# APPENDIX H

*Additional Air Quality Information*

# MEMORANDUM

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|---|---|
| **To** | Simon Kinchington<br>Greg Fisk |
| **From** | Michael Burchill |
| **Deliverable No.** | D1206135-20 |
| **Subject** | SCA EIS - Response to DEHP |
| **Date** | 4 May 2015 |

Dear Simon,

This memorandum addresses the requests made by the Department of Environment and Heritage Protection (DEHP) for further information regarding the air quality assessment for the Sunshine Coast Airport Expansion project. The relevant requests made by DEHP were included in the minutes of the 9 March 2015 meeting facilitated by the office of the Coordinator-General, and are reproduced below:

SCA to include in the AEIS:

- further information on construction impacts and mitigation measures, as outlined in SCA's interim response to DEHP's EIS submission
- the speciated VOCs table as justification for conclusions.

Katestone's response to these requests made by DEHP are summarised in Table 1. Additional information, as requested by DEHP, is provided in two appendices to this memorandum, the first covering construction impacts and mitigation and the second an assessment of the speciated VOCs.

**Table 1 Response to DEHP requests**

| Agency | Issue/Concern | Response |
|---|---|---|
| DEHP | Request for further information on construction impacts and mitigation measures | Construction impacts have been presented as contour plots in the appendix *Air Quality Assessment – Construction*, showing contours of predicted $PM_{10}$ concentrations and dust deposition rates, with and without backgrounds.<br><br>The modelling indicates that there is the potential for some impacts very close to the boundary and that activities to manage dust will be required. Section 16.6.1.1 of the EIS specifies the following mitigation measures for controlling wind generated dust from material stockpiles:<br>○ Watering<br>○ Minimising surface area<br>○ Shielding/enclosure<br>Watering alone is estimated to reduce emissions of wind generated dust from stockpiles by 50%.<br><br>Additional management actions were recommended on a proactive or reactive basis, including:<br>○ Applying additional watering during strong winds<br>○ Limiting work near sensitive receptors during calm conditions when the dispersive capacity of the atmosphere is poor<br>○ Minimising exposed areas<br><br>These recommended management actions will significantly reduce the chances of potential impacts and dust related complaints.<br><br>The emission factors used in estimating the dust emissions from construction activities have also been included in the appendix *Air Quality Assessment – Construction*. |

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| Agency | Issue/Concern | Response |
|---|---|---|
| DEHP | Speciated VOCs table as justification for conclusions | The predicted offsite ground-level concentrations of speciated VOCs are shown in the appendix *Air Quality Assessment – VOCs*. The results are presented as absolute concentrations and relative to criteria and show that xylenes (presented in the EIS) have the highest proportional impact, however all VOCs are less than one percent of their respective criteria. |

If you have any questions please do not hesitate to contact the undersigned.

Kind regards,

Michael Burchill

# ATTACHMENT A - AIR QUALITY ASSESSMENT - CONSTRUCTION

## 1. CONSTRUCTION IMPACTS

Figure 1 to Figure 4 present contour plots showing predicted ground-level concentrations of $PM_{10}$ and predicted dust deposition rates compared to the relevant air quality criteria (shown in red). Compliance with the air quality criteria for $PM_{10}$ is predicted at the majority of sensitive receptor locations, and at all sensitive receptors for dust deposition, as indicated in the contour plots. At these locations, the construction activities would therefore not adversely affect the health and wellbeing of sensitive receptors. With proposed dust mitigation measures (see section 2) adverse impacts at the residential areas to the east of the airport are unlikely.

Known thresholds for impacts on vegetation are well above thresholds for amenity, and therefore adverse impacts on nearby vegetation are not predicted.

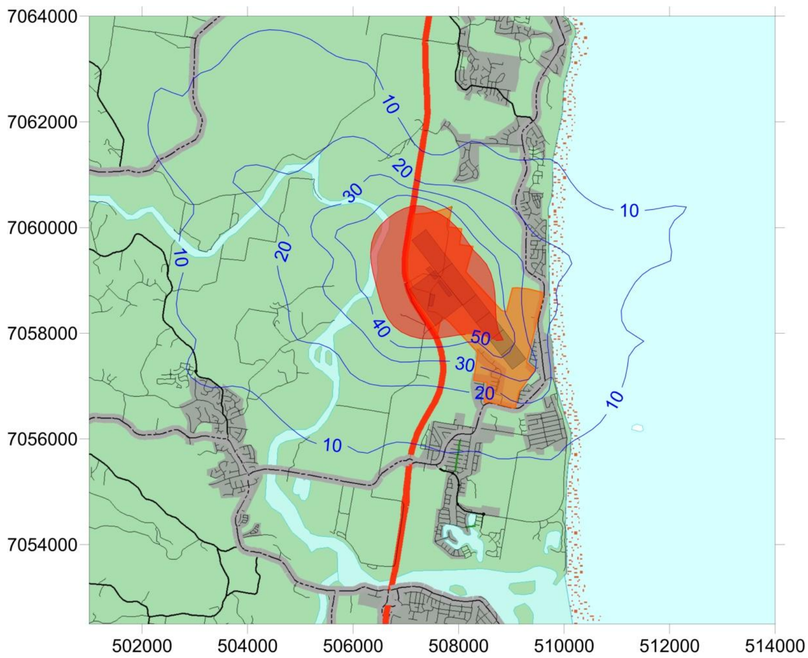


**Figure 1** **Predicted 6th highest 24-hour average $PM_{10}$ concentrations (µg/m³) due to construction sources in isolation**

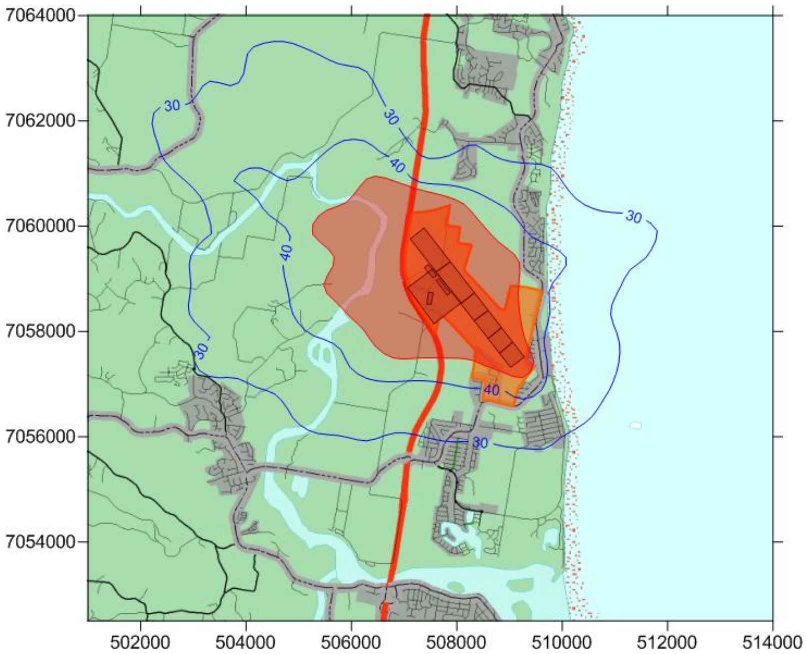


**Figure 2** **Predicted 6th highest 24-hour average $PM_{10}$ concentrations (µg/m³) due to construction sources including a background of 19.2 µg/m³**

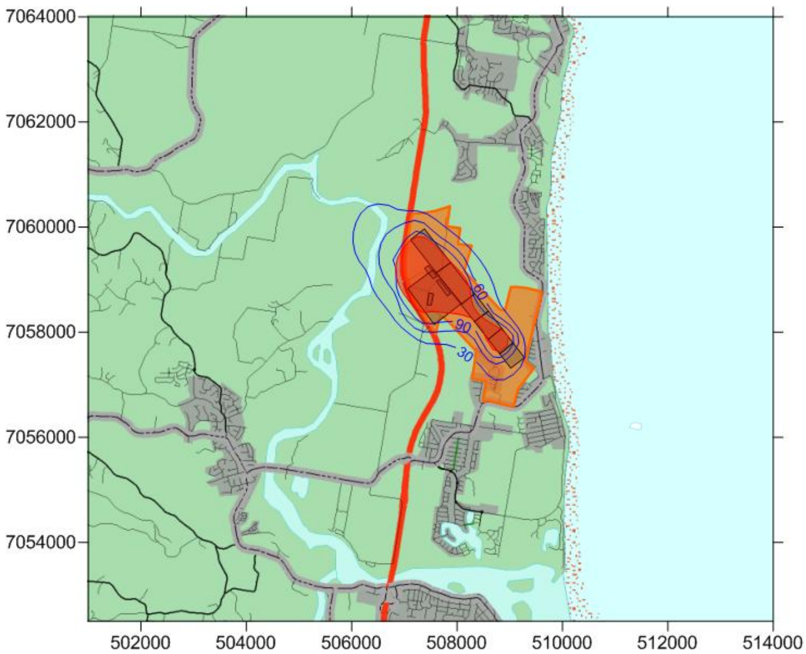


**Figure 3** **Predicted annual average dust deposition rate (mg/m²/day) due to construction sources in isolation**

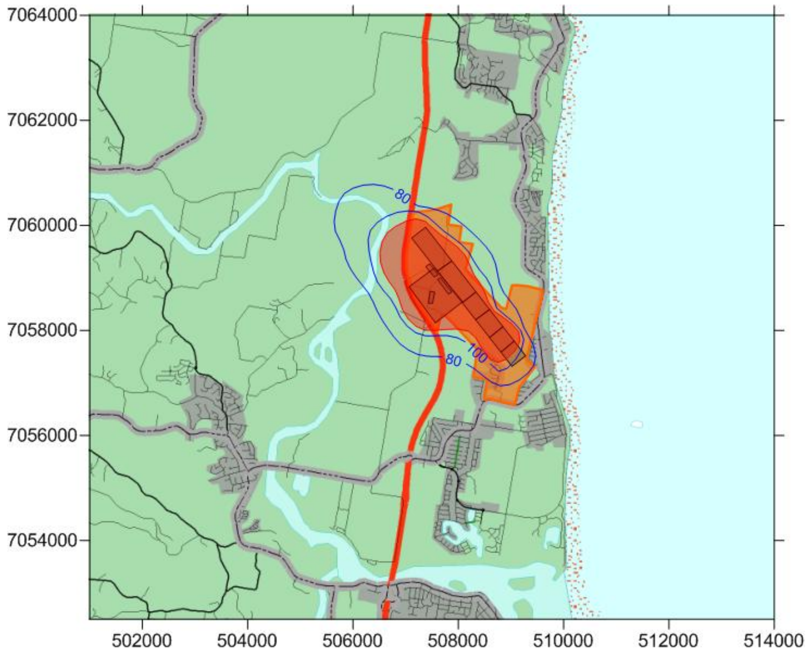


**Figure 4** **Predicted annual average dust deposition rate (mg/m²/day) due to construction sources including a background of 60 mg/m²/day**

## 2. MITIGATION

The modelling results presented in Section 1 did not include proactive or reactive mitigation measures beyond level 1 application of water to haul roads and topsoil scraping. This section describes potential mitigation measures, which will ensure that potential impacts are managed if they are applied proactively. The construction contractor will be responsible for managing dust emissions by implementing mitigation measures appropriate for the works and conditions.

Section 16.6.1.1 of the EIS specifies the following additional mitigation measures for controlling wind generated dust from material stockpiles:

- Watering
- Minimising surface area
- Shielding/enclosure

Watering alone is estimated to reduce emissions of wind generated dust from stockpiles by 50%.

Additional management actions were recommended on a proactive or reactive basis, including:

- Applying additional watering during strong winds
- Limiting work near sensitive receptors during calm conditions when the dispersive capacity of the atmosphere is poor
- Minimising exposed areas

These recommended management actions will significantly reduce the chances of potential impacts and dust related complaints.

# 3. CONSTRUCTION EMISSION FACTORS

## 3.1 Topsoil scraping and scraper unloading

Emissions related to topsoil scraping and unloading of the scraper depend on the amount of material moved (kg/tonne). Emissions of TSP were calculated using the following emission factors from AP42 Chapter 11.9 Table 11.9-4:

Topsoil scraping: 0.029 kg/tonne

Scraper Unloading: 0.02 kg/tonne

Of TSP emissions, 47% were estimated to be $PM_{10}$ and 7.2% of TSP emissions were estimated to be $PM_{2.5}$. The particulate matter distribution was based on size particle distribution for materials handling as defined in the AP42 Chapter 13.2.4.

Level 1 watering was assumed to be applied to the topsoil scraping, which would result in a reduction in emissions of 50%.

## 3.2 Grading

Maintenance of haul roads will be achieved with the use of a grader. Emissions of TSP during grading were estimated using the equation defined in AP42:

$$EF_{TSP} = 0.0034 \times (S)^{2.5}$$

$$EF_{PM10} = 0.0034 \times (S)^{2}$$

7.5% of TSP emissions are estimated to be $PM_{2.5}$.

where:

s: average grader speed, 8 km/hr

## 3.3 Materials handling including excavator activity

Emissions from material handling are dependent on the amount of material transferred (kg/tonne of material). Emission rates were calculated using the following equation (NPI, 2001):

$$EF = k \times 0.0016 \times \left(\frac{U}{2.2}\right)^{1.3} \left(\frac{2}{M}\right)^{1.4}$$

where:

*k*: 0.74 for particles less than 30 µm

0.35 for particles less than 10 µm

0.053 for particles less than 2.5 µm

*U*: Mean wind speed in m/s, 4.5 m/s adopted in this study based on the average wind speed measured at the Sunshine Coast Airport BOM AWS between 2007 and 2009

*M*: Material moisture content, 7.9% adopted in this study based on the mean value defined in AP42 for overburden

## 3.4 Onsite haulage (unpaved)

Wheel-generated dust was estimated using the emission factor defined in AP42 for haulage of materials on unpaved roads. The emission factor for wheel-generated dust on haul roads is dependent on the size of the truck and the silt content of the road. In equation form, the emission factors (g/VKT) for dust are defined using the following equations:

$$EF_{TSP} = 281.9 \times 4.9 \times \left(\frac{s}{12}\right)^{0.7} \times \left(\frac{W}{3}\right)^{0.45}$$

$$EF_{PM10} = 281.9 \times 1.5 \times \left(\frac{s}{12}\right)^{0.9} \times \left(\frac{W}{3}\right)^{0.45}$$

$$EF_{PM2.5} = 281.9 \times 0.15 \times \left(\frac{s}{12}\right)^{0.9} \times \left(\frac{W}{3}\right)^{0.45}$$

where:

*s*: Silt content of the road, 8.4% based on the mean value defined in AP42

*W*: mean vehicle weight in tons, an average weight of 75 Mg was assumed for this study representing a 55 Mg truck with a 40 Mg payload (50% of trips full, 50% empty)

The total emissions are dependent on the total distance travelled by the truck, which is based on truck capacity and the length of the haul road to be travelled, which was estimated to be 340 VKT/day.

Level 1 watering was assumed to be applied, which would result in a reduction in emissions of 50%.

## 3.5 Bulldozing

Emissions from bulldozing are dependent on hours of operation (kg/hr). The TSP and $PM_{10}$ emission factors for bulldozing were calculated using the following equations (NPI, 2012):

$$EF_{TSP} = 2.6 \times \frac{s^{1.2}}{M^{1.3}}$$

$$EF_{PM10} = 0.34 \times \frac{s^{1.5}}{M^{1.4}}$$

where

*s*: Silt content, 6.9% based on the mean value defined in AP42

*M*: Moisture content, 7.9% based on the mean value defined in AP42

$PM_{2.5}$ emissions were assumed to be 10.5% of TSP emissions, based on the $PM_{2.5}$ to TSP ratio for dozing materials other than coal defined in AP42 Ch. 11.9.

No control factors have been applied for dozer activity.

## 3.6 Wind erosion of active stockpiles

Emissions of dust from wind erosion of stockpiles are dependent on the surface area of the stockpiles (kg/ha/hr). The emission rate of dust from the stockpiles has been calculated using the emission factor for active storage piles from the AP42 Chapter 11.9. In equation form, the emission factor for TSP is defined as:

$$EF_{TSP} = 1.8 \times \mathrm{u}$$

where

*u*: Wind speed (m/s), extracted from the meteorological model for each modelled hour

Of TSP emissions, 50% are estimated to be $PM_{10}$ and 7.5% of TSP emissions were estimated to be $PM_{2.5}$. The particulate matter distribution was based on size particle distribution for wind erosion as defined in the AP42 and the NPI.

## 3.7 Wind erosion of exposed areas

Emissions of dust from wind erosion of exposed areas are dependent on the size of the exposed areas (Mg/ha/yr). The emission rate was based on the equation defined in the AP42 for estimating emissions of wind exposed areas. The TSP emission factor was estimated using the following equation:

$$EF_{TSP} = 0.85$$

Of TSP emissions, 50% were estimated to be $PM_{10}$ and 7.5% were estimated to be $PM_{2.5}$. The particulate matter distribution was based on the particle size distribution for wind erosion as defined in the AP42 and the NPI.

## ATTACHMENT B -VOC ASSESSMENT

## 1. EMISSION ESTIMATION

Emissions of individual VOCs from aircraft LTO were estimated using EDMS. Emissions of total VOCs due to the fuel storage facility and aircraft refuelling activities were calculated using emission factors from the NPI for Airports, specifically, data for Melbourne Airport (DEWHA, 2008). These are shown in Table 2. The VOC speciation from EDMS fuel storage emissions was used to estimate emissions of individual VOCs from fuel storage and aircraft refuelling. This speciation is shown in Table 3. Emissions of VOCs due to aircraft refuelling were calculated using the emission factor for Avgas and not jet kerosene. This provides a conservative assessment, as jet kerosene has negligible evaporative emissions (Alamo Area Council of Governments, 2012).

**Table 2 Emission factors for fuel storage and aircraft refuelling**

| Activity | Fuel | Units | VOC Emission Factor |
|---|---|---|---|
| Aircraft refueling | Avgas | kg/LTO/yr | $3.72 \times 10^{-2}$ |
| Fuel and organic liquid storage tanks | n/a | kg/LTO/yr | $6.71 \times 10^{-2}$ |

**Table 3 Speciation of VOCs from EDMS fuel storage emissions**

| VOC | Percentage of total VOCs |
|---|---|
| Benzene | 3% |
| Xylenes | 22% |
| Toluene | 15% |

## 2. IMPACT ASSESSMENT

The predicted offsite ground-level concentrations of speciated VOCs are shown in Table 4, in absolute terms and relative to criteria. The results show that the xylenes have the highest proportional impact, however all VOCs are less than one percent of their respective criteria.

**Table 4 Predicted offsite impacts for speciated VOCs**

| Pollutant | Averaging Period | Criteria (µg/m³) | Predicted maximum concentration offsite (µg/m³) | Proportion of criteria |
|---|---|---|---|---|
| 1,3-butadiene | 1-year | 2.4 | 0.002 | 0.06% |
| Benzene | 1-year | 10 | 0.06 | 0.60% |
| Formaldehyde | 24-hour | 54 | 0.19 | 0.35% |
| Xylenes (total) | 24-hour | 1,200 | 9.61 | 0.80% |
| | 1-year | 950 | 0.39 | 0.04% |
| Toluene | 24-hour | 4,100 | 6.76 | 0.16% |
| | 1-year | 410 | 0.28 | 0.07% |