Appendix C

Aviation Safety Assessment

R E P O R T

Aviation Safety Assessment

Prepared for

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and engineering
professional services

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Reference: 42625791

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The Gladstone Nickel Project is approximately 5 km from Gladstone Airport and directly below the main flight path for aircraft approaches from the north-west. The proximity and location of the Refinery has lead to discussions with the Civil Aviation Safety Authority (CASA) and the Gladstone Airport operators leading to the quantitative evaluation of the hazards to aviation posed from stack emissions.

Aviation safety issues need to be evaluated where high vertical velocity of exhaust gases from industrial stacks can potentially affect the handling characteristics of aircraft, with the risk of airframe damage in extreme cases. The purpose of this report is to present the information required to perform an aviation hazard analysis based on the predicted impacts of the proposed facility. The analysis of predicted impacts has been compiled in coordination with the Civil Aviation Safety Authority's (CASA) Advisory Circular AC 139-05(0) *"Guidelines for Conducting Plume Rise Assessments"* (June, 2004). This involved use of the CSIRO's The Air Pollution Model (TAPM) model, which was used to calculate plume rise trajectories for the stack emissions. TAPM was also used to create site-specific three-dimensional meteorological profiles for use in subsequent analysis of the plume behaviour.

The Refinery has four plant areas that have elevated stack sources; the sulphuric acid plant, hydrogen plant, power plant and hydrogen sulphide incinerator. The stacks are all designed to have an initial exit velocity of 15 m/s, and, combined with the elevated temperatures of the plumes and elevated release heights, require an aviation safety assessment.

1.1 CASA Requirements

The CASA Advisory Circular AC 139-05(0) considers an exhaust plume with a vertical velocity component of greater than 4.3 m/s to be a potential hazard to aircraft stability during approach, landing, take-off and for low level manoeuvring in general. At these stages of flight, the stability of the aircraft is critical.

Under poor visibility conditions, potentially hazardous areas cannot be identified visually, and pilots are reliant on instruments for navigation. In addition, industrial plumes are not visible, thus cannot be easily detected and avoided by the pilot. Such plumes also possibly create risks to the structure of the aircraft where the transient nature of the plume velocity has the potential to overstress the aircraft frame.

CASA has prepared a Protection Plan for Gladstone Airport, which details the Obstacle Limitation Surface (OLS) for the Airport. The height of the OLS increases with distance from the airport, providing a conservative limit for low-level aircraft manoeuvres. The aviation hazard analysis identifies exhaust plumes that may reach a vertical velocity greater than 4.3 m/s at the OLS height so that suitable measures can be taken to prevent the hazards to aircraft operation described above.

1.2 Proposed Plant Location

The proposed site for the plant is at Yarwun, Queensland. The site layout and the corresponding Protection Plan for Gladstone Airport are shown as Figure 1.

As noted from this figure, the site is approximately 5 km from the western end of the airport runway. The OLS above the plant ranges from 70 m on the eastern side, to approximately 130 m on the western side of the plant. At the location of the sulphuric acid stacks, the OLS is approximately 100 m, and other stacks are located further to the west and hence have a higher OLS. An OLS of 100 m has been used in this assessment to evaluate the potential aviation safety impacts due to all the plume releases on site.

1.3 Stack Parameters

The stack coordinates and emission parameters for each plant area, for operation of the Refinery to Stage 2, are given in Table 1. For the purposes of the plume height assessment, Stage 2 of the Refinery operation was modelled. The base elevation of all stacks is 16 m AHD.

Table 1 - Source parameters used in Aviation Safety Assessment

Plant area	Stack coordinates	Stack Height (m)	Stack Diameter (m)	Exit Velocity (m/s)	Exit Temperature (°C)
Sulphuric Acid Plant	313796, 7361409 313771, 7361365 313827, 7361465	60	2.67 2.67 2.81	15	82
Hydrogen Sulphide (H_2S) Incinerator	313543, 7361168 313652, 7361335	25	0.8	15	795
Power Plant	313715, 7361439 313759, 7361505	40	2.7	15	130
Hydrogen (H_2) Plant	313621, 7361505 313640, 7361535	40	1.5	15	300

1.4 Plume Merging

TAPM does not account for interaction between sources with regards to plume dynamics. Every source is treated separately, with its trajectory defined by its individual exit parameters and the surrounding meteorology. This is an inadequate representation for cases where plumes merge and experience enhanced buoyancy due to the presence of multiple stacks. Contact between plumes results in a reduction of the entrainment of cooler static air, thus increasing the extent and rate of plume rise.

In this assessment, the buoyancy enhancement factor parameter in TAPM has been used in accordance with the methodology of Manins [1] and Hurley [2] (2005) to account for the additional plume rise due to the

[1] Manins, P C, *Plume Rise from Multiple stacks*, Clean Air (Australia) May 1992 Vol 26 Part2 pp 65-68

[2] Hurley, Peter J, *The Air Pollution Model (TAPM) Version 3: Technical Description*, CSIRO 2005

merging of the plumes. This methodology takes into account the number of stacks present, their separation, as well as the exit parameters of the exhaust gas, thus arriving at a buoyancy enhancement factor for use in TAPM. In TAPM this enhancement factor is used to scale the initial condition for buoyancy flux, thus increasing the magnitude of the plume velocity throughout its rise.

The buoyancy enhancement factor was calculated for each plant section and included in the TAPM modelling. The buoyancy enhancement factor for each source is presented in Table 2, where a factor of 1 indicates no interaction between the plumes. One elevated stack source was used to model the plume dynamics from each plant area, using the estimated buoyancy enhancement factor.

Table 2 – Estimated Buoyancy Enhancement Factor for each Plant Area

Plant area	Buoyancy Enhancement Factor
Sulphuric Acid Plant	1.19
Hydrogen Sulphide (H_2S) Incinerator	1.03
Power Plant	1.16
Hydrogen (H_2) Plant	1.20

The analysis performed in this report was conducted using TAPM model (Version 3.0.7). TAPM was used to generate site specific meteorology for the proposed plant. The model was also set to produce an output of the plume rise trajectory from the stacks. This output consists of vertical velocity, plume centreline elevation and radius of the plume. The plume elevation and radius are calculated from the plume's point of release, until reaches its equilibrium height in the atmosphere. TAPM produces this output in intervals ranging from 1 to 5 seconds, for each source (stack), for every hour of the modelling period. This allows the elevation of the plume at the point at which it reaches 4.3 m/s to be interpolated.

2.1 Model Setup

The configuration of TAPM used in this assessment was based on the guidelines included in Attachment A of the Advisory Circular *"Guidelines for Conducting Plume Rise Assessments"* (CASA –AC139-05(0) – June 2004). Due to the proximity of the site to the airport runway, the assessment was conducted for the complete specified modelling period of 5 years.

The TAPM setup used for the aviation safety assessment was as follows:

- Grid centre coordinates: -23^0-51 min latitude, 151^0 12 min longitude (316,687 mE, 7,361,207 mN);
- Four nested grid domains (25 x 25): 30 km, 10 km, 3 km and 1 km;
- Twenty-five vertical grid levels from 10 to 8,000 m;
- AUSLIG 9 second DEM terrain database;
- Eulerian Grid Dispersion was used for 10 km and 3 km nests, whilst Lagrangian Particle Mode was used for the inner most (1 km) grid;
- The plume heights were recorded by TAPM after 1 second from release from the stacks;
- Buoyancy enhancement from multiple stacks was calculated according to the method described in Manins *et al.* 1992 (see Section 1.4).

2.2 Statistical Analysis

Plume rise statistics were developed using the TAPM gradual plume rise output in accompaniment with the upper air data derived from TAPM (at heights of 10 to 1500 m above ground level). This data was processed to give the statistical representation of the plume's vertical and horizontal plume extent required for the assessment.

The height at which the plume velocity decreases to 4.3 m/s was calculated through linear interpolation of the TAPM gradual plume rise output. This gives the critical vertical extent of the plume for each hour of the modelling period (i.e. the height at which the vertical velocity reaches 4.3 m/s).

The critical horizontal plume extent was calculated using the TAPM gradual plume rise output, in conjunction with the TAPM-generated upper air data. The plume is assumed to adopt the ambient horizontal wind velocity immediately (Hurley, 2005).

i.e. $$\frac{dx_p}{dt} = u$$

where x_p = horizontal plume velocity;
t = time
u = horizontal component of wind speed.

The downwind displacement of the plume (due to the horizontal wind speed) plus the plume radius (R_y) was estimated for each source. The critical horizontal extent represents the downwind distance from the stack to where the vertical velocity meets the criteria of 4.3 m/s.

Statistics for wind speed at specific elevations were calculated through linear interpolation of the upper air data, which was given at 15 heights (between 10, 25, 50, 100, 150, 200, 250, 300, 400, 500, 600, 750, 1000, 1250, 1500 m). Whilst the vertical wind profile follows a power-law trend, the error of linear interpolation is considered to be negligible, considering that the intervals between lower levels are smaller where change in wind speed with elevation is greatest. These results were then manipulated to give the various statistical representations required for the hazard assessment.

The results of the 5 years of assessment were evaluated to determine which was the worst-case year for aviation safety impacts. A summary of the plume height data for all years (2001, 2002, 2003, 2004 and 2005) is given in Section 3.2. The year 2004 gave the highest plume heights, and has been used for detailed data analysis.

3.1 Local Meteorology

As displayed in Figure 2, TAPM analysis of the local meteorology at 10 m elevation shows winds from the east to south-easterly direction to be dominant for strong winds, with calm winds (< 0.5 m/s) occurring for 0.46% of the year.

The rate at which the plume vertical velocity dissipates after its release to the atmosphere is sensitive to wind speed, not wind direction. Higher wind speeds result in greater horizontal movement of the plume downwind, and enhanced mixing with ambient air. These conditions result in lower aviation safety impacts than during calm conditions, as the critical plume height is reduced. The frequency distribution of wind speeds is presented in Figure 3, showing that the mean wind speed is 3.2 m/s, with a standard deviation of 1.2 m/s and 95% confidence limits of 1.4 and 5.1 m/s. There are a low proportion of winds below 2 m/s.

Figure 2 - TAPM generated wind rose for 10 m elevation, 2004, all hours

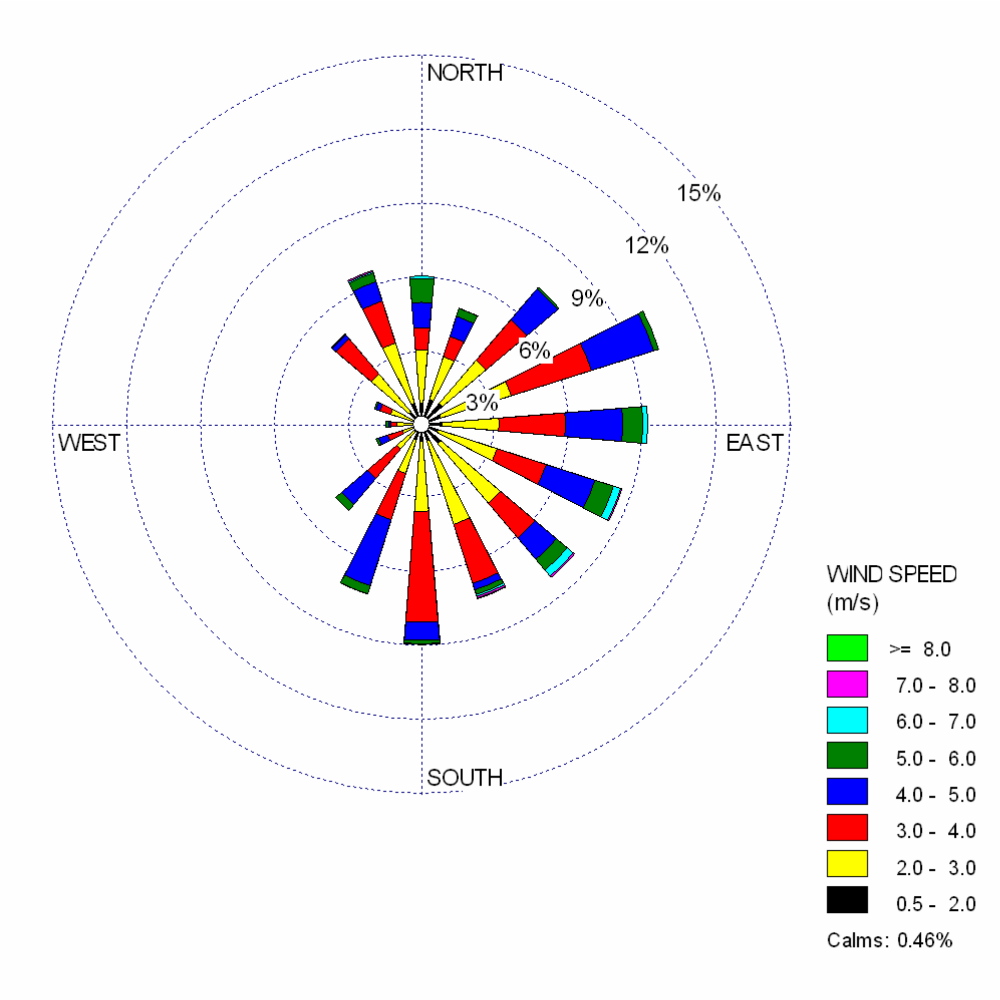


Figure 3 - TAPM generated percentage and cumulative percentage for wind speed at 10 m, 2004

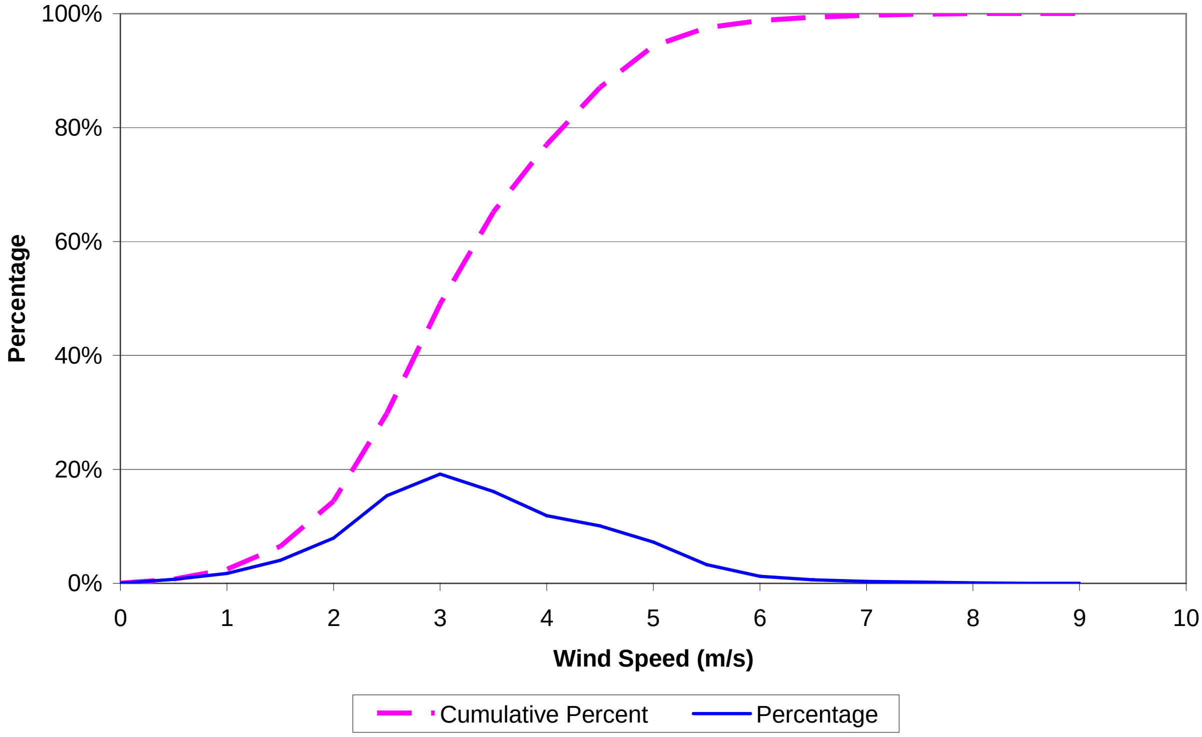


Figure 4 shows the relative cumulative frequency for wind speeds at various elevations, with the data also presented numerically in Table 3. The figure shows the probability (at various elevations) of experiencing a wind speed less than or equal to a given value, based on the TAPM results for 2004. For example, at 80 m elevation, there is approximately 54% probability that the wind speed for a given hour is less than or equal to 5 m/s. Wind speeds tend to increase with elevation, increasing the dispersion of the plume.

Figure 4 - TAPM upper air wind speed relative cumulative frequency, 2004

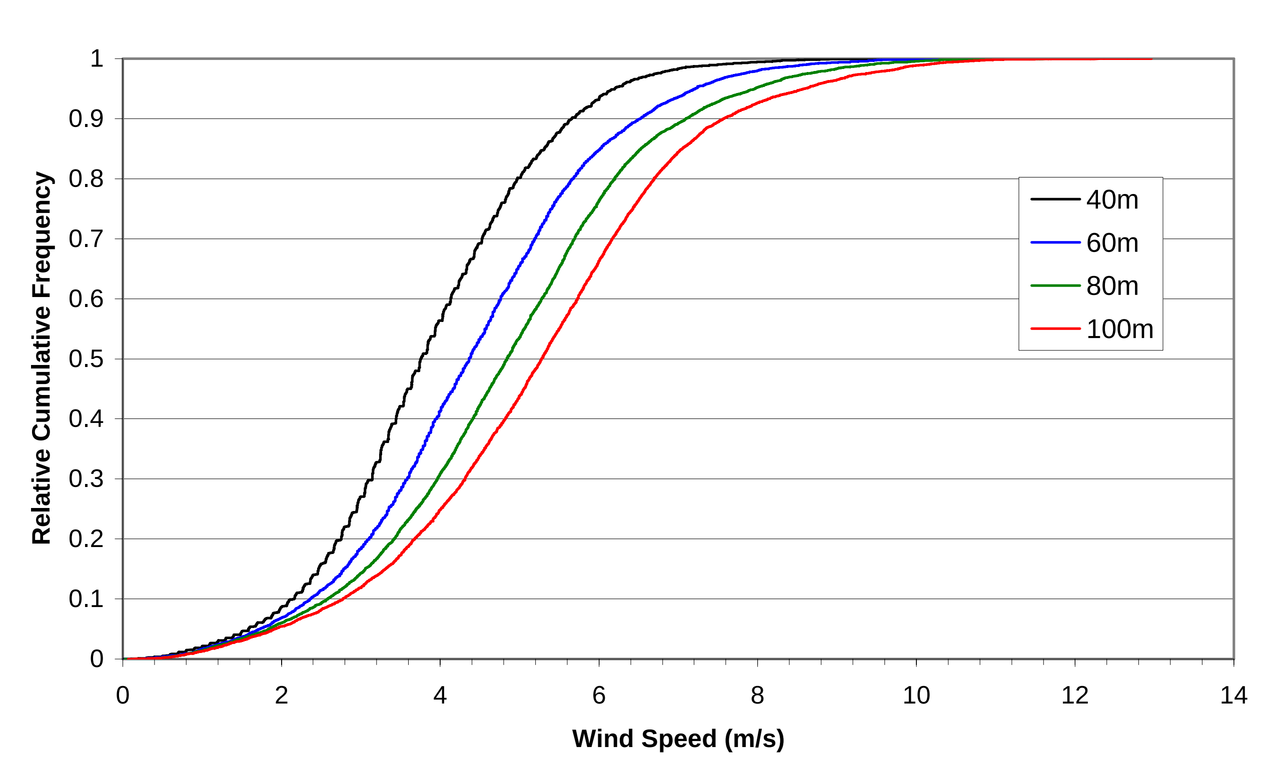


Table 3 - TAPM Upper Air Wind Speeds by percentage

Wind Speed	40m	60m	80m	100m
< 0.1 m/s	0.02%	0.01%	0.01%	0.01%
< 0.2 m/s	0.08%	0.01%	0.02%	0.02%
< 0.3 m/s	0.15%	0.10%	0.03%	0.06%
< 0.4 m/s	0.33%	0.18%	0.07%	0.10%
< 0.5 m/s	0.43%	0.33%	0.22%	0.18%
< 1.0 m/s	2.0%	1.6%	1.4%	1.3%
< 1.5 m/s	4.4%	3.6%	3.3%	3.0%
< 2.0 m/s	8.6%	6.8%	6.0%	5.4%
< 3.0 m/s	27.0%	18.3%	14.3%	11.9%
< 4.0 m/s	56.3%	41.2%	30.9%	24.8%
< 5.0 m/s	80.1%	65.4%	53.6%	43.8%
< 6.0 m/s	93.1%	84.7%	76.3%	66.3%
< 7.0 m/s	98.3%	93.6%	89.2%	84.4%
< 8.0 m/s	99.5%	98.0%	95.2%	92.6%

3.2 Maximum plume height

Five years of meteorological and plume height data that were evaluated for this assessment were analysed to determine the maximum, minimum and mean plume height for each year. The critical vertical extent represents the height at which the plume vertical velocity drops below the critical velocity of 4.3 m/s for a given hour. Hence, above this height, the plume conditions satisfy the requirements of having no effect on aircraft handling and safety.

The critical vertical plume extent results are presented in Table 4 to Table 8 for years 2001 to 2005 respectively. The results show that the highest plume height to reach the critical velocity is 99.9 m, which occurs in 2004 for the Sulphuric Acid Plant plume.

The critical horizontal extent of each plume for 2004 is presented in Table 9. This parameter shows the maximum downwind distance that the plume may travel under ambient wind conditions before attaining a vertical velocity of less than 4.3 m/s. The plumes are not expected to travel more than 32 m downwind of the release point, and thus should not affect the lower sections of the OLS that are closer to the airport runway, as defined in the Gladstone Airport Protection Plan and Figure 1.

More detailed statistical analysis has been carried out for 2004, as this year demonstrates the highest plume height, and thus the highest potential for exceedance of the OLS.

Table 4 - Maximum, Minimum and Mean Critical Vertical Plume Extents (m) for 2001

Source name	Maximum	Minimum	Mean
Sulphuric Acid Plant	95.6	79.3	81.4
H_2S Incinerator	47.2	44.0	44.2
Power Plant	81.4	59.3	61.5
H_2 Plant	71.1	59.1	60.2

Table 5 - Maximum, Minimum and Mean Critical Vertical Plume Extents (m) for 2002

Source name	Maximum	Minimum	Mean
Sulphuric Acid Plant	94.3	79.3	81.3
H_2S Incinerator	47.2	44.0	44.2
Power Plant	80.3	60.2	61.5
H_2 Plant	66.6	59.2	60.2

Table 6 - Maximum, Minimum and Mean Critical Vertical Plume Extents (m) for 2003

Source name	Maximum	Minimum	Mean
Sulphuric Acid Plant	96.5	79.3	81.4
H_2S Incinerator	47.2	44.0	44.2
Power Plant	81.9	60.2	61.5
H_2 Plant	70.6	59.1	60.2

Table 7 - Maximum, Minimum and Mean Critical Vertical Plume Extents (m) for 2004

Source name	Maximum	Minimum	Mean
Sulphuric Acid Plant	99.9	79.3	81.4
H_2S Incinerator	47.2	44.0	44.2
Power Plant	89.6	60.2	61.6
H_2 Plant	70.8	59.2	60.2

Table 8 - Maximum, Minimum and Mean Critical Vertical Plume Extents (m) for 2005

Source name	Maximum	Minimum	Mean
Sulphuric Acid Plant	97.1	79.3	81.4
H_2S Incinerator	47.2	44.0	44.2
Power Plant	84.5	60.2	61.6
H_2 Plant	69.4	59.2	60.2

Table 9 - Maximum, Minimum and Mean Critical Horizontal Plume Extents (m) for 2004

Source name	Maximum	Minimum	Mean
Sulphuric Acid Plant	13	4	9
H_2S Incinerator	32	9	14
Power Plant	14	5	10
H_2 Plant	26	3	15

3.3 Plume Rise Statistics for 2004

Table 10 shows the critical vertical plume extent by percentage of time, for the year 2004. The data shows that for 0.05% of the year (up to 4 hours in the year), the plume vertical velocity exceeds 4.3 m/s at a height of up to 94.8 m.

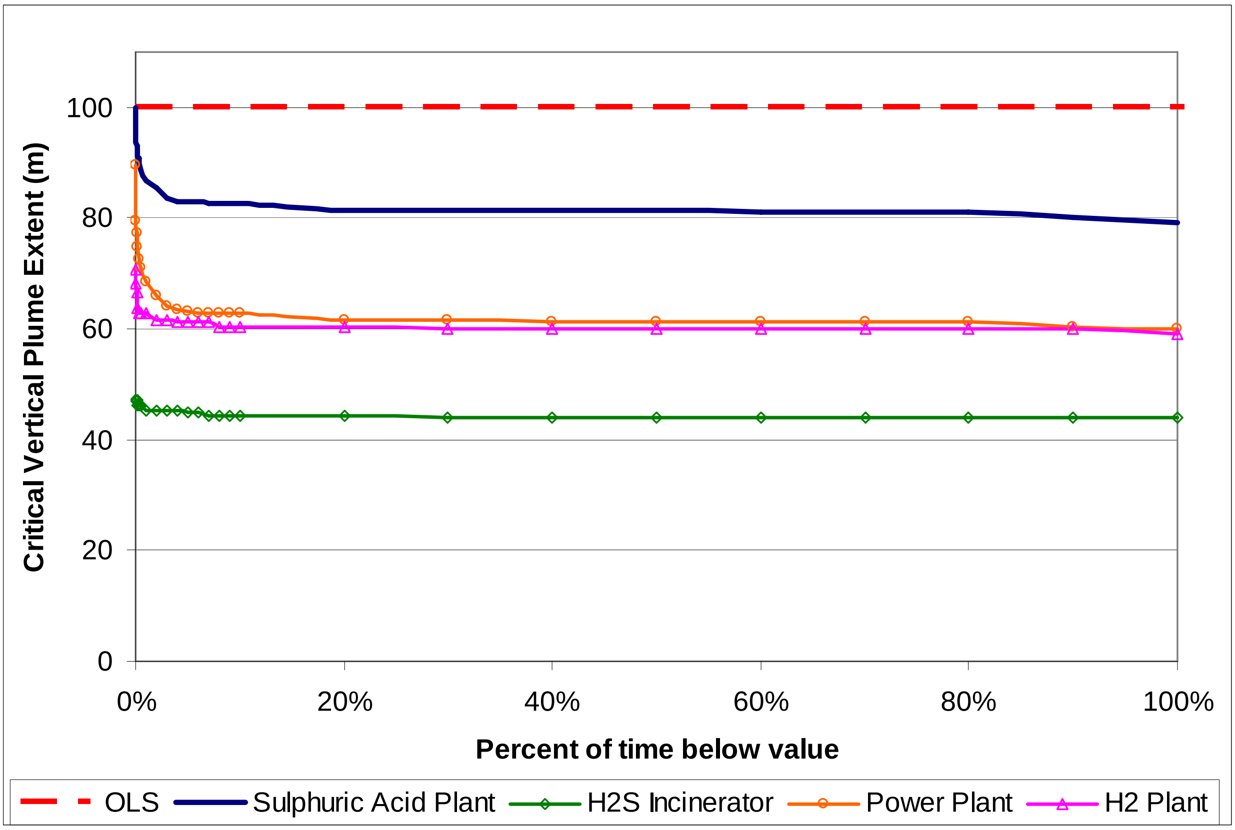
The OLS of 100 m is achieved for all hours of the year, assuming that the plant operates full time and under all possible meteorological conditions.

Table 10 - Heights at which the vertical velocity exceeds 4.3 m/s by percentage of time

Percentage of time, 2004	Sulphuric Acid Plant	H_2S Incinerator	Power Plant	H_2 Plant
Maximum	99.9	47.2	89.6	70.8
0.05%	94.8	47.2	79.4	68.3
0.10%	93.0	47.2	77.4	66.7
0.20%	91.5	46.3	74.8	63.7
0.30%	90.7	46.3	72.6	63.0
0.50%	88.7	46.2	70.9	62.9
1%	86.7	45.3	68.4	62.7
2%	85.6	45.2	66.0	61.6
3%	83.7	45.1	64.2	61.5
4%	83.1	45.1	63.6	61.4
5%	82.9	45.1	63.0	61.3
6%	82.8	45.1	62.9	61.3
7%	82.8	44.2	62.8	61.3
8%	82.7	44.2	62.8	60.4
9%	82.7	44.2	62.7	60.3
10%	82.6	44.2	62.7	60.3
20%	81.5	44.2	61.5	60.2
30%	81.4	44.1	61.5	60.2
40%	81.3	44.1	61.4	60.1
50%	81.3	44.1	61.3	60.1
60%	81.2	44.1	61.3	60.1
70%	81.2	44.1	61.3	60.1
80%	81.2	44.1	61.2	60.1
90%	80.3	44.1	60.3	60.0
100% (minimum)	79.3	44.0	60.2	59.2

A graphical depiction of the critical vertical plume extent for 2004 is shown in Figure 5. For each of the four sources modelled, the peak critical plume height predicted by TAPM occurs only for one hour of the year. Throughout the year, the plume heights are below the OLS for all stack sources.

Figure 5 - Critical vertical plume extent for each source for 2004



Analysis of the times of day at which the highest plume heights occurred (for the Sulphuric Acid Plant stacks) showed that the peak heights occurred in the morning, as shown in Figure 6. The higher plume heights tend to occur in the early morning hours (midnight to 7 am), due to the increased plume rise during the calm, cool conditions that occur during these times.

Figure 6 – Critical plume height with hour of day for Sulphuric Acid Plant stacks

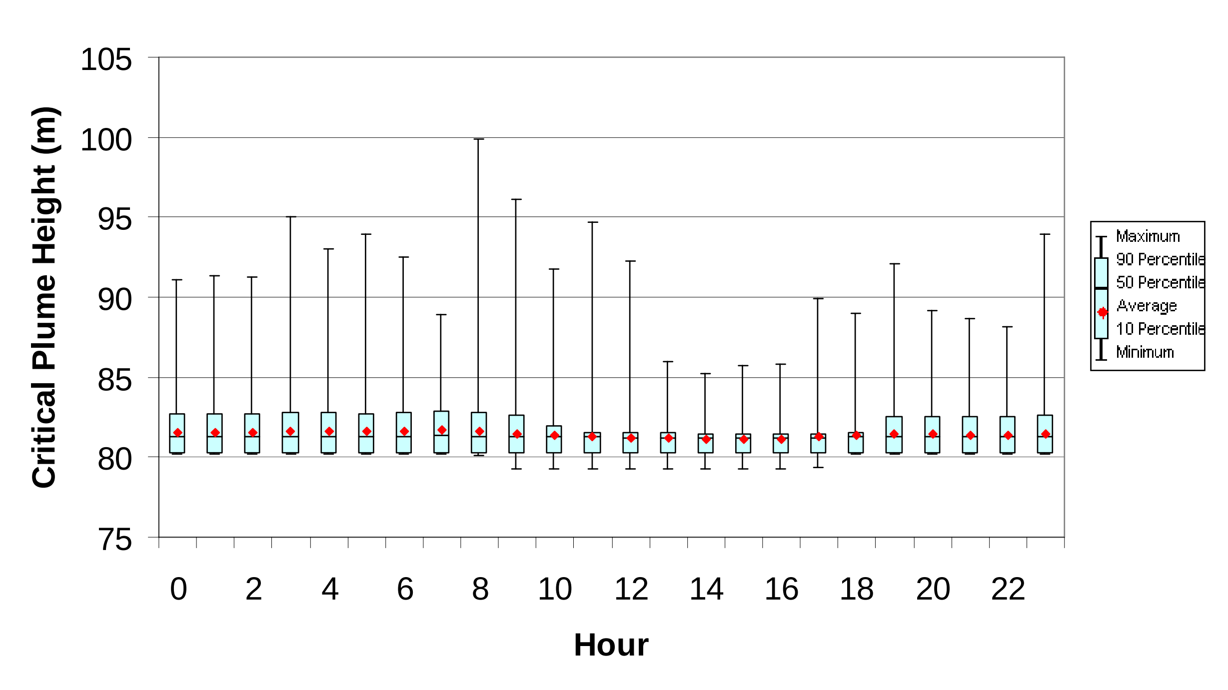
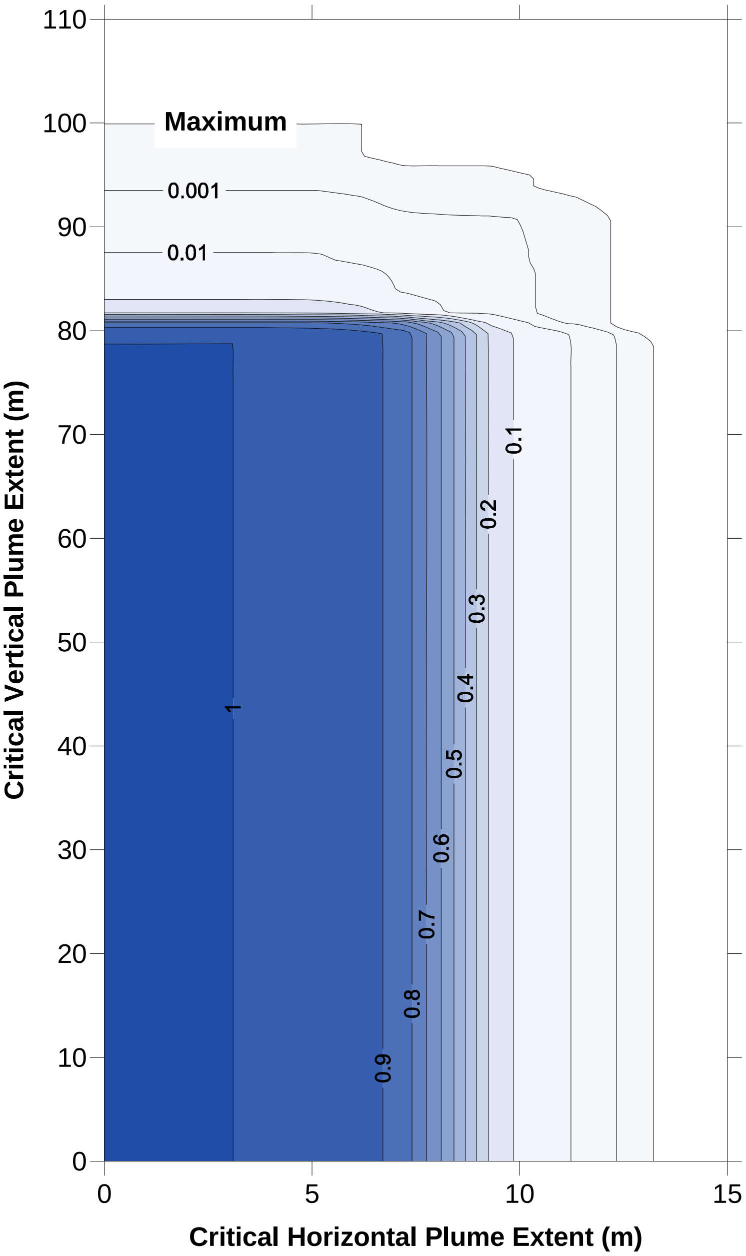


Figure 7 contains a contour plot of the probability density of the horizontal and vertical plume extents for the Sulphuric Acid Plant plume, thus illustrating the regions of space for which the plume velocity exceeds 4.3 m/s by fraction of the year 2004. For example, for contour level 0.01 (1% of the time, or 87 hours per year), the critical vertical plume extent for the Sulphuric Acid Plant is 87m and the corresponding total horizontal extent is 12 m. The maximum contour (with a probability of 0.00011) is representative of the worst hour of the year and thus indicates entire region of space at which the vertical velocity was greater than 4.3 m/s for any instance during the year of 2004.

Figure 7 - Probability density plot representing the region of space for which the plume velocity exceeds the critical velocity of 4.3 m/s



The proposed Gladstone Nickel Project was assessed for its impact on aviation safety. Elevated stacks from the following plant areas were evaluated for potential impacts on aviation safety:

- Sulphuric Acid plant;
- H_2S Incinerator;
- Power Plant;
- H_2 Plant.

The aviation safety considered the plume buoyancy enhancement due to several stacks that are located in close proximity. Five years of meteorological data were evaluated in the assessment, to establish the likely worst-case conditions that may affect aircraft. The worst year for aviation safety was found to be 2004, which has been used for subsequent detailed analysis.

Detailed analysis of the plume height results for five years of data showed that the OLS of 100 m is not exceeded for any hour of the assessment. The Sulphuric Acid Plant plume reaches up to 99.9 m with a vertical velocity of 4.3 m/s for the worst-case hour over the five years (in 2004), while the next highest result was 97.1 m in 2005. Detailed analysis of the data for 2004 showed that the highest plume heights occurred at 9 and 10 am, while most of the higher plume heights occurred in the morning.

The results of this assessment have shown that the major stack sources will comply with the OLS for Gladstone Airport, using the methodology and analysis procedures specified by CASA. Thus the site does not need to be considered as a hazard to aircraft operations.

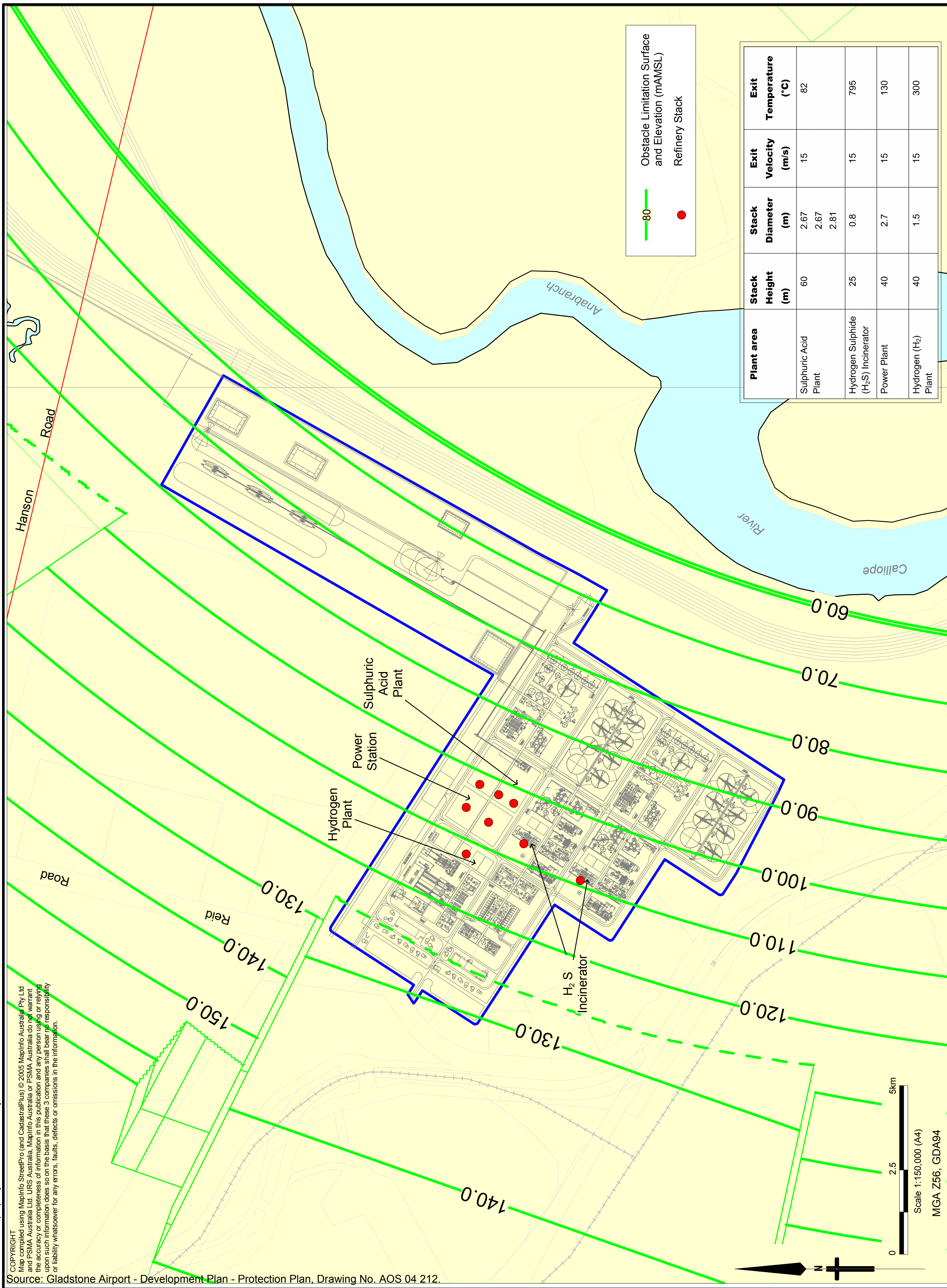
URS Australia Pty Ltd (URS) has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of Gladstone Pacific Nickel Limited and only those third parties who have been authorised in writing by URS to rely on the report. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the Variation dated 15th September 2006.

The methodology adopted and sources of information used by URS are outlined in this report. URS has made no independent verification of this information beyond the agreed scope of works and URS assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to URS was false.

This report was prepared between October and November 2006 and is based on the conditions encountered and information reviewed at the time of preparation. URS disclaims responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

Figures



Plant area	Stack Height (m)	Stack Diameter (m)	Exit Velocity (m/s)	Exit Temperature (°C)
Sulphuric Acid Plant	60	2.67 2.67 2.81	15	82
Hydrogen Sulphide (H_2S) Incinerator	25	0.8	15	795
Power Plant	40	2.7	15	130
Hydrogen (H_2) Plant	40	1.5	15	300

Source: Gladstone Airport - Development Plan - Protection Plan, Drawing No. AOS 04 212.

Client	Project	Title
Gladstone Pacific Nickel Ltd	GLADSTONE NICKEL PROJECT AVIATION SAFETY ASSESSMENT	**GLADSTONE AIRPORT DEVELOPMENT PLAN PROTECTION PLAN AND REFINERY SITE LAYOUT**
URS	Drawn: VH · Approved: CMP · Date: 21-11-06 Job No: **4262 5791** · File No: 42625791-g-099b.wor	Figure: **1** · Rev:B · **A4**

Appendix A
TAPM Definition File

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#TRUE#
#TRUE#
#TRUE#
#TRUE#
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25
25
1
29
37
1
"c:\surfer6"
"Notepad"
1
""
0
0
#TRUE#
#FALSE#
#TRUE#
#FALSE#
```

Appendix B
TAPM Input File

```
 &GRDINFO
LON=151.199997,LAT=-23.8500004,CX=316687.000,CY=7361207.00,NX=25,NY=25,NZ=25,DEL
X=30000.0000,10000.0000,3000.00000,1000.00000,500.000000,DELY=30000.0000,10000.0
000,3000.00000,1000.00000,500.000000,ZLEV=10.0000000,25.0000000,50.0000000,100.0
00000,150.000000,200.000000,250.000000,300.000000,400.000000,500.000000,600.0000
00,750.000000,1000.00000,1250.00000,1500.00000,1750.00000,2000.00000,2500.00000,
3000.00000,3500.00000,4000.00000,5000.00000,6000.00000,7000.00000,8000.00000,0.0
0000000E+00,0.00000000E+00,0.00000000E+00,0.00000000E+00,0.00000000E+00,0.000000
00E+00,0.00000000E+00,0.00000000E+00,0.00000000E+00,0.00000000E+00,0.00000000E+0
0,0.00000000E+00,0.00000000E+00,0.00000000E+00,0.00000000E+00,0.00000000E+00,0.0
0000000E+00,0.00000000E+00,0.00000000E+00,0.00000000E+00,0.00000000E+00,0.000000
00E+00,0.00000000E+00,0.00000000E+00,0.00000000E+00/
 &METINFO
WSMAXM=30.0000000,WSDRAG=1.00000000,WSFILT=1.00000000,LHOUR=10.1000004,SDATE=200
10101,EDATE=20011231,SYNOP=3,VEGE=1,NONHYD=1,RAIN=1,TURB=1,DNZOUT=6,NSKIP=0,LES=
0,CTM=0,C3D=0,IRUN0=1,NRUN=4,METIN=0,METOUT=0,RUNNAME=c:\Modelling\GPN_Aviation\
g-300
c:\Modelling\GPN_Aviation\g-100
c:\Modelling\GPN_Aviation\g-30
c:\Modelling\GPN_Aviation\g-10
c:\Modelling\GPN_Aviation\C1-05
,M3DNAME=t300a
        t100a
       t030a
      t010a
     t003a
    /
 &CNCINFO
NTR=1,ISX=1,IEX=25,FACX=2,ISY=4,IEY=22,FACY=2,TRSKEW=0,TRVAR=0,APMBACK=0.0000000
0E+00,SO2BACK=0.00000000E+00,NOXBACK=0.00000000E+00,RSBACK=0.00000000E+00,O3BACK
=20.0000000,FPMBACK=0.00000000E+00,PH=4.50000000,RSEED=15.0000000,MAXTIME=1500.0
0000,NPPS=6,NT=1000000,NMIX=1,PLR=1,APMSPEC=0,NOXSPEC=0,SO2SPEC=0,NO2SPEC=0,APMD
ECAY=0.00000000E+00,NOXDECAY=0.00000000E+00,SO2DECAY=0.00000000E+00,NO2DECAY=0.0
0000000E+00,SDAYGSE=0,LPMONLY=0/
 &CTMINFO CTM_ON=0,CTM_IRUN0=1/
```

Appendix C
TAPM Point Source Files

```
4,   1
1,  313816.00, 7361398.00,      60.00,       1.34,       1.19,       1.00,
0.50
1,  313543.00, 7361168.00,      25.00,       0.40,       1.03,       1.00,
0.50
1,  313715.00, 7361439.00,      40.00,       1.35,       1.16,       1.00,
0.50
1,  313621.00, 7361505.00,      40.00,       0.75,       1.20,       1.00,
0.50
 15.00,   355.00,   152.0000,     0.0000,     0.0000,     0.0000
 15.00,  1068.00,     0.0016,     0.0000,     0.0000,     0.0000
 15.00,   403.00,     0.5500,     0.0000,     0.0000,     0.0000
 15.00,   573.00,     0.0000,     0.0000,     0.0000,     0.0000
```

"SulfAcid_S1a"
"H2SIncin"
"PowerPlant"
"H2_Plant"

URS Australia Pty Ltd
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Brisbane, QLD 4000 Australia
GPO Box 302, Queensland 4001
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