton to the project site include the following:

- Contractual arrangement with the major contractor(s) whereby it will be a condition of engagement that the construction workers involved in the major works and staying at the Gracemere accommodation facility be actively encouraged to use the buses provided;
- Contractual arrangement with smaller specialist construction crews that employees utilising the Gracemere accommodation facility be encouraged to use the buses provided and/or participate in car pooling;
- Provision of frequent bus services from Gracemere and Rockhampton to encourage use;
- Limiting car parking spaces and conditioning of use so that any light vehicles required to be on site (*e.g.* those for specialist works such as electrical works) are the minimum number necessary and are used to transport as many of the relevant workers as possible; and/or
- Communication strategies and incentives that encourage bus use.

FSC states that the EIS needs to address the impact that the project will have on Council controlled roads such as Power Station Road and Gracemere Streets and other roads, both during the construction and its operational phase.

This is addressed above and in Supplement Appendix E.

FSC states that detail is required on the effect that the accommodation facility at Gracemere will have on the local roads to be used to transport the construction workers to and from the construction site. The bus route/s from the accommodation facility to the site need to be defined and matters such as pavement impacts, intersection layout and capacity need to be considered.

This is addressed above and in Supplement Appendix E.

FSC states that the road network surrounding the workers' accommodation facility will need to be upgraded with kerb and channelling, bitumen roads, drainage etc. The matter has not been addressed but could be addressed in the development application for the site.

The proponents will consult with DMR and FSC as necessary regarding the requirements for pavement and intersection upgrades resulting from the impacts of project-related traffic. This will include any transport infrastructure required around the accommodation facility in Gracemere.

FSC states that the EIS does not address the likely sources of construction materials such as quarry products. The volume of these materials will be significant and the provision thereof will have a severe impact on Council's road network as well as an impact on the community/area from which the material is sourced. The necessary approvals to expand the site beyond its current approval would also have to be made.

This is addressed above and in Supplement Appendix E. Reference should be made to Table 2.1.

FSC requires that any access to the construction site must be via the Capricorn Highway and Power Station Road. No entrance to the site is to be from Coombes Road which would necessitate heavy vehicles using Stanwell Township streets.

No access will be permitted during construction to the site via Brickworks Road. Access via Brickworks Road will be restricted through the use of security fencing that will be established around the perimeter of the construction site. Existing gates off Brickwork's Road providing access to the project site will also be secured. The proponents will ensure that vehicles access the construction site via the Capricorn Highway and Power Station Road. No heavy vehicles will have any need to use Stanwell streets.

CSC states that the EIS does not give a pavement impact assessment beyond the intersection of the Capricorn and Bruce Highways, yet states that 50% of the construction heavy vehicles will be from Gladstone. The impact on local and main roads at Port of Gladstone or Port Alma resulting from the transportation of oven bricks has not been determined. CSC concern is potential impacts on local and regional roads depending on where construction materials are sourced and how they are transported to site.

The volumes anticipated to travel to and from Gladstone are minimal and only during the construction phase will there be any heavy vehicles travelling from Gladstone to the worksite in any notable volume. The primary haulage from Gladstone will be of refractory bricks. The proposed haulage route is to exit Gladstone terminal via Port Access Road, right turn into Hansen Road, then onto Port Curtis Way, Mount Larcom Road, right onto the Bruce Highway, left onto the Capricorn Highway and then left onto Power Station Road. Depending on the type of vehicle used and assuming bricks would be transported from Monday to Friday, truck movements along this route to the site will approximate 5,714 over approximately 24 months per project stage. No light vehicles relating to construction are anticipated to travel from Gladstone.

For the worst case scenario (Scenario 2), the estimated volumes travelling along the Bruce Highway to and from Gladstone are listed below.

- Approx average weekly volume – 236 trucks per week (118 in and 118 out);
- Approx average daily volume – 48 trucks per day (24 in and 24 out);
- Peak hour volume
  - AM Peak 8 vph (4 in and 4 out);
  - PM Peak 8 vph (4 in and 4 out);

These volumes do not represent considerable increases in vehicular traffic and therefore are unlikely to be of detriment to the road network. It is considered therefore that no further assessment of the impacts is warranted.

Regarding the proposal to rail refractory bricks into Rockhampton and the transport of these bricks by roads to the project, RCC seeks information including the location of the delivery point within Rockhampton, the proposed heavy vehicle route to deliver the bricks to site and an analysis of the impacts such as road and intersection capacity and pavement damage to Councils road network.

As discussed above the oven bricks will be sourced internationally and shipped to Auckland Point, Port of Gladstone. From Gladstone, they will be transported to site via semi-trailers or B-doubles in shipping containers. Should oven bricks be required to be shipped to the Port of Brisbane, they will then be railed to Rockhampton and transported via semi-trailer to the project site, although this would be limited to emergency situations only and to a maximum of 20% of the bricks (due to the restricted space for loading the semi-trailers at the Rockhampton rail yard). Should brick haulage be required from the Rockhampton rail yard, heavy vehicles will travel from the rail yard gate on Bolsover Street and along Stanley Street towards Gladstone Road. From Gladstone Road, heavy vehicles will travel to the Capricorn Highway/Bruce Highway roundabout and onto the project site. Given that bricks will only be transported from Rockhampton in an emergency and at limited numbers, minimal if any impact on the local road network is anticipated.

RCC requests that a traffic impact analysis be undertaken of the Lower Dawson Road, Upper Dawson Road and Jellicoe Street intersection, and the bridge over the Yeppen crossing and the two-lane section of road between the bridge and the Yeppen roundabout.

The results of the intersection capacity analysis undertaken for the Lower Dawson Road/Jellicoe Street are presented in Section 14.3.1 above. Full details of the analysis are included as Supplement Appendix E. The Project does not represent a significant increase in traffic volumes along the bridge over the Yeppen Crossing or along the two-lane section of road between the bridge and the Yeppen roundabout, and therefore does not justify any additional analysis.

RCC asks that the proponents be requested to consult with QT, DMR and RCC regarding the proposed locations of bus pick up points and any other associated infrastructure including carparking. RCC also asks that the proponents be requested to hold discussions with RCC and Queensland Transport about upgrades to the public transport system to cater for members of the Rockhampton community who rely heavily on this system.

The requests are noted and where applicable the proponents will consult with relevant stakeholders during decision making regarding the locations of construction worker bus pick-up and drop-off points and other associated infrastructure. Where appropriate, the proponents will also consult with relevant stakeholders regarding the public transport system and any impacts resulting from the Project.

Urbis states that the project should not result in the use of Gracemere Township as a bypass for heavy vehicles to reduce traffic conflicts and protect the amenity of the area and nearby developments. Heavy vehicles that do not provide for local services to Gracemere should be restricted to the Capricorn Highway and kept off Gavial-Gracemere Road which runs through the town centre. A freight network plan should be prepared which will restrict trucks to more appropriate routes.

Messers. Walsh and Churchill and Ms Tracy state that the nomination of 50% of all construction and post-construction heavy trucks to travel through Gracemere Township is inconsistent with the aim of Section 14 that seeks to designate specific routes for heavy vehicles to avoid residential and built up areas where possible. The proposal would have significant impact on the amenity of the town, impact on sensitive land uses and pose significant risk to local traffic and pedestrians. Messers. Walsh and Churchill and Ms Tracy state that the proposal for heavy trucks to travel through Gracemere Township has not been justified and that there is no provision in the EIS for upgrading any of the roads to mitigate any impacts. Messers. Walsh and Churchill and Ms Tracy state that there is no proposed enforcement mechanism to ensure that only 50% of heavy vehicles travel through Gracemere Township and that the volume of trucks does not increase over time

Coal fines and coke breeze will not be required to be transported via Gracemere to the Bouldercombe briquette factory as it is proposed that coal fines and coke breeze will be disposed of by bleeding slowly into the SPS feed. Should the opportunity arise in the future, the coal fines and coke breeze will be supplied to a local briquetting industry. A briquette factory is outside the scope of the EIS and would undergo an independent approval process should it be considered further.

Heavy vehicle traffic will not use Gracemere Township as a bypass. Heavy vehicle traffic in the vicinity of Gracemere (*i.e.* Lawrie Street and Gaval-Gracemere Road) will be limited to that required for waste disposal at Gracemere landfill during construction and operation and that required for the transport of quarry fill during the first four months of each construction stage (refer Figure 14.3 and Supplement Appendix E). Transport routes will be outlined in a detailed Road Use Management Plan both for the construction and operational phases of the Project. Contractors will be required to comply with the plan.

14.4.2 [*Rail*] Potential Impacts and Mitigation Measures (5, 18)

QT states that there is no discussion of the tenure arrangements for the land required for the extension and modification of the rail loop.

Land tenure for the project site including that relating to the rail spur is discussed in Section 3.4.1 of the EIS. The proponents are negotiating with the owners of Lots 214/P4047 and 2/RP614973 (Figure 3.4) regarding the purchase of parts of those lots. Should negotiations proceed, the rail infrastructure provider will be involved for the purchase of the land required for the rail spur modification. Should negotiations prove unsuccessful and QR is the provider, QT will need to exercise its statutory powers to acquire the

land required for the rail spur. Once the land is obtained (either through purchase or acquisition) the land will be added to the State rail corridor headlease and subleased to QR under the *Transport Infrastructure Act 1997.*

QT notes that both coal and coke will be transported by rail and expects that under no circumstances will road transport be considered.

It is not considered that coke and coal be transported by road at any stage of the Project. Coal will be brought to the project site via rail from the coal mines in Central Queensland and coke product will be transported by rail to Fisherman's Landing, as facilitated by the construction of the proposed rail spur at the project site.

QR states that the proponents consider cross referencing Section 7 Air and Section 17.4.2 on page 14-22 of the EIS.

The environmental impacts of rail are not discussed in Section 7 - Air and therefore cross referencing is unnecessary.

Ms Goldsworthy states that the potential impacts from the rail spur construction have not been adequately addressed in the EIS. Information on the design, shape, structure, construction mode, ultimate route and timeframe for the rail spur construction and potential impact on environmental values is lacking.

Project-specific infrastructure enhancements will be required at the existing SPS rail loop and the loop at Fisherman's Landing. Mainline infrastructure enhancements will also be needed to provide the capacity to rail additional coal to the Stanwell project site. Rail infrastructure will be built in two phases prior to operation of Stage 1 of the Coke Plant (rial infrastructure to be in place by late 2008). Phase 1 infrastructure will be designed to support the transport of up to 2.4 Mtpa of coal to the Stanwell project site and 1.6 Mtpa of coke to Fisherman's Landing. Phase 2 will be designed to rail up to 4.8 Mtpa of coal to the Stanwell project site and 3.2 Mtpa of coke from the project site to Fisherman's Landing. It is proposed that electric locomotives transport the coal to the Project site and diesel trains take the coke product to Fisherman's Landing. The revised number of trains per week is less than that described in the EIS. For the 1.6 Mtpa and 3.2 Mtpa project stages respectively, it is anticipated that 7 and 14 coal trains are required and 15 and 29 coke trains are required.

Should QR National be the rail infrastructure provider, trains of 985 m in length will be operated to haul coke to Fisherman's Landing. This reduction in train length has allowed for the tightening of the rail spur and reduction of the impact on Lot 2/RP614973 (with the impact limited to approximately 180 m^2). The redesign of the rail spur at the project site has minimised its potential impact on flooding and it is anticipated that there will be no impact on access across that lot or on irrigation or water abstraction infrastructure that may be present there. In addition, it should be noted that dust emissions from the trains will be minimal if any, particularly when compared to coal, as coke will be screened at the project site prior to transport to remove all fines less than 6 mm.

The design of the rail spur is still to be confirmed, however, it should be noted that the proposed works will be subject to further impact assessment, specific to this part of the project. All relevant approvals will be obtained prior to the commencement of construction of rail infrastructure.

14.5 Port Facility (1)

EPA states that the EIS provides no detailed information or plans on the proposed port facilities necessary for the export of coke.

The EPA's comments relate to coastal works and dredging at Fisherman's Landing. As discussed in Section 1.6.3, CQPA, as registered freehold title holder of Lot 502/SP144781 and Lots 105 and 106/DS699 and lessee of Lot 503/SP144788 (Figure 3.3), holds reclamation and dredging approvals for the development of the Fisherman's Landing Berths. Construction of the berth and any dredging required is outside the scope of the EIS and relevant licensing requirements will be addressed by persons commissioned to undertake those works.

15.1 Hazard Analysis (3)

QH states that the proponent has not addressed the potential for radioactive material to be concentrated during the production of coke.

Naturally occurring radionuclides are associated with certain natural minerals and other resources, including coal. Coal contains traces of radioactivity from Uranium (U), Thorium (Th), Polonium (Po), Lead (Pb) and Potassium 40 (K), either associated with elements in the coal itself or within minerals that are part of the coal formation. The radionuclide content of coal is generally below the average radioactivity levels in soil (Australian soils typically have U and Th concentrations in the range of 5 to 60 Bq/kg) and depends on the type of coal and the location of the mine (Kenny and Harris, 2002; Cooper, 2005).

During the process of coking, coal is heated in an oxygen-free atmosphere until volatile components in the coal are removed. Depending on the coke oven temperature and design, certain radioactive series may be emitted in their gaseous form or as small particulates. Radionuclide content may concentrate in coke. When coal is burnt to ash (such as during coal-fired power generation), radionuclides concentrate further. The radionuclides tend to partition between stack emissions and the various forms of ash. The more volatile ^{210}Po and ^{210}Pb tend to be present in stack emissions and accumulate in the fly ash, and more refractory elements such as U and Th tend to accumulate in the bottom ash (Kenny and Harris, 2002; Cooper, 2005).

Recent studies on Port Kembla coke ovens and sinter plant, Illawara Coke Company coke ovens and on Australian coal and power station ash indicate typical radionuclide concentrations (Table 5) (Kenny and Harris, 2002; Cooper, 2005).

Table 15.2 Indicative Radionuclide Concentrations in Coal, Coke and Ash

Material	Radionuclide Concentration (Bq/kg)						
	^{266}Ra	^{210}Pb	^{210}Po	^{238}U-series	U/ ^{226}Ra	^{232}Th-series	^{40}K
Soil				5-60		5-60	
Coal (Qld)				10-20		10-20	10-40
Coal (black coal used in power generation)				10-50		5-50	10-500
Coal (Port Kembla coke ovens and Illawara Coke Company coke ovens)				10-25		10-25	
Coke (Port Kembla sinter plant)	26	26	61	26			
Ash (from Qld coal)		40-100			70-120	50-160	50-400
Fly Ash (from power generation)		40-300		20-190		20-200	100-800
Bottom Ash (from power generation)		5-80		50-200		50-190	40-100

Based on the results above, radionuclides of ^{238}U-series, ^{232}Th-series and ^{40}K appear to concentrate by approximately 10 fold in ash upon full combustion of coal. Concentrations of ^{238}U-series radionuclides in coke appear similar to coal and are comparable to that of soil.

Radioactivity modelling for the sinter plant, copper smelter and coke ovens at Port Kembla (based on the results above) indicated a total dose equivalent measure (biological effects of radiation) of 0.01 to 0.02 mSv/yr. This is two orders of magnitude less than the NSW *Radiation Control Act 1990* and the Qld *Radiation Safety Regulation 1999* total effective public dose limit of 1 mSv/yr, and is also within the natural variations expected in background radiation (Kenny and Harris, 2002; Cooper, 2005).

Based on this data, it is anticipated that any radionuclide concentration in coke produced by the Project will be minimal and will not provide a risk to public health. The ash that will result from coking (approximately 5%) will likely have more concentrated levels of radionuclides than the original coal or coke product, although, based on the findings at Port Kembla, the dose equivalent measure of radiation from the ash is expected to be within regulatory limits. The ash will be removed during the quenching process and settle out in the settlement dams. Since the coal undergoes washing prior to coking and the coking process occurs at approximately 1,000 °C, it is unlikely that further mobilisation of radioactive particles into the settlement dam water column will result.

15.2.4 Emergency Response (3)

QH states that the proponent should include Queensland Health and the Queensland Ambulance Service in the development of the emergency response plan, as appropriate.

An emergency response plan will be developed by the proponents for both the construction and operational phases of the Project. A number of organisations will be extensively consulted during this process, including Queensland Health, Queensland Fire and Rescue Service, Queensland Ambulance Service and Queensland Police.

16.3 Road Use Management Plan (2)

DMR states that the proponent should provide more specific details in the draft Road Use Management Plan.

The conceptual road use management plan (RUMP) for the Project is provided below (Table 16.1). It should be noted that this is a preliminary plan only. A fully comprehensive plan will be developed prior to construction in conjunction with the Primary Contractor, once the detailed design, schedule and contractual issues are finalised.

Table 16.1 Road Use Management Plan

Policy
To minimise any impacts associated with traffic generated by the Project and transportation and handling of materials.
Performance Criteria
To ensure the effective and safe transport of personnel and materials to and from the project site along the existing road network. To minimise traffic-related complaints and incidents. To ensure safe operation of light and heavy vehicles on-site and off-site.
Objectives of the RUMP
The objective of this RUMP is to provide a framework for the management of road traffic generated by the Project. Specific details including targets and measures will be provided into this framework once the Project design and schedule are finalised.
Background
The Project comprises the development of a Coke Plant and Power Plant at the Stanwell Energy Park, Stanwell, approximately 20 km south-west of Rockhampton. The Project will be developed in two 1.6 Mtpa stages (each requiring approximately 24 months), with the Power Plant to be constructed should Stage 2 of the Coke Plant progress. The general project layout is presented on Supplement Figure 3.4. Transport routes and road network are presented on Supplement Figures 14.1 to 14.5. Road transport will be required for all personnel, construction materials, some operational inputs, and construction and operational wastes. The primary operational inputs (coal) and product (coke) will be transported by rail.
Regulatory Framework
Project-related road use and traffic management will be undertaken in accordance with the following legislation: • Dangerous Goods Safety Management Act 2001 and Regulation 2001 • Transport Operations (Road Use Management) Act 1995 • Traffic Regulation 1962 Transport Operations (Road Use Management—Dangerous Goods) Regulation 1998 • Transport Operations (Road Use Management—Driver Licensing) Regulation 1999 (• Transport Operations (Road Use Management—Fatigue Management) Regulation 1998 • Transport Operations (Road Use Management—Mass, Dimensions and Loading) Regulation 2005 • Transport Operations (Road Use Management—Road Rules) Regulation 1999 • Transport Operations (Road Use Management—Vehicle Registration) Regulation 1999 • Transport Operations (Road Use Management—Vehicle Standards and Safety) Regulation 1999 • Environmental Protection Act 1994, Regulation 1998 and Policies.
Implementation Strategy
Personnel Management • Construction haulage will be managed by the Primary Contractor in consultation with the proponents, Fitzroy Shire Council and, where necessary, DMR. Operational transport will be managed by the Operator in consultation with the proponents and Fitzroy Shire Council. • Management of the construction personnel bus services will be the responsibility of the Primary Contractor in consultation with the proponents and, where necessary, Fitzroy Shire Council. Use of carpooling and bus services will be encouraged to reduce vehicle numbers. This will be achieved by - Contractual arrangement with the major contractor(s) whereby it will be a condition of engagement that the construction workers involved in the major works and staying at the Gracemere accommodation facility be actively encouraged to use the buses provided;

- Contractual arrangement with smaller specialist construction crews that employees utilising the Gracemere accommodation facility be encouraged to use the buses provided and/or participate in car polling;
- Provision of frequent bus services from Gracemere and Rockhampton to encourage use;
- Limiting car parking spaces and conditioning of use so that any light vehicles required to be on site (*e.g.* those for specialist works such as electrical works) are the minimum number necessary and are used to transport as many of the relevant workers as possible; and/or
- Communication strategies and incentives that encourage bus use.

Traffic Management

- All heavy vehicles travelling to and from the site will follow specified routes to avoid built-up areas (refer Supplement Figure 14.3). will be limited to the Heavy vehicles permitted to travel through Gracemere (via Lawrie St and Gaval-Gracemere Rd) will be limited to waste transport vehicles destined for Gracemere landfill and vehicles transporting quarry fill material during the first 4 months of construction of each stage of the Project.
- Bus services provided for construction personnel from Rockhampton and Gracemere will be required to use the specified routes presented in Figure 14.4.
- The arrival and departure of construction vehicles will be restricted where possible to between 6am and 6pm five days per week. Some movement of construction material may be required on weekends and will be undertaken during daylight hours. Construction personnel transport will be staggered during peak hours (reflecting staggered start times) and restricted to between 6am and 6pm six days per week.
- The transport of construction workers to and from site will be planned so as not to coincide with the operation of school bus services.
- For construction, heavy vehicles will comprise B-doubles or smaller, depending on the load to be transported (with the exception of a small number of oversized vehicles).
- Clear traffic signs and signals will be installed on-site to provide for safe traffic movement.
- The on-site speed limit will be 30 km/h. Vehicle operators will be required to drive to the specification of their vehicle and comply with all road rules. Site speed limits will be enforced by the Principal Contractor through site security.

Vehicle Management

- The Primary Contractor and Operator will ensure that construction and operational vehicles respectively will be inspected and maintained regularly and in accordance with manufacturer's specifications (including ensuring such vehicles owned by sub-contractors are regularly inspected and maintained). This work will be undertaken by suitably qualified mechanics.
- Refuelling of construction machinery (*e.g.* bob-cats, dozers etc) will occur on-site within specified bunded areas. All other refuelling will occur off-site at appropriate refuelling stations.
- Night-time operations will be limited to situations where day-time operations are impossible. Generally, construction will be limited to the hours of 6am to 6pm Monday to Saturday. Operational vehicles (such as waste disposal trucks) will operate where possible during the hours of 6am to 6pm Monday to Friday.
- Loading and unloading operations will occur at designated points (to be nominated) at the Stanwell project site and at Fisherman's Landing. These points will be signed and supervised as appropriate.

Compliance

- All construction and operational vehicles will be operated within their specified weight and loading capacity.
- Dangerous goods will be transported in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail and in accordance with the requirements of the Queensland *Transport Operations (Road Use Management – Dangerous Goods) Regulation 1998* and the *Transport Infrastructure Act 1994*.
- During the construction phase the transportation of oversized loads will be restricted to non-peak periods to avoid traffic disruptions and will be provided with appropriate escorts and approvals from both the Department of Main Roads and the Police.
- The transport of heavy equipment loads will be in accordance with a Road Transport Plan developed in conjunction with the DMR.

Environmental Management

- Where possible, heavy vehicle movements will be restricted to daytime working hours to reduce noise and safety impacts.
- Waste disposal will be by appropriately authorised vehicles to Gracemere landfill for general waste or to recycling facilities in Gladstone or Rockhampton.
- Loads will be required to be appropriately secured. Any vehicles transporting dangerous goods and other liquids will be required to have the appropriate clean up kit on board. For such transport, spill prevention and clean up procedures will be developed and implemented.
- Dust suppression on site (*e.g.* unsealed roads) will be managed through the re-use of water stored in the settlement and evaporation pond.

Accident and Incident management

• An Emergency Management Plan will be developed for the construction and operation of the Project as a whole. This plan will provide for actions to be taken during a road traffic emergency such as an accident or spill. Details of the Emergency Management Plan will be developed once design and scheduling has been finalised, in conjunction with Fitzroy Shire Council, DMR and the Department of Emergency Services. • The following would constitute an incident or failure to comply in regards to traffic management: - Not following specified routes; - Personnel not observing site traffic regulations, *e.g.* speed regulations; - A traffic accident involving a project vehicle; - Transportation of oversized loads at times and in a manner not specified in the RUMP agreed with the Department of Main Roads; - Necessary approvals for traffic-related activities not obtained from relevant bodies *e.g.* Department of Main Roads and local councils; and/or - Non-compliance with the requirements of the Queensland Road Rules (*Transport Operations (Road Use Management—Road Rules) Regulation 1999)* or the Australian Code for the Transport of Dangerous Goods by Road and Rail if relevant. In the event of a complaint, an incident or failure to comply with requirements, relevant corrective action will be taken according to a Corrective Action Protocol. The Protocol will detail responsibilities, procedures and actions to be taken, which could include the following: - Traffic patterns will be investigated and traffic will be rescheduled or re-routed if possible; - Repeatedly offending personnel will be identified and educated in the desired mode of operation for the vehicle; - Appropriate approvals will be sought from relevant authorities where this was not done previously; and - Issues of non-compliance will be rectified.
Monitoring and Reporting
The occurrence of any traffic incidents or complaints will be recorded within site safety and environmental management systems and reported to the Site Managers for corrective action. Project Representatives will monitor the implementation of, and compliance with, the RUMP. This will include monitoring the number of incidents or complaints received in relation to project traffic and preparing a monthly report, attaching any relevant information. Regular reporting will be had to DMR and Queensland Transport. Haulage information and travel and traffic information will be provided as defined by departmental requirements. Annual auditing will be of monitoring results against any relevant approval conditions.
Review and Amendment
The effectiveness of the RUMP in managing project-related road use will be reviewed annually or more frequently if required. The RUMP will be regularly updated and amended in accordance with audit findings.

RCC asks that the proponents be requested to consult with RCC regarding specific routes for heavy vehicles within Rockhampton City.

The request is noted and the proponents intend to consult with RCC regarding this issue.

16.4 Air Quality Management Plan (6)

QR suggest that the following point is incorporated into the implementation strategy for the Air Quality Management Plan – Operations Phase.

The potential affect on air quality from increased rail operations would be separately assessed as part of the access agreement process administrated by QR, if they prove to be the rail infrastructure provider.

16.5 Noise Management Plan (6)

QR suggest that the following point is incorporated into the implementation strategy for the Noise Management Plan – Operations Phase.

The potential affect on the noise environment from increased rail operations would be separately assessed as part of the access agreement process administrated by QR, if they prove to be the rail infrastructure provider.

Appendix B - Community Consultation (9)

While the draft EIS commits the project to comply with the Regional NRM Plan (Section 3.4.1, Pages 3-27), DLGPSR states that it is not clear whether comments on the EIS were invited from the FBA as part of the advisory body consultation process.

As stated in EIS Appendix B Community Consultation (part B.3), the Fitzroy Basin Association (FBA) was identified as an "interested person" at the commencement of the EIS process and invited to be involved in consultation with the proponents during that process. To this end the proponents met one-on-one with the FBA on 20 July 2005 and 22 February 2006.

Appendix L - Road Impact Assessment Study (2)

DMR states that the proponent should review the content of the appendix having regard to the issues raised in relation to the body of the EIS.

EIS Appendix L comprises the Road Impact Assessment Study conducted for the EIS by Cardno Eppell Olsen. A number of elements of the Road Impact Assessment Study have been reviewed and a revised report is attached as Appendix E to this Supplement.

Appendix J – Noise and Vibration (6)

EIS Appendix J comprises the Noise and Vibration Study conducted for the EIS by ASK Consulting Engineers. A number of elements of the Noise and Vibration Study have been reviewed and a revised report is attached as Appendix D to this Supplement.

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