SUPPLEMENTARY AIR QUALITY ASSESSMENT FOR THE WANDOAN JOINT VENTURE PROJECT

Prepared for

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Glossary

Term	*Definition*
%	percent
$\mu g/m^3$	micrograms per cubic metre
μm	micROMetre
<	less than
>	greater than
^0C	degrees Celsius
m AHD	meters Australian Height Datum
AS	Australian Standard
AS/NZS	Australian Standards/New Zealand Standards
BCM	Bulk cubic meter
BoM	Bureau of Meteorology
CHPP	Coal Handling and Preparation Plant
CO	Carbon monoxide
CO_2	Carbon dioxide
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DEM	Dust extinction moisture
e.g.	for example
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EP Act	*Environmental Protection Act 1994* (Qld)
EPA	Queensland Environmental Protection Agency
EPP	Environmental Protection Policy
GWh	Gigawatt hours
i.e.	that is,
kL	kilolitres
kL/day	kilolitres per day
km	kilometre
km/h	kilometre per hour
km^2	square kilometre
m	metre
M	million
m/s	metres per second
m^2	square metres
m^3	cubic metres
m^3/s	cubic metres per second
mg	milligram
MLA	mining lease application
Mm^3	million cubic metres
Mt	million tonnes
Mtpa	million tonnes per annum
MW	megawatt
Nm^3	Normalised cubic metre
No.	Number
NO_2	Nitrogen dioxide

NO_x	Oxides of nitrogen
NPI	National pollution inventory
NWP	numerical weather prediction
ou	Odour units
PM	Particulate matter (fine dust)
$PM_{2.5}$ and PM_{10}	Particulate matter less than 2.5 or 10 microns, respectively
Project	Wandoan Coal Project
SO_2	sulphur dioxide
t	tonnes
tpa	tonnes per annum
TEOM	Tapered element oscillating microbalance
ToR	Terms of Reference as defined by Part 4 of the *State Development & Public Works Organisation Act 1971*
tph	tonnes per hour
TSF	Tailings storage facility
TSP	total suspended particles
TSS	total suspended solids
VOC	Volatile organic compounds
WJV	Wandoan Joint Venture, and the Proponent
Xstrata Coal Queensland	Lead proponent representative
XCQ	Xstrata Coal Queensland

Executive Summary

A supplementary Environmental Impact Statement (EIS) for the Wandoan Joint Venture Project (the Project) was necessitated by the revision of the Environmental Protection (Air) Policy 2008 (EPP(Air) 2008) and its introduction into legislation as of January 2008. Following on from the air dispersion modelling undertaken by Katestone Environmental for the Project (Katestone Environmental 2008 Air-Tech Report TR13-1-v1.5); a revised air dispersion modelling study was conducted. The revised model utilised the same model configurations as detailed in Katestone Environmental 2008 Air-Tech Report TR13-1-v1.5; while incorporating alterations to the mine schedule and assessing the impacts of fine dust particulates ($PM_{2.5}$).

The results published in Katestone Environmental 2008 Air-Tech Report TR13-1-v1.5 indicated that a two kilometre buffer zone around the township of Wandoan would be sufficient to mitigate dust impacts for the township. The Project took this finding and re-developed the mine schedule to accommodate the buffer zone. The results of the revised air dispersion modelling support this initiative with no exceedences of the EPP(Air) 1998 objectives or project goals within the township of Wandoan during the thirty year operational life of the mine. The prospect of future mining within the buffer zone is reasonable provided that appropriate mitigation measures are in place prior to commencement.

Katestone Environmental 2008 Air-Tech Report TR13-1-v1.5 assessed construction impacts, five operating scenarios believed to be representative of the mine's presence during its operational life, the installation and operation of an 80 MW power station, an upgrade to the Wandoan wastewater treatment plan and associated mine infrastructure. This supplementary air quality study considers only those operations that are significantly different from those detailed in Katestone Environmental 2008 Air-Tech Report TR13-1-v1.5. These are:

- *Year 1 of mining operation*
- *Year 5 of mining operation*
- *Year 10 of mining operation*
- *Year 20 of mining operation*
- *Year 30 of mining operation*

The overall findings of the supplementary air quality assessment are as follows:

Mining operations

- *Dispersion modelling has been undertaken to assess the potential impact of the Project on ground-level concentrations of $PM_{2.5}$, PM_{10} and TSP and the dust deposition rate at the Wandoan township and other surrounding sensitive receptors.*
- *The results show:*
  - *Compliance with the maximum 24-hour average EPP(Air) 2008 objective of 25 $\mu g/m^3$ for $PM_{2.5}$ for Year 1, 5, 10, 20 and 30.*
  - *Compliance with the maximum 24-hour average EPP(Air) 1998/Project goal of 150 $\mu g/m^3$ for PM_{10} for Year 1, 5, 10, 20 and 30.*
  - *Compliance with the annual average EPP(Air) 2008 objective of 8 $\mu g/m^3$ for $PM_{2.5}$ for Year 1, 5, 10, 20 and 30.*
  - *Compliance with the annual average EPP(Air) 2008 objective of 90 $\mu g/m^3$ for TSP for Year 1, 5, 10, 20 and 30.*

- *Compliance with the annual average project goal of 120 mg/m^2/day for dust deposition rate for Year 1, 5, 10, 20 and 30.*
- *Non-compliance with the maximum 24-hour average EPP(Air) 2008 objective of 50 $\mu g/m^3$ for PM_{10} for Year 1, 5, 10, 20 and 30 at some sensitive receptor locations.*

The revised air dispersion modelling and air quality assessment show that, with the operational and predictive controls employed, the Project will meet the air quality objectives and project goals at sensitive receptors within the township of Wandoan and the surrounding region for the assessment scenarios. Analysis of monitoring data indicates that existing non-compliances with the EPP(Air) 2008 objective of 50 $\mu g/m^3$ for PM_{10} are due to adverse meteorological conditions and elevated natural background concentrations.

It is recommended that the EPP(Air) 2008 objective of 50 $\mu g/m^3$ of PM_{10} for a 24 hour average be applied with an allowable number of exceedences of 35 days, in conjuction with the previous EPP(Air) 1998 goal of 150 $\mu g/m^3$ of PM_{10} for a 24 hour average as the maximum allowable exceedence due to the Projects activities. This will bring the Projects environmental management plan in line with US EPA and European Union guidelines for extractive industries in non-industrialised regions.

The dust management plan for the mine should include an action trigger level equalling 80 percent (120 $\mu g/m^3$) of the PM_{10} project goal of 150 $\mu g/m^3$ for a 24-hour averaging period. This action trigger level should be based on the real-time monitoring of the 24-hour rolling average at the TWN station. As the natural background variability of dust levels in the region may reach or exceed the air quality objectives and project goals the need to distinguish between natural events (e.g. dust storms) and mine impacts is paramount for efficient operation of the mine and the protection of the public. With the extensive management controls and protocols detailed herein applied to the operation of the Project the likelyhood of an exceedence of Air Quality Objectives at any sensitive receptor locations is extremely remote.

1. Introduction

The introduction of the Environmental Protection (Air) Policy (EPP(Air) 2008) into legislation in January 2008 has required the submission of a supplementary EIS for the Wandoan Joint Venture Project (the Project). Further, recent alterations to the submitted mine schedule have prompted a revision of the air dispersion modelling. These changes have also allowed for the explicit modelling of $PM_{2.5}$ for all sources and the updating of monitoring data to include a full 12 months of PM_{10} and dust deposition data and 1 month of $PM_{2.5}$ data. Reanalysis of the coal resource characteristics by Xstrata has identified an increase in coarse rejects from the coal handling and processing plant (CHPP). To accommodate this increase, the tailings disposal area, known as Austinvale North (AN) was expanded from a surface area of 1,393,913 m^2 to 2,894,882 m^2. This expansion also required an increase in overburden removal and the hauling of coarse reject material from the CHPP to the AN disposal area.

The results of the air dispersion modelling undertaken in the primary EIS (Katestone Environmental 2008 Air-Tech Report TR13-1-v1.5) found that a two kilometre buffer zone around the township of Wandoan was sufficient to mitigate potential dust impacts. These findings prompted the mine schedule to be redeveloped altering the shape of Frank Creek (FC) pit, introducing a new pit, Wubagul (WU) located at the southern end of mine lease area (MLA) 221 adjacent to the Leichhardt Highway. Minor amendments to the location of haul roads were required to accommodate these changes as well as the introduction of the WU pit haul road.

To maintain the economic efficiency of the mine, alterations to the volume of overburden removed and coal extracted from active pits listed in the primary EIS was necessary. These alterations were significant enough to warrant the complete re-modelling of all sources included in the primary EIS. The revised air dispersion modelling utilised the same model developed in primary EIS (refer to section 4 of Katestone Environmental 2008 Air-Tech Report TR13-1-v1.5) with equipment in the same locations, except where alterations to pit layout have occurred. The only alteration to the model structure was the recalculation of emission rates for each source and the explicit modelling of $PM_{2.5}$.

The revised air dispersion modelling was undertaken for the same five representative years of mine operations as detailed in the primary EIS (Katestone Environmental 2008 Air-Tech Report TR13-1-v1.5). These years are:

- Year 1 of mining operation
- Year 5 of mining operation
- Year 10 of mining operation
- Year 20 of mining operation
- Year 30 of mining operation

There were no alterations to the waste water treatment plant from what was assessed in the primary EIS (section 5 of Katestone Environmental 2008 Air-Tech Report TR13-1-v1.5) and therefore the results of that assessment are still valid and will not be addressed here in the supplementary EIS.

Power supply options assessed in Section 6 of the primary EIS (Katestone Environmental 2008 Air-Tech Report TR13-1-v1.5) are still valid and the results of the air dispersion modelling are not expected to change. The location and configuration of the power plant is not expected to be significantly different from that assessed in the primary EIS. A possible decrease in power plant size to 10 MW is also under consideration. If a smaller generator were used the affect on air quality would be less than that considered in the primary EIS and, hence, a revision to the assessment is unnecessary.

Air dispersion modelling has been undertaken to assess the air quality impacts of the Project accounting for the alterations to the mine schedule since the release of the primary EIS. The model utilised in the primary EIS (refer to Attachment C of Katestone Environmental 2008 Air-Tech Report TR13-1-v1.5) was re-run to include $PM_{2.5}$ and any alterations to mine layout, equipment locations and volume of overburden and coal extracted

2. Methodology of assessment and limitations

2.1 Relevant legislation and guidelines

Schedule 1 of the EPP(Air) specifies air quality indicators and objectives for Queensland and these are presented in Table 1. The EPP(Air) 2008 has implemented revisions to the PM_{10} air quality objective and has introduced $PM_{2.5}$ objectives. The PM_{10} annual goal has been removed and the 24-hour objective has been reduced to 50 µg/m^3. The new 24-hour PM_{10} objective has an allowance of 5 exceedences taking into account natural fluctuations in the background PM_{10} concentration (i.e. dust storms). The $PM_{2.5}$ 24-hour objective has been set to 25 µg/m^3 with an annual objective of 8 µg/m^3. The Queensland Department of Environment, and Resource Management (DERM, formerly EPA) has recommended a dust deposition goal of 120 mg/m^2/day, based on monitoring data obtain from the Hunter Valley, NSW in the 1980s. This goal was determined as an annoyance threshold and is not legislated or of concern to human health. It is widely acknowledged that the particulates are considered to be non-threshold pollutants and that any air quality standards that are set have some level of risk associated with them.

Table 1 Existing ambient air quality objectives and guidelines applicable to the project

Parameter	Averaging period	Source	Value[1]	Units
Total suspended particulates (TSP)	Annual	EPP(Air)[2]	90	µg/m^3
Particulate matter less than 10 µm (PM_{10})	24-hour	EPP(Air)	50[2]	µg/m^3
		US EPA and former EPP(Air)[3]	150	µg/m^3
Particulate matter less than 2.5 µm ($PM_{2.5}$)	24-hour	EPP(Air)	25	µg/m^3
	Annual	EPP(Air)	8	µg/m^3
Dust deposition rate	Annual	DERM (formerly QLD EPA[4])	120	mg/m^2/day

Note
[1]No exceedences allowed unless otherwise indicated.
[2]EPP(Air) Environmental Protection (Air) Policy 2008 Five exceedences allowed per year.
[3]Former EPP(Air) Environmental Protection (Air) Policy 1997 goal and current US EPA standard.
[4]Recommended goal

A review of international PM_{10} objectives for developed nations shows that there is some disparity in the setting of ambient PM_{10} standards (Table 2). Table 2 shows that maximum 24-hour objectives vary from 50 to 150 µg/m^3 depending on issuing country or state; while the allowable number of days that PM_{10} can exceed a given objective ranges from 1 to 35 days per year. Australia, Germany and The UK have passed legislation adopting a maximum 24-hour concentration of 50 µg/m^3 for PM_{10}. Germany and the UK have set the limit of acceptable exceedences of the PM_{10} objective at 35 days per year, while Queensland has adopted the NEPM objective of 5 days per year.

Table 2 International ambient air quality objectives and guidelines

Country	Authority	Averaging Period	Objective/ Standard (µg/m³)	Frequency of Exceedences	Comments
Australia	National[21] 2003	24-hour	50	5 days a year	Human health
	Queensland[13] 2008	24-hour	50	5 days a year	Human health
	New South Wales[21] To be met by 2008	24-hour	50	-	Human health
	Victoria[11] 2001	24-hour	60	-	Intervention level
United States of America 2009	National[31]	24-hour	150	Average 1 day per year over 3 years	Primary/ Secondary
	Texas[28]	24-hour	155	Average 1 day per year over 3 years	Primary/ Secondary
	Massachusetts[20]	24-hour	150	1	Primary/ Secondary
	Tennessee[27]	24-hour	150	1	Primary/ Secondary
	California[3]	24-hour	50	-	-
United Kingdom 2008	National[14]	24-hour	50	35 days a year	Human health
Germany 2008	National[14]	24-hour	50	35 days a year	Human health
European Union 2008	EU[14]	24-hour	50	35 days a year	Human health
Global Recommendation 2005	WHO[0]	24-hour	50	-	Average ratio $PM_{2.5}/PM_{10}$ In Urban areas
Interim target -1	WHO[0]	24-hour	150	-	-
Interim target -2	WHO[0]	24-hour	100	-	-
Interim target -2	WHO[0]	24-hour	75	-	-
Note: [29] refers to reference 29					

The National Environment Protection Council defines national ambient air quality standards and objectives in consultation, and with agreement from all State Governments. These were first published in 1998 in the NEPM(Air). As prescribed by the NEPM(Air), compliance with the NEPM(Air) standards is evaluated via ambient air quality monitoring undertaken in urban areas that are representative of large populations (> 25,000). The objective of the

NEPM(Air) is for the ambient air quality standards to be achieved at these monitoring stations within ten years of commencement (NEPC 2003). Under the NEPM assessment of ambient air quality is not to be conducted at peak sites or sites impacted by individual sources as these sites are not representative of the general population. The NEPC goes on to state in a discusison paper reviewing the NEPM that

"...*to provide a representative assessment of exposure, monitoring networks include regions of generally high or low air quality levels excluding localised source-related peaks. ....* The use of standards to assess local air quality issues, or as individual licence conditions for industry, is not in accordance with the intent of the NEPM.*"(NEPC 2007 20 45)*

In 2005 the World Health Organisation (WHO 2005) published a Global Update of its Air Quality Guidelines (AQG's) based on scientific evidence amassed from multi-city studies in Europe and USA were health effects associated with particulate matter were observed in urban environments. The AQG's were derived from evaluating the relative proportions coarse (PM_{10} – $PM_{2.5}$) and fine (<$PM_{2.5}$) particulates, their source characteristics (combustion versus mechanical), local meteorology and geography. The subsequent indicator used for setting the AQG's was $PM_{2.5}$ with the ratio of $PM_{2.5}$/PM_{10} being used to set the PM_{10} guideline. It is noted that the WHO recommends that the annual average take precedence over the 24-hour average. This is due to the fact that episodic excursions of the 24-hour average is of less concern than consistently high levels of particulate matter. The AQG for 24-hour PM_{10} therefore reflects the source, composition and ratio to $PM_{2.5}$ in its derivation and is defined by the relationship between the distribution of 24-hour averages and the annual average concentration.

2.2 Relationship between ambient PM_{10} and $PM_{2.5}$

The NEPM(Air) standards have been derived from studies conducted in urban areas where anthropogenic emissions, such as motor vehicles and the combustion of fuels for power generation and industrial activities are the primary source of particulate matter (WHO 2005, NEPC 2003, Cohen 1999). For example particulate matter from motor vehicles consists almost entirely (≈ 80%) of particles that are smaller than 2.5 micrometres in diameter and contain soot, hydrocarbons, metals and other materials (Watson 2000).

There is a demonstrated statistical association between health effects and the concentration of fine (≤ 2.5µm) airborne particulates ($PM_{2.5}$). Recent studies (US EPA 2004, 2005, 2006b) indicate that in susceptible sub-populations, fine airborne particulates ($PM_{2.5}$) from combustion related sources are markedly more detrimental to health than coarse particulate fractions ($PM_{10-2.5}$). There is data associating PM_{10} from a combustion origin with health effects but this PM fraction also contains $PM_{2.5}$ (Drew 2009) and, hence, the specific cause cannot be delineated.

There is clearly a fundamental distinction between particulate matter originating from the combustion of fuel and secondary chemical reactions, and mechanically generated crustal particulate matter. Where the former is generated for example by motor vehicles, power stations, and industrial activities and consists predominantly of fine particulate matter ($PM_{2.5}$). While the latter, originates from construction, mining, earth works, unpaved roads, agricultural activities and erosion and consists predominantly of coarse particulate matter (PM_{10}).

The US EPA (2004, 2005, 2006) noted there are clear distinctions between:

- The character of the ambient mix of particles generally found in urban areas as compared to that found in rural areas, and

- The nature of the evidence concerning health effects associated with thoracic coarse particles generally found in urban versus rural areas.

Further, the mix of particles typically found in areas with sources of a combustive nature, such as industrial sites and urban areas, contain a number of contaminants that are not commonly present, or not present to the same degree, in the mix of natural crustal particles. Particles of crustal origin, which are predominately in the coarse fraction, appear to be relatively non-toxic under most circumstances, compared to combustion-related particles. There is no immediate evidence that non-occupational exposure to crustal PM is associated with adverse health effects (Drew 2009).

2.3 Relationship between source specific PM_{10} and $PM_{2.5}$

Recent studies conducted by the United States Environmental Protection Agency (Cowherd and Donaldson 2005, Ono 2005 and USEPA 2006) found that fugitive dust sources such as those generated from mining activities had an average $PM_{2.5}$ to PM_{10} ratio of 0.1 (10%) and that the ratio declined with increasing PM_{10} concentrations.

Analysis of the emission rates for the Project, based on AP-42 emission factors (USEPA), found that the majority of the dust emissions (≈ 90%) are in the coarse size range (that is, larger than 2.5 micrometres). Table 3 and Figure 1 show the ratio as percentage of $PM_{2.5}$ to PM_{10} and the relative contribution of $PM_{2.5}$ to the total PM_{10} emission for each individual source assessed in the air dispersion model for the Project.

It is important to note that the sources with the largest percentage of $PM_{2.5}$ have the smallest contribution to the total emission. For example dozers operating on overburden have a $PM_{2.5}$ to PM_{10} ratio of 0.53, or 53% of the PM_{10} emission is in the $PM_{2.5}$ size fraction. The contribution of this source to the total PM_{10} emission is only 10%. In contrast a dragline has a ratio of 0.07, or 7% but contributes nearly 30% to the total.

This corresponds with the studies conducted by the USEPA in establishing fine fraction ratios for fugitive dust sources, where dust sources outside major metropolitan areas were found to have a $PM_{2.5}$ to PM_{10} ratio of 0.05 to 0.15 or 5% to 15% (USEPA 2006). That same study also concluded that $PM_{2.5}$ emissions from the mechanical disturbance of crustal matter (i.e. earth) be revised to less than 0.15 or 15% of the PM_{10} emission as the previous ratio of 0.26 (26%) for emission factor calculations were proven to over-predict the $PM_{2.5}$ fraction by more than a factor of two (Cowherd and Donaldson 2005 and Ono 2005).

Table 3 Average PM_{10} and $PM_{2.5}$ emissions and ratios by source calculated from US EPA AP-42 emission factors as input for the dispersion model

Source	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	RATIO
Dragline	2.90	0.20	0.07
Truck and Shovel	1.78	0.12	0.07
Truck loading coal	1.78	0.22	0.12
Bulldozing - overburden	0.19	0.10	0.53
Truck dumping overburden	0.10	0.04	0.42
ROM	1.95	0.11	0.06
Wind erosion	0.02	0.001	0.05
Truck dumping coal	1.33	0.06	0.05
loading trains	0.01	0.00	0.15
Conveyor	0.03	0.00	0.06

Blasting	2.11	0.12	0.06
Drilling	0.05	0.003	0.06
Grader	0.04	0.01	0.14
Haul Road	0.79	0.08	0.10

2.3.1 Relationship between receptor specific PM_{10} and $PM_{2.5}$

The average ratio of $PM_{2.5}/PM_{10}$ at source is shown to be 0.1, meaning that on average 10% of the PM_{10} emitted by the Project is in the $PM_{2.5}$ size fraction (Section 2.3). Table 15 shows the average and maximum receptor specific $PM_{2.5}/PM_{10}$ ratio for the representative sensitive receptors for Year 1 of operations. The average receptor specific $PM_{2.5}/PM_{10}$ ratio is 0.23 (23%) with a range of 97% to 0.03%. The large range is due to the fluctuation of PM_{10} concentrations, where a reduction in PM_{10} is matched by a relative increase in $PM_{2.5}$. This occurs because the $PM_{2.5}$ size fraction is suspended in the atmosphere for much longer periods of time while the $PM_{2.5}$-PM_{10} size fraction is lost from the atmosphere to the surface. Figure 20 clearly shows the inverse relationship between modelled PM_{10} and $PM_{2.5}$ concentrations at MLA-520 for year 1 of operations. The highest modelled $PM_{2.5}/PM_{10}$ ratio (0.99) occurs when PM_{10} concentrations are below 1 µg/m^3, while the lowest ratios (0.024) occur when PM_{10} is predicted to be greater than 30 µg/m^3. This relationship is due to the low percentage of $PM_{2.5}$ emissions from the Project. The majority of particulate matter emitted to the atmosphere by the project is in the coarse ($PM_{2.5}$-PM_{10}) and very coarse (PM_{10}-PM_{50}) size fractions due to the fact that the mechanism of release is the mechanical disruption of crustal matter.

This illustrates the influence that source characteristics have on concentrations of particulate matter at downwind locations. The inherent nature of the activity and the constituents of the particulates being transported through the atmosphere may play a significant role in the potential health effects experienced at sensitive receptor locations.

3. Model limitations

This study necessarily relies on the accuracy of a number of data sets including, but not limited to:

- Meteorological information
- Calculation of emission rates of dust for mining activities

A number of assumptions have been applied. These include, but are not limited to:

- Ambient air monitoring data obtained from an existing monitoring site is representative of air quality within the study region
- Projected mining extraction rates will be an accurate representation of mine activities
- Meteorological data provides a reasonable characterisation of the potential for dispersion

CALMET/CALPUFF is a three dimensional diagnostic meteorological and dispersion model and represents one of the most sophisticated air quality modelling tools currently available. It is important to note that all numerical models are based on an approximation of governing equations and will inherently be associated with some degree of error. The more complex the physical model, the greater the number of physical processes which must be parameterised.

As such there will be physical processes that are not accounted for in the model, for example in the real world when a plume of dust reaches an area of sloping terrain mass from the plume will be removed through impaction on the surface. In model space however, the dust plume is treated as a gas and the plume will pass over or around the obstacle with no loss of mass. This subtle difference in characterisation can lead to an over prediction of dust impacts downwind from the source.

There exists extensive in-house expertise in the use of CALMET/CALPUFF within Katestone Environmental and our modellers make every reasonable attempt to ensure that model results are of the highest possible quality.

4. Ambient Air quality

4.1 Ambient dust levels and dust monitoring

The Project commenced monitoring of PM_{10} using two TEOMs in March 2008 to measure the existing levels of PM_{10} at the Township of Wandoan (TWN located at Short Street) and on the mine site (WSTN located near the Project's weather station). As of April 2009 continuous monitoring of $PM_{2.5}$ has been added to WSTN, at the time of writing three months of data is been available for analysis. Dust deposition rates were also measured at both of these locations. Fifteen months of monitoring results, from March 2008 until July 2009 are presented below.

4.1.1 24-hour average PM_{10}

The ambient monitoring conducted in the township of Wandoan and on the project site indicates that 24-hour average concentrations of PM_{10} vary between 2 and 110 µg/m^3 depending on synoptic circulation patterns and surface interactions. The natural variability of background concentrations (Table 4 and Figure 2) is seen to exceed the EPP(Air) objective of 50 µg/m^3 for a 24-hour averaging period on six occasions. These exceedences can be attributed to regional scale dust storms initiated by the passage of fast moving cold fronts (Bureau of Meteorology 2008-2009).

Table 4 Measured exceedences of the 24-hour average PM_{10} air quality objective of 50 µg/m³ at the WSTN and Wandoan monitoring sites during March 2008 to June 2009

Date	24-hour average PM_{10} concentration	
	WSTN	TWN
3 April 08	57.9	60.5
28 April 08	99.7	108.4
16 September 08	101.8	98.2
17 September 08	62.7	63.2
23 November 08	66.0	58.2
5 March 09	84.7	74.6

To establish a background dust concentration for the Wandoan region 12 months of monitoring data was selected beginning in April 2008 and ending in March 2009. This subset of the data was chosen to represent seasonal variations in background PM_{10} concentrations. Since the monitoring data does not coincide with the 12 months of modelled data (April 2007 to March 2008) due to the model being developed and run prior to 2009 for the primary EIS (Katestone Environmental 2008 Air-Tech Report TR13-1-v1.5) it cannot be added to the model as a contemporaneous background. With the change in the EPP(Air) 24-hour PM_{10} objective from 150 µg/m^3 to 50 µg/m^3 the addition of a background concentration must be accurate as well as conservative.

Figure 4, Figure 5, and Figure 6 show the hourly varying PM_{10} and $PM_{2.5}$ concentrations measured at the WSTN and TWN monitoring station as a function of wind direction (a) and time of day (b). There appears to be no significant directionality to the ambient background concentrations, this is likely due to the lack of significant sources in the region. The figures also show that the naturally occurring high concentrations occur mostly during the day-time.

Both monitoring stations display several hours out of the year where elevated concentrations are measured originating from the south west sector. These events coincide with natural dust storms attributed to fast moving cold fronts.

The mean, maximum, minimum and standard deviation of the 24-hour average concentrations are presented for the WSTN and the TWN monitoring sites in Table 6. The large range of PM_{10} observations (2 – 108 µg/m^3) and relatively low average (TWN: 14 µg/m^3 and WSTN = 12 µg/m^3) compared to the range, suggests that the distribution of concentrations are centred on the lower end of the spectrum, punctuated by a few individual high concentration events, this is shown as a frequency distribution in Figure 6.

Table 5 Measured PM_{10} (µg/m³) for the TWN and WSTN monitoring station (March 2008 to July 2009)

Variable	TWN_PM_{10}	$WSTN\_PM_{10}$
Mean	13.8	12.1
Standard Error	0.5	0.5
Median	11.7	9.8
Mode	13.5	6.9
Standard Deviation	10.3	11.0
Sample Variance	105.8	121.8
Kurtosis	28.9	30.5
Skewness	4.5	4.8
Range	107.0	100.8
Minimum	1.4	0.9
Maximum	108.4	101.8
Count	520.0	478.0
95th percentile	27.1	24.6
70th percentile	14.2	14.0

The distribution is simply the number of days a certain concentration was measured, in this case increasing by 1 µg/m^3 from 0 to 150 µg/m^3. To ensure that the 24-hour average distribution does not lose any vital details from the averaging process, the 1 hour distribution was also generated and compared to the 24-hour average (Figure 4 and Figure 7). The distributions were found to retain the same shape, therefore there is no loss of detail and the 24-hour average distribution can be used for the analysis.

Figure 8 clearly shows that the concentrations centre on the lower (< 20 µg/m^3) end of the spectrum with an elongated tail to the right (or positive skew). The tail of the distribution is punctuated by the six days where the ambient PM_{10} concentration was measured to be greater than 50 µg/m^3.

In order to accurately assess the cumulative impact the Project could have on the environment in regards to airborne PM_{10} concentrations the entire range of possible background concentrations needs to be used. By calculating the distribution of background concentrations, the likelihood of a certain concentration being measured is also calculated. The probability of a measured concentration is weighted by the number of values in the data set. For example according to the data the probability of the TWN monitoring station recording a PM_{10} concentration of 58 µg/m^3 is 0.003 (or 0.03%) over a 12 month period. This is equivalent to one day per year.

Therefore to add the natural variability of measured PM_{10} concentrations as measured at the TWN monitoring station to the Projects predicted contribution of PM_{10} at a sensitive receptor the distribution of both the measured and the modelled datasets is merged.

This is accomplished by using a convolution of the two distributions, where a convolution expresses the amount of overlap the Projects impact has as it is shifted over the distribution of ambient background concentrations. It therefore "blends" the Project and the background into one distribution taking into account all the possible combinations of the Projects impacts and the natural variability in the observations.

An example of a convolution is shown in Figure 9, where the distribution of PM_{10} impacts at MLA-520 is blended with the ambient PM_{10} distribution. The result is a distribution of all possible combinations and as described above the probability of these combinations. By summing up all of the convolved probabilities above a certain threshold and multiplying them by the length of the data set (365 days) the result is the predicted total number of days on average that a specific location could experience PM_{10} concentrations above this threshold.

This methodology is similar in application to frequency analysis used in hydrology to estimate flood return periods (World Meteorological Organisation 1994), it has applications in trend analysis (Smith 1989) and the modelling of multivariate space-time data (Calder 2007). The methodology has been applied to all identified sensitive receptor locations and a table of exceedences has been generated that details the frequency of occurrence of natural events, the Project in isolation and the combination of both the background and the Project.

4.1.2 24-hour average $PM_{2.5}$

Monitoring data for ambient $PM_{2.5}$ concentrations was available for March 19 2009 to July 31 2009 at the WSTN monitoring site. The ratios of the 24-hour average $PM_{2.5}$ and PM_{10} concentrations measured at the WSTN monitoring site (Table 6) ranged from 0.09 to 1.0, with an average ratio of 0.56. The high $PM_{2.5}$ to PM_{10} ratio observed in the measured dust levels at the WSTN monitoring site are likely to be due to the short duration of the data period (three months).

Table 6 Comparison of measured PM_{10} and $PM_{2.5}$ ($\mu g/m^3$) for WSTN monitoring station (March 19 2009 to July 31 2009)

Variable	WSTN_PM_{10}	WSTN_$PM_{2.5}$	RATIO
Mean	10.56	5.03	0.56
Standard Error	0.73	0.10	0.01
Median	8.88	4.80	0.56
Standard Deviation	9.05	1.31	0.16
Sample Variance	81.94	1.73	0.02
Kurtosis	60.38	30.22	0.16
Skewness	6.92	4.19	-0.10
Range	94.34	12.94	0.91
Minimum	3.60	3.00	0.09
Maximum	97.94	15.94	1.00
Count	154.00	162.00	154.00
95th percentile	17.83	6.77	0.38
70th percentile	11.21	5.08	0.45

The time-series of 24-hour $PM_{2.5}$ and PM_{10} concentrations and ratios presented in Figure 3 show that there is an inverse relationship between the total PM_{10} levels and the proportion of $PM_{2.5}$. When background PM_{10} levels are relatively high, the proportion of $PM_{2.5}$ is low, while higher proportions of $PM_{2.5}$ are associated with lower PM_{10} levels. Figure 3 shows that the days exhibiting a relatively high $PM_{2.5}$ to PM_{10} ratio (3 – 7 and 14 – 15 April) recorded relatively low dust (PM_{10}) levels.

Although the data does not extend for an entire 12 month period and appears to be higher than expected the 95th percentile of the measured $PM_{2.5}$ was chosen as a conservative 24-hour $PM_{2.5}$ and annual background concentration. This equates to an ambient $PM_{2.5}$ concentration of 6.8 µg/m^3 which has been applied to all model scenarios.

4.1.3 TSP and dust deposition rate

There are no known measurements of TSP in the Wandoan region. Previous assessments by Katestone Environmental and standard conversion ratios detailed in the USEPA's Compilation of Air Pollution Emission Factors Volume 1 (AP-42) and in the National Pollutant Inventory (NPI) Handbooks, have found that PM_{10} is usually 50% of the TSP concentration. In accordance with standard industry practice, this ratio has been employed here from an annual average PM_{10} concentration of 13 µg/m^3 giving an annual background level of 26 µg/m^3 for TSP.

Dust deposition gauges were co-located with the TEOMs to provide baseline data from which the estimation of background dust deposition levels was possible. The results of total insoluble solids (mg/m^2/day) for 12 months of monitoring are presented in Figure 10. The amounts of deposited dust recorded for the month of July 2008 appear quite low; while May 2008 at the WSTN site, and December 2008, January 2009 and March 2009 at both sites are quite high. The elevated dust deposition levels, when recorded at both sites, are likely to be due to regional scale dust storms. No statistical analysis is available on the frequency of dust storms in the region; however, it is recognised that dust storms are commonly associated with the passage of cold frontal systems. The cold front can generate strong surface winds at the leading edge of the front encouraging the entrainment of dust. The leading edge of the front is also a zone of convergence where vertical uplift of wind and particulates can be quite strong, thus giving rise to localised dust storms (McInnes *et. al.* 1994).

The statistical breakdown of the monitoring data is shown in Table 7. A maximum monthly average deposition rate of 123 mg/m^2/day was recorded at the TWN site in March 2009. The average dust deposition rate was 32 mg/m^2/day and 38 mg/m^2/day for the TWN and WSTN sites respectively. To determine an annual average background deposition rate the combined average of the 12 months of monitoring from the WSTN and the TWN of 35 mg/m^2/day was used.

Table 7 Dust deposition statistics for WSTN and the TWN monitoring sites. Units are in mg/m²/day.

Monitoring Site	Monthly Minimum	Monthly Maximum	Monthly Average	Monthly Standard Deviation	Combined Monthly Average
TWN	3	123	32	31	35
WSTN	3	93	38	29	

5. Alterations to mine schedule

5.1 Year 1

The major alteration to year 1 operations was the expansion of the Austinvale North (AN) pit to accommodate an increase in coarse rejects. The dispersion model was setup with these changes and $PM_{2.5}$ explicitly modelled for the increase in surface area of the AN pit from 1,393,913 m^2 to 2,894,882 m^2, the removal and in-pit dumping of 5,685,211 bcm of overburden and 1,700,000 bcm of partings by truck and shovel and dozer operations, and the transfer of coarse rejects from the CHPP and dumping in AN pit by haul trucks accounting for an extra 21 trips per day. This alteration had a negligible impact on $PM_{2.5}$ and PM_{10} concentrations contributing to less than 0.01% of the maximum.

5.1.1 Year 5

The major alteration to year 5 operations was the addition of the Wubagul (WU) pit with minor amendments to haul road locations. The Frank Creek pit was also changed to accommodate a 2 kilometre buffer zone around the township of Wandoan. Such that mining activities within the 2 kilometre zone must be closely monitored and adjusted according to atmospheric conditions to mitigate any adverse dust levels in the township to the keep them below the air quality goals and objectives.

The volume of coal extracted from the Mud Creek (MC) pit was reduced from 4,815,753 tons to 266,510 tons. The associated volume of overburden removed was also reduced as was the amount of days spent operating in the pit.

While the volumes of overburden and coal extracted from Woleebee pit and Austinvale pit did not significantly change (< 5% difference) the emissions were recalculated for these pits and re-modelled for consistency.

Table 8 details the major changes in the mine schedule used as input for the air dispersion model. The dispersion model was setup with these changes and $PM_{2.5}$, PM_{10}, TSP and dust deposition were explicitly modelled.

5.1.2 Year 10

The major alteration to year 10 operations is the mining of Frank Creek north and south pit and the mining of Mud Creek pit, where these pits were inactive for this year of operation in the primary EIS (Katestone Environmental 2008 Air-Tech Report TR13-1-v1.5). The volume of coal extracted from Turkey Hill pit was reduced from 13,333,427 tons to 7,291,928 tons and Summer Hill saw a reduction in volume of approximately 6%.

Table 8 details the major changes in the mine schedule used as input for the air dispersion model. The dispersion model was setup with these changes and $PM_{2.5}$, PM_{10}, TSP and dust deposition were explicitly modelled.

5.1.3 Year 20

The major alteration to year 20 operations is the volume of coal extracted from Leichhardt pit, Mud Creek pit, Summer Hill pit and Turkey Hill pit. The Frank Creek West (FCw) pit is also represented in this year. FCw is a relatively small pit located to the south of Leichhardt pit and west of the Frank Creek area. Table 9 details the major changes in the mine schedule used as input for the air dispersion model. The dispersion model was setup with these changes and $PM_{2.5}$, PM_{10}, TSP and dust deposition were explicitly modelled.

5.1.4 Year 30

The major alteration to year 30 operation the volume of coal extracted from Woleebee pit, Mud Creek pit, Summer Hill pit and Turkey Hill pit. This year also saw the removal of Turkey Hill/Summerhill ROM pad and associated conveyor. The ROM coal is driven by haul trucks to the Mud Creek ROM pad and transported to the CHPP by the Mud Creek conveyor. Table 9 details the major changes in the mine schedule used as input for the air dispersion model. The dispersion model was setup with these changes and $PM_{2.5}$, PM_{10}, TSP and dust deposition were explicitly modelled.

Table 8 Changes to ROM tonnages from Primary EIS to Supplementary EIS for Year 1, Year 5 and Year 10 modelling scenarios

ROM Tons Mined Per Pit	Year 1			Year 5			Year 10		
	Primary EIS	Supplementary EIS	% change	Primary EIS	Supplementary EIS	% change	Primary EIS	Supplementary EIS	% change
Austinvale	10,000,000	10,000,000	0%	11,343,221	10,806,264	5%	0	0	0%
Woleebee	0	0	0%	9,235,436	8,909,241	4%	5,450,082	5,891,411	7%
Leichhardt	0	0	0%	0	0	0%	0	0	0%
Frank Creek	0	0	0%	4,605,591	1,914,492	141%	0	1,098,176	100%
Woleebee Creek	0	0	0%	0	0	0%	0	0	0%
Mud Creek	0	0	0%	4,815,753	266,510	1707%	0	4,136,326	100%
Summer Hill	0	0	0%	0	0	0%	11,216,491	11,882,158	6%
Turkey Hill	0	0	0%	0	0	0%	13,333,427	7,291,928	83%
Wubagul	0	0	0%	0	8,403,493	100%	0	0	0%
Total	10,000,000	10,000,000	0%	30,000,001	30,300,000	1%	30,300,000	30,300,000	1%

Table 9 Changes to ROM tonnages from Primary EIS to Supplementary EIS for Year 20 and Year 30 modelling scenarios

ROM Tons Mined Per Pit	Year 20			Year 30		
	Primary EIS	Supplementary EIS	% change	Primary EIS	Supplementary EIS	% change
Austinvale	0	0	0%	0	0	0%
Woleebee	0	0	0%	4,303,229	0	0%
Leichhardt	3,611,686	4,106,995	12%	0	0	0%
Frank Creek (West)	3,434,914	2,668,980	29%	0	0	0%
Woleebee Creek	9,407,935	9,323,941	1%	10,581,467	9,962,455	6%
Mud Creek	5,048,149	3,463,989	46%	4,589,205	3,937,579	17%
Summer Hill	4,254,887	3,830,197	11%	3,873,047	4,298,016	10%
Turkey Hill	4,242,430	6,905,898	39%	653,053	618,387	6%
Wubagul	0	0	0%	0	6,183,562	100%
Total	30,000,001	30,300,000	1%	24,000,001	24,999,999	4%

5.2 Operational controls

A suite of best practice operational controls have been applied to the model and agreed to be implemented by the proponent. These controls are listed in Table 10.

Table 10 Operational controls employed as best practice for all model scenarios.

Activity	Normal operational control	High management control
Dragline - overburden	Controlled by restricting drop height to 5 metres	Relocation / Cease activity
Truck & Shovel	n/a	Relocation / Cease activity
Truck loading coal	n/a	Relocation / Cease activity
Bulldozing - overburden	n/a	Relocation / Cease activity
Truck dumping overburden	In Pit	Relocation / Cease activity
Tailings disposal area	99% control applied due to progressive revegetation	n/a
ROM - erosion active stockpile	No control	50% control due to water sprays
Truck dumping coal	No control	50% control due to water sprays
Batch drop conveyor	75% control for partial cover (chute)	n/a
Washplant	99% control for full cover	n/a
Loading trains	75% control for partial cover (chute)	n/a
Conveyor	40% for partial cover	n/a
Blasting - coal and overburden	Only blasting during daylight hours	Relocation / Cease activity
Drilling - overburden	70% control for Bag filter	Relocation / Cease activity
Haul roads	50% reduction for watering (2 ltr/m2/hr) natural control of 29 rain days per year exceeding 0.25 mm / Average vehicle speed 40 Kph	85% control due to Chemical suppressants / Relocation of haul routes / Cease activity
Grader	50% control due to watering of roads	Relocation / Cease activity
Note: n/a = non-available		

The air quality studies conducted previously for this project found that operating a dragline at full capacity in Frank Creek Pit had had the potential to adversely impact the township of Wandoan. Therefore a 2 km buffer zone was delineated around the township as a high management zone (Figure 11). Operations inside the zone would be strictly managed considering the meteorology, ambient dust monitoring, type of equipment and length of time allowed inside the zone.

A set of high management operational controls have been developed to address the situation and these may also be applied in other locations as indicated by the meteorological and ambient PM_{10} monitoring. These are

- Implementation of a weather and dispersion forecasting system to identify the adverse meteorological conditions likely to produce elevated levels of PM_{10} due to natural events (i.e. dust storms) and/or the project
- Progressive ambient monitoring of PM_{10} at representative sensitive receptor locations as mining activities approach these locations
- Implementation of an action triggers response indicated by a 24-hour average rolling PM_{10} concentration of 120 $\mu g/m^3$. The response will consist of a range of options employed at the mines discretion. These are:

    1. Application of chemical suppressants on haul roads in the zone of influence
    2. Application of water sprays on ROM dumping stations
    3. Alteration of haul routes to increase the separation distance between affected sensitive receptors and haul trucks
    4. Cessation of operations in affected areas until adverse conditions return to normal

The weather forecasting system will be supplemented by real time monitoring of meteorological variables at two semi-permanent automatic weather stations (AWS). Figure 12 shows the indicative locations of the semi-permanent AWS sites. These sites will provide critical information of changes in wind direction, the speed of approaching frontal systems and upwind/downwind characteristics for source apportionment and forensic meteorology investigations.

Figure 13 shows the locations of the representative sensitive receptors where ambient dust monitoring is to be progressively introduced to and relocated from as required. The selection criterion for representative receptors and the modelled scenario year where dust monitoring is recommended is detailed in section 6.

The combination of real-time continuous monitoring, proactive and reactive dust management protocols and a defined high management procedure constitute worlds best practice environmental management of mining activities and exceeds the controls documented in the NPI Handbook for Mining Activities (NEPC 2001), The Victorian EPA Draft Protocol for Environmental Management – Mining and Extractive Industries (VicEPA 2006) and advocated in the Pollution Prevention and Abatement Handbook (World Bank Group 1998). It is proposed that this project will be one of the most heavily monitored and managed open cut coal mines in the world.

If the management strategies detailed above are adopted by the proponent an exceedence of air quality objectives at any sensitive receptor due to mining activities is highly unlikely.

5.3 Emission estimation

Dust emission rates from the mine have been calculated using emission factors published by the US EPA in the Compilation of Air Pollution Emission Factors Volume 1 (AP-42) (US EPA 1998) and in the Department of the Environment, Water, Heritage and the Arts National Pollutant Inventory Handbooks (NEPC 2001).

The alterations to the mining schedule necessitated the re-calculation of emission rates for each of the five modelling scenarios (refer to Appendix A). It was assumed that the limiting factors to the removal of overburden and coal is the bucket size of the equipment, the number of trucks available and speed at which the trucks can be loaded, travel to the unloading area, unload and return to the loading area. This timeframe was calculated from distance travelled, the average speed of haul trucks (40 km/h), and the time taken to load and unload (≈ 600 s). This calculation resulted in an average extraction rate in tons per hour (t/hr) for each pit. This was then divided by the total volume of coal and overburden to be removed from each pit for each scenario, yielding a total number of hours spent in each pit.

Table 11 shows the calculation steps taken to derive the number of days spent operating per pit for year 5 of the mine schedule (calculations for all scenarios are detailed in Appendix A). The Draglines were assumed to be operating at 90% of maximum capacity (≈ 8563 t/hr) allowing for downtime due to blasting, maintenance and movement of active pit faces as the mine progresses. The timing of operations within the mine is exceedingly difficult to forecast. The nature of mining operations are fluid and alter on a daily basis, therefore all activities are assumed to be occurring simultaneously for the duration of the total days of in pit operation. If the total number of days exceed 363 (days of operation in one calendar year) then it is assumed that all activities occur simultaneously for all 363 days of operation.

The dispersion model was setup with these emission rates and $PM_{2.5}$, PM_{10}, TSP and dust deposition were explicitly modelled for a one year period.

Table 11 Example of estimation procedure for deriving the number of operating days per pit for Year 5

Coal	**Frank Creek**	**Woleebee**	**Austinvale**	**Mud Creek**	**Wubagul**
Equipment	**Truck and Shovel**	**Truck and Shovel**	**Truck and Shovel**	**Truck and Shovel**	**Truck and Shovel**
Haul truck speed (km/hr)	40	40	40	40	40
roundtrip (min)	24	24	21	17	47
t/hour	1,597	1,597	1,597	1,762	1,077
ROM tons	2,833,448	13,185,677	15,993,271	394,435	12,437,170
total hours	1,774	8,255	10,013	224	11,545
days of operations	74	344	417	9	481
Overburden					
Equipment	**Truck and Shovel**	**Dragline**	**Dragline**	**Truck and shovel**	**Truck and Shovel**
t/hour	3,208	8,564	8,564	2,495	2,495
Overburden tons	10,381,750	57,721,211	59,804,250	1,970,146	5,704,008
total hours	3,237	6,740	6,984	790	2,286
days of operations	135	281	291	33	95
total days in pit	209	625	708	42	576

6. Results due to alterations of the mines schedule and layout

The results for a selection of representative sensitive receptors of the five modelling scenarios are presented below. Sensitive receptors where determined to be representative for each modelling scenario by the following criteria:

1. Proximity to operations (e.g. active haul roads, active pits, tailings storage facility)
2. Magnitude of the predicted maximum 24-hour PM_{10} concentration ($\mu g/m^3$)
3. Downwind direction from operations to ensure all compass points are represented

Figure 13 shows the locations of the representative sensitive receptors for each model scenario. The colour coding indicates which year of operations dust monitoring is to be commenced at that receptor. This will most likely coincide with the operations approaching the receptor location (i.e. criteria 1). Table 12 shows the modelled operational years where ambient dust monitoring is recommended at representative sensitive receptors.

The modelled results for 24-hour PM_{10} concentrations for all sensitive receptors are presented in Appendix A.

Table 12 Operational years where ambient dust monitoring is recommended at representative sensitive receptors

Representative sensitive receptor	Modelled operational year				
	Year 1	Year 5	Year 10	Year 20	Year 30
MLA-106	Y	-	-	-	-
MLA-207	-	Y	-	-	-
MLA-450	-	-	Y	Y	Y
MLA-520	Y	Y	Y	Y	-
MLA-402	Y	Y	Y	-	-
Accommodation facilities	Y	Y	Y	Y	Y
MLA-505	-	Y	Y	Y	Y
MLA-548	Y	-	-	-	-
MLA-300	Y		Y	Y	Y
MLA-355	-	Y	Y	Y	Y
MLA-50	-	-	Y	Y	Y
MLA-595	-	-	Y	Y	Y
MLA-693	-	-	Y	-	-

6.1 Year 1

Table 13 shows the modelling results for Year 1 of operations. Background concentrations have been added to the data as described in Section 4.1. The model shows that the 24-hour $PM_{2.5}$ and annual $PM_{2.5}$, TSP and dust deposition rate comply with air quality objectives and goals adopted by the Project at all sensitive receptor locations.

Table 13 Model results for Year 1 of operations. Background concentrations of 6.8 μg/m³ ($PM_{2.5}$: 24-hour and Annual), 26 μg/m³ (TSP : Annual) and 35 mg/m²/day (dust deposition) have been added.

Parameter	Year 1			
	$PM_{2.5}$ 24-hr	$PM_{2.5}$ Annual	TSP Annual	Dust Deposition Annual
Objective/Goal	25	8	90	120
Maximum at a receptor	13	7.2	29	41
Percent contribution of the Project	48%	6%	10%	15%
Percent of Objective/Goal	52%	90%	32%	34%

The maximum 24-hour average concentration of $PM_{2.5}$ (Figure 14) is predicted to occur at MLA-520. The predicted concentrations are approximately 52% of the $PM_{2.5}$ objective. These results include a $PM_{2.5}$ background of 6.8 μg/m³. The relative contribution of the Year 1 operations to the 24-hour average $PM_{2.5}$ concentrations is 48% at this receptor.

The maximum 24-hour average concentration of PM_{10} (Figure 15) is predicted to exceed the EPP(Air) objective of 50 μg/m³ at MLA-520 due to the project in isolation. The maximum concentration predicted for this location is 53 μg/m³. Figure 17 shows a box and whisker plot of the predicted one hour average PM_{10} concentrations at MLA-520. The figure indicates that the occurrence of elevated 1-hour average PM_{10} concentrations is restricted to night time events. This would occur when a strong inversion develops. The spike in concentrations seen at 6 AM coincides with the breakup of the inversion and signals the transition from non-convective night-time conditions to daytime convective conditions. During this transition period the boundary layer is still depressed and the additional convective activity causes an increase in concentrations until the boundary is fully developed.

Figure 18 shows the distribution of predicted 24-hour average concentrations of PM_{10} at MLA-520 for the project in isolation. The data indicates that 99% of the time or 363 days of the year (Table 14) the project contributes less than 20 μg/m³ at that location. There are only two occasions when PM_{10} concentrations are above 40 μg/m³ these events coincide with the adverse meteorological conditions described above. To manage these events the use of a weather forecasting system will warn the operations manager of the impending adverse meteorological conditions and appropriate procedures would be taken to minimise the dust levels (Figure 16).

Figure 19(a) shows the time series of 24-hour PM_{10} concentrations at MLA-520 under normal operating procedures and controls for the project in isolation. Figure 19(b) shows the time series of 24-hour PM_{10} concentrations at MLA-520 under high management operating procedures and controls for the project in isolation. The high management scenario (Figure 19 b) shows that the maximum 24-hour PM_{10} concentration at MLA-520 has been reduced from 53 μg/m³ to 41 μg/m³. In the high management scenario a chemical suppressant is applied to the haul roads. These results show the effectiveness of high management operational controls in reducing PM_{10} concentrations at sensitive receptor locations under adverse conditions.

It is assumed from this point on that the weather forecasting and high management procedures are applied as required for each modelling scenario. The addition of a background concentration of PM_{10} has been calculated for all sensitive receptor locations based on the distribution of of the measured PM_{10} concentrations from the TWN monitoring station and the predicted contribution of the Project at each location. This method provides a surrogate to a 24-hour varying background as all possible combinations of natural and Project related contributions of PM_{10} are accounted for.

For Year 1 of operations, six sensitive receptor locations have been chosen as representative of the potential air quality impacts due to the Project. Figure 13 shows the location of the six representative sensitive receptors. Table 14 shows the number of days when 24-hour PM_{10} concentrations are predicted to be below 20 µg/m^3 at the representative locations from the Project in isolation. This indicates that elevated levels of PM_{10} are relatively rare occurrences and are associated with adverse meteorological conditions (Figure 17).

Table 15 shows the average and maximum PM_{10}, $PM_{2.5}$ and $PM_{2.5}/PM_{10}$ ratio for the representative sensitive receptor locations. The distribution of concentrations is important such that a very low average predicted concentration such as 1.4 µg/m^3 for MLA-548 indicates that the distribution is skewed to the lower end (i.e. < 10 µg/m^3) while the maximum (38 µg/m^3) would be a singular or rare occurrence as seen in Figure 18 for MLA-520. This figure also shows that the Project in isolation does not cause an exceedence of the 24-hour PM_{10} objective.

Table 16 shows the number of days when the 24-hour EPP(Air) objective of 50 µg/m^3 for PM_{10} is exceeded due to natural events, due to the Project in isolation and the potential of an exceedence occurring due to natural events and the Project combined. Table 16 shows that the Project in isolation contributes to a maximum of one extra exceedence of the 24-hour PM_{10} objective when the natural variability of PM_{10} concentrations is added at MLA-520. Table A1 in Appendix A contains the results for all other sensitive receptors.

The maximum annual average concentration of $PM_{2.5}$ (Figure 21) is predicted to occur at MLA-355. The predicted dust level is 90% of the $PM_{2.5}$ objective (7.2 µg/m^3). This includes a background of 6.8 µg/m^3. The relative contribution of the Year 1 operations to the annual $PM_{2.5}$ concentration is 0.4 µg/m^3 or 6%. The maximum annual average concentration of TSP (Figure 22) is predicted to occur at MLA-397. The predicted dust level is only 32% of the TSP objective with a background TSP concentration of 26 µg/m^3; meaning that the relative contribution of the Year 1 operations to TSP concentrations is approximately 10% at this receptor. The maximum annual average dust deposition rate (Figure 23) is predicted to occur at the Accommodation facilities (41 mg/m^2/day) and is 34% of the recommended dust deposition rate with a background dust deposition rate of 35 mg/m^2/day. The relative contribution of the Year 1 operations to the dust deposition rate is approximately 15% at this receptor.

Table 14 Percentage of year and number of day's 24-hour average PM_{10} is below 20 µg/m³ for Year 1 of operations

Sensitive receptor	Percentage (%) of year < 20 µg/m³	Number of days < 20 µg/m³
MLA-520	99%	363
Town (MLA-106)	99%	363
MLA-402	99.7%	364
MLA-548	99%	362
MLA-300	100%	365
Accommodation facilities	99.7%	364

Table 15 Model results for Year 1 of operations for 24-hour average PM_{10}, $PM_{2.5}$ and $PM_{2.5}/PM_{10}$ ratio for the Project in isolation at representative receptor locations

Sensitive Receptor	PM_{10} (µg/m3)		$PM_{2.5}$ (µg/m3)		Ratio $PM_{2.5}/PM_{10}$	
	Average	Maximum	Average	Maximum	Average	Maximum
MLA-520	0.8	40.2	0.2	6.6	26%	91%
Town (MLA-106)	0.6	29.7	0.1	5.9	28%	97%
MLA-402	1.0	25.4	0.1	4.1	17%	79%
MLA-548	1.4	26.9	0.2	3.1	14%	48%
MLA-300	1.4	17.1	0.2	2.3	15%	57%
Accommodation facilities	2.1	22.2	0.6	5.4	26%	72%

Table 16 Model results for Year 1 of operations for 24-hour average PM_{10} where the Project + background column expresses the amount of overlap the Projects impact has as it is shifted over the distribution of ambient background concentrations, blending the two distributions into one with all the possible combinations of the Projects impacts and the natural variability in the observations

Sensitive Receptor	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} may exceed 50 µg/m³ due to the Project + natural background
MLA-520	6	0	7
Town (MLA-106)	6	0	6
MLA-402	6	0	6
MLA-548	6	0	6
MLA-300	6	0	6
Accommodation facilities	6	0	6

6.2 Year 5

Table 17 shows the modelling results for Year 5 of operations. Background concentrations have been added to the data as described in Section 4.1. The model shows that the 24-hour $PM_{2.5}$ and annual $PM_{2.5}$, TSP and dust deposition rate comply with air quality objectives and goals adopted by the Project at all sensitive receptor locations.

Table 17 Model results for Year 5 of operations. Background concentrations of 6.5 µg/m³ ($PM_{2.5}$: 24-hour and Annual), 26 µg/m³ (TSP : Annual) and 35 mg/m²/day (dust deposition) have been added

Parameter	Year 5			
	$PM_{2.5}$ 24-hr	$PM_{2.5}$ Annual	TSP Annual	Dust Deposition mg/m²/day
Objective/Goal	25	8	90	120
Maximum at a receptor	19	7.75	40	50
Percent contribution of the Project	64%	12%	35%	30%
Percent of Objective/Goal	76%	97%	44%	42%

The maximum 24-hour average concentration of $PM_{2.5}$ (Figure 24) predicted to occur at MLA-520. The predicted concentrations are approximately 76% of the $PM_{2.5}$ objective. These results include a $PM_{2.5}$ background of 6.8 µg/m³. The relative contribution of the Year 5 operations to the 24-hour average $PM_{2.5}$ concentrations is 64% at this receptor.

Figure 13 shows the seven sensitive receptors that are most representative of the impacts predicted for the Project in Year 10 of operations. Table 18 shows the number of days 24-hour PM_{10} concentrations are predicted to be below 20 µg/m³ at the representative locations from the Project in isolation. This indicates that elevated levels of PM_{10} are relatively rare occurrences and are associated with adverse meteorological conditions (Figure A1).

Table 19 shows the average and maximum 24-hour PM_{10}, $PM_{2.5}$ and $PM_{2.5}/PM_{10}$ ratio for the representative sensitive receptor locations. The low average PM_{10} and $PM_{2.5}$ concentrations relative to the maximum concentration is seen across all representative receptors exemplifying the skew to the lower end of the concentration spectrum.

The maximum 24-hour average concentration of PM_{10} (Figure 25) is predicted to exceed the EPP(Air) objective of 50 µg/m³ at multiple sensitive receptor locations due to the project in isolation. The maximum concentration is predicted to occur at MLA-520 (86 µg/m³). Table 20 shows the number of days when the 24-hour EPP(Air) objective of 50 µg/m³ for PM_{10} is exceeded due to natural events, due to the Project in isolation and the potential of an exceedence occurring due to natural events and the Project combined. Table 20 shows that the Project contributes to a maximum of 17 extra exceedences (total of 23 minus the 6 natural events) of the 24-hour PM_{10} objective when the natural variability of PM_{10} concentrations is added at MLA-520. Table A2 in Appendix A contains the results for all sensitive receptors.

As discussed in Section 6.1 the elevated concentrations are restricted to night-time events (Refer Figure A1 to Figure A6). Figure 26(a), Figure 27(a), Figure 28(a) Figure 29(a) and Figure 30(a) show the 24-hour average time series and the corresponding distribution of PM_{10} concentrations are shown in Figure 26(b), Figure 27(b), Figure 28 (b) Figure 29(b) and Figure 30 (b) for the five representative sites that are predicted to exceed the 24-hour average PM_{10} concentration due to the Project in isolation. The figures indicate that there are a few individual events where the 24-hour average is elevated. However, for the majority of the year the contribution of PM_{10} concentrations from the Project at the receptors are less than 20 µg/m^3 (Table 18).

The maximum annual average concentration of $PM_{2.5}$ (Figure 33) is predicted to occur at MLA-355. The predicted dust level is 97% of the $PM_{2.5}$ objective. This includes a background of 6.8 µg/m^3. The relative contribution of the Year 5 operations to the annual $PM_{2.5}$ concentration is 0.95 µg/m^3 or 12% at this receptor.

The maximum annual average concentration of TSP (Figure 34) and dust deposition rate (Figure 35) are predicted to occur at MLA-207. The predicted dust levels are 44% of the TSP objective and 42% of the goal for dust deposition rate. These results include a TSP background of 26 µg/m^3 and a background dust deposition rate of 35 mg/m^2/day. The relative contribution of the Year 5 operations to these concentrations is 35% and 30% at this receptor.

Table 18 Percentage of year and number of day's 24-hour average PM_{10} is below 20 μg/m³ for Year 5 of operations

Sensitive receptor	Percentage (%) of year < 20 μg/m³	Number of days < 20 μg/m³
Town (MLA-207)	87	317
MLA-520	94	342
MLA-300	96	350
MLA-402	98	357
MLA-505	94	343
MLA-355	91	333
Accommodation facilities	100	365

Table 19 Model results for Year 5 of operations for for 24-hour average PM_{10}, $PM_{2.5}$ and $PM_{2.5}/PM_{10}$ ratio for the Project in isolation at representative receptor locations

Sensitive Receptor	PM_{10} (μg/m³)		$PM_{2.5}$ (μg/m³)		Ratio $PM_{2.5}/PM_{10}$	
	Average	Maximum	Average	Maximum	Average	Maximum
Town (MLA-207)	8.1	84.4	0.9	8.4	9%	79%
MLA-520	5.7	85.6	0.7	12.2	10%	64%
MLA-300	5.3	52	0.7	6.7	11%	38%
MLA-402	2.9	63.3	0.4	7.7	9%	79%
MLA-505	5.6	52	0.8	8	9%	33%
MLA-355	7.2	45.9	0.9	6.9	11%	49%
Accommodation facilities	1.1	8.9	0.3	2.2	14%	99%

Table 20 Model results for Year 5 of operations for 24-hour average PM_{10} where the Project + background column expresses the amount of overlap the Projects impact has as it is shifted over the distribution of ambient background concentrations, blending the two distributions into one with all the possible combinations of the Projects impacts and the natural variability in the observations

Sensitive Receptor	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
Town (MLA-207)	6	6	23
MLA-520	6	2	13
MLA-300	6	0	9
MLA-402	6	1	8
MLA-505	6	1	12
MLA-355	6	0	10
Accommodation facilities	6	0	6

6.3 Year 10

Table 21 shows the modelling results for Year 10 of operations. Background concentrations have been added to the data as described in Section 4.1. The model shows that the 24-hour $PM_{2.5}$ and annual $PM_{2.5}$, TSP and dust deposition rate comply with air quality objectives and goals adopted by the Project at all sensitive receptor locations.

Table 21 Model results for Year 10 of operations. Background concentrations of 6.5 µg/m³ ($PM_{2.5}$: 24-hour and Annual), 26 µg/m³ (TSP : Annual) and 35 mg/m²/day (dust deposition) have been added.

Parameter	Year 10			
	$PM_{2.5}$	$PM_{2.5}$	TSP	Dust Deposition
	24-hr	Annual	Annual	Annual
Objective/Goal	25	8	90	120
Maximum at a receptor	17.2	7.5	36	48
Percent contribution of the Project	60%	9%	28%	27%
Percent of Objective/Goal	69%	94%	40%	40%

The maximum 24-hour average concentration of $PM_{2.5}$ (Figure 36) is predicted to occur at MLA-520. The predicted concentration is approximately 69% of the $PM_{2.5}$ objective. These results include a $PM_{2.5}$ background of 6.8 µg/m^3. The relative contribution of the Year 10 operations to the 24-hour average $PM_{2.5}$ concentrations is 60% at this receptor.

Figure 13 shows the ten sensitive receptors that are most representative of the impacts predicted for the Project in Year 10 of operations. Table 22 shows the number of days when 24-hour PM_{10} concentrations are predicted to be below 20 µg/m^3 at the representative locations from the Project in isolation. This indicates that elevated levels of PM_{10} are relatively rare occurrences and are associated with adverse meteorological conditions (Figure A7).

Table 23 shows the average and maximum 24-hour PM_{10}, $PM_{2.5}$ and $PM_{2.5}/PM_{10}$ ratio for the representative sensitive receptor locations. The low average PM_{10} and $PM_{2.5}$ concentrations relative to the maximum concentration is seen across all representative receptors exemplifying the skew to the lower end of the concentration spectrum.

The maximum 24-hour average concentration of PM_{10} (Figure 37) is predicted to exceed the EPP(Air) objective of 50 µg/m^3 at multiple sensitive receptor locations due to the project in isolation. The maximum concentration is predicted to occur at MLA-520 (80 µg/m^3). Table 24 shows the number of days when the 24-hour EPP(Air) objective of 50 µg/m^3 for PM_{10} is exceeded due to natural events, due to the Project in isolation and the potential of an exceedence occurring due to natural events and the Project combined. Table 24 shows that the Project contributes to a maximum of ten extra exceedences (total of 16 minus the 6 natural events) of the 24-hour PM_{10} objective when the natural variability of PM_{10} concentrations is added at MLA-520. Table A3 in Appendix A contains the results for all sensitive receptors.

As discussed in Section 6.1 the elevated concentrations are restricted to night-time events (Refer to Figure A7 and Figure A8). Figure 38(a), Figure 39(a) and Figure 40(a) show the 24-hour average time series and distribution of PM_{10} concentrations are shown in Figure 38 (b), Figure 39(b) and Figure 40 (b) for the three representative sites that are predicted to exceed the 24-hour average PM_{10} concentration due to the Project in isolation. The figures indicate that there are a few individual events where the 24-hour average is elevated. However, for the majority of the year the contribution of PM_{10} concentrations from the Project at the receptors are less than 20 µg/m^3 (Table 22).

The maximum annual average concentration of $PM_{2.5}$ (Figure 41) is predicted to occur at MLA-505. The predicted dust level is 94% of the $PM_{2.5}$ objective. This includes a background of 6.8 µg/m^3. The relative contribution of the Year 10 operations to the annual average $PM_{2.5}$ concentration is 0.7 µg/m^3 or 9% at this receptor.

The maximum annual average concentration of TSP (Figure 42) and dust deposition rate (Figure 43) are predicted to occur at MLA-520. The levels are 40% of the TSP objective and 40% of the recommended goal for dust deposition rate. These results include a TSP background of 26 µg/m^3 and a background dust deposition rate of 35 mg/m^2/day. The relative contribution of the Year 10 operations to these concentrations is approximately 28% and 27% at this receptor.

Table 22 Percentage of year and number of day's 24-hour average PM_{10} is below 20 µg/m³ for Year 10 of operations

Sensitive receptor	Percentage (%) of year < 20 µg/m³	Number of days < 20 µg/m³
MLA-520	93%	339
Town (MLA-450)	96%	349
MLA-300	99.7%	364
MLA-402	100%	365
MLA-505	94%	342
MLA-355	99.7%	364
MLA-595	95%	346
MLA-693	100%	365
MLA-50	98%	357
Accommodation facilities	100%	365

Table 23 Model results for Year 10 of operations for 24-hour average PM_{10}, $PM_{2.5}$ and $PM_{2.5}/PM_{10}$ ratio for the Project in isolation at representative receptor locations

Sensitive Receptor	PM_{10} (µg/m³)		$PM_{2.5}$ (µg/m³)		Ratio $PM_{2.5}/PM_{10}$	
	Average	Maximum	Average	Maximum	Average	Maximum
MLA-520	4.4	80.1	0.6	10.4	8%	67%
Town (MLA-450)	2.7	65.3	0.4	9.9	8%	55%
MLA-300	3.1	31.6	0.5	4.7	12%	48%
MLA-402	1.6	17.0	0.2	3.7	9%	72%
MLA-505	4.4	42.0	0.7	7.8	9%	49%
MLA-355	3.4	22.0	0.5	5.0	12%	45%
MLA-595	5.9	44.0	0.7	6.1	11%	78%
MLA-693	1.5	20.6	0.2	1.7	9%	72%
MLA-50	3.5	51.5	0.5	5.6	12%	78%
Accommodation facilities	1.6	15.8	0.2	2.6	10%	69%

Table 24 Model results for Year 10 of operations for PM_{10} where the Project + background column expresses the amount of overlap the Projects impact has as it is shifted over the distribution of ambient background concentrations, blending the two distributions into one with all the possible combinations of the Projects impacts and the natural variability in the observations

Sensitive Receptor	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-520	6	5	16
Town (MLA-450)	6	2	12
MLA-300	6	0	7
MLA-402	6	0	6
MLA-505	6	0	9
MLA-355	6	0	7
MLA-595	6	0	12
MLA-693	6	0	6
MLA-50	6	1	8
Accommodation facilities	6	0	6

6.4 Year 20

Table 25 shows the modelling results for Year 20 of operations. Background concentrations have been added to the data as described in Section 4.1. The model shows that the 24-hour $PM_{2.5}$ and annual $PM_{2.5}$, TSP and dust deposition rate comply with air quality objectives and goals adopted by the Project at all sensitive receptor locations.

Table 25 Model results for Year 20 of operations. Background concentrations of 6.5 µg/m³ ($PM_{2.5}$: 24-hour and Annual), 26 µg/m³ (PM_{10} : 24-hour), 26 µg/m³ (TSP : Annual) and 35 mg/m²/day (dust deposition) have been added.

	Year 20			
Parameter	**$PM_{2.5}$ 24-hr**	**$PM_{2.5}$ Annual**	**TSP Annual**	**Dust Deposition Annual**
Objective/Goal	25	8	90	120
Maximum at a receptor	14	7.6	36	48
Percent contribution of the Project	51%	11%	28%	27%
Percent of Objective/Goal	56%	95%	40%	40%

The maximum 24-hour average concentration of $PM_{2.5}$ (Figure 44) is predicted to occur at MLA-595. The predicted concentration is approximately 56% of the $PM_{2.5}$ objective. This result includes a $PM_{2.5}$ background of 6.8 µg/m^3. The relative contribution of the Year 20 operations to the 24-hour average $PM_{2.5}$ concentrations is 51% at this receptor.

The maximum 24-hour average concentration of PM_{10} (Figure 45) is predicted to exceed the EPP(Air) objective of 50 µg/m^3 at multiple sensitive receptor locations due to the project in isolation. The maximum concentration is predicted to occur at MLA-595 (64 µg/m^3). Table 28 shows the number of days when the 24-hour EPP(Air) objective of 50 µg/m^3 for PM_{10} is exceeded due to natural events, due to the Project in isolation and the potential of an exceedence occurring due to natural events and the Project combined. Table 28 shows that the Project contributes to a maximum of eight extra exceedences (total of 14 minus the 6 natural events) of the 24-hour PM_{10} objective when the natural variability of PM_{10} concentrations is added at MLA-595. Table A4 in Appendix A contains the results for all sensitive receptors.

Figure 13 shows the eight sensitive receptors that are most representative of the impacts predicted for the Project in Year 20 of operations. Table 26 shows the number of days 24-hour PM_{10} concentrations are predicted to be below 20 µg/m^3 at the representative locations from the Project in isolation. This indicates that elevated levels of PM_{10} are relatively rare occurrences and are associated with adverse meteorological conditions (Figure A9).

Table 27 shows the average and maximum 24-hour PM_{10}, $PM_{2.5}$ and $PM_{2.5}/PM_{10}$ ratio for the representative sensitive receptor locations. The low average PM_{10} and $PM_{2.5}$ relative the maximum concentration is seen across all representative receptors exemplifying the skew to the lower end of concentration spectrum.

As discussed in Section 6.1 the elevated concentrations are restricted to night-time events (Refer to Figure A9 and Figure A10). Figure 46(a) and Figure 47(a) show the 24-hour average time series and distribution of PM_{10} concentrations Figure 46 (b) and Figure 47 (b) for the two representative sites that are predicted to exceed the 24-hour average PM_{10} concentration due to the Project in isolation. The figures indicate that there are a few individual events where the 24-hour average is elevated. However, for the majority of the year the contribution of PM_{10} concentrations from the Project at the receptors are less than 20 µg/m^3 (Table 26).

The maximum annual average concentration of $PM_{2.5}$ (Figure 48) is predicted to occur at MLA-355. The predicted dust level is 93% of the $PM_{2.5}$ objective. This includes a background of 6.8 µg/m^3. The relative contribution of the Year 20 operations to the annual $PM_{2.5}$ concentration is 0.6 µg/m^3 or 8% at this receptor.

The maximum annual average concentration for TSP (Figure 49) is predicted to occur at MLA-355. The predicted dust level is 40% of the TSP objective including a TSP background of 26 µg/m^3. The relative contribution of the Year 20 operations to TSP concentrations is approximately 28% at this receptor.

The maximum annual average dust deposition rate (Figure 50) is predicted to occur at MLA-300. The predicted dust deposition rate is 40% of the recommended goal, this includes a background dust deposition rate of 35 mg/m^2/day. The relative contribution of the Year 20 operations to dust deposition is approximately 27% at this receptor.

Table 26 Percentage of year and number of day's 24-hour average PM_{10} is below 20 µg/m³ for Year 20 of operations

Sensitive receptor	Percentage (%) of year < 20 µg/m³	Number of days < 20 µg/m³
MLA-520	99%	361
Town (MLA-450)	100%	365
MLA-300	94%	342
MLA-505	99%	361
MLA-355	92%	336
MLA-595	92%	335
MLA-50	96%	352
Accommodation facilities	100%	365

Table 27 Model results for Year 20 of operations for 24-hour average PM_{10}, $PM_{2.5}$ and $PM_{2.5}/PM_{10}$ ratio for the Project in isolation at representative receptor locations

Sensitive Receptor	PM_{10} (µg/m³)		$PM_{2.5}$ (µg/m³)		Ratio $PM_{2.5}/PM_{10}$	
	Average	Maximum	Average	Maximum	Average	Maximum
MLA-520	1.5	34.7	0.1	2.9	10%	68%
Town (MLA-450)	1.0	20.1	0.2	4.5	8%	56%
MLA-300	5.7	55.4	0.7	6.4	10%	51%
MLA-505	1.9	36.3	0.3	5.3	7%	41%
MLA-355	6.7	44.5	0.8	4.9	7%	68%
MLA-595	5.9	63.8	0.7	7.4	7%	68%
MLA-50	5.2	46.9	0.6	6.1	11%	68%
Accommodation facilities	1.5	10.2	0.2	1.3	10%	53%

Table 28 **Model results for Year 20 of operations for 24-hour average PM_{10} where the Project + background column expresses the amount of overlap the Projects impact has as it is shifted over the distribution of ambient background concentrations, blending the two distributions into one with all the possible combinations of the Projects impacts and the natural variability in the observations**

Sensitive Receptor	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-520	6	0	6
Town (MLA-450)	6	0	6
MLA-300	6	1	12
MLA-505	6	0	7
MLA-355	6	0	10
MLA-595	6	2	14
MLA-50	6	0	9
Accommodation facilities	6	0	6

6.5 Year 30

Table 29 shows the modelling results for Year 30 of operations. Background concentrations have been added to the data as described in Section 4.1. The model shows that the 24-hour $PM_{2.5}$ and annual $PM_{2.5}$, TSP and dust deposition rate comply with air quality objectives and goals adopted by the Project at all sensitive receptor locations.

Table 29 Model results for Year 10 of operations. Background concentrations of 6.5 µg/m³ ($PM_{2.5}$: 24-hour and Annual), 26 µg/m³ (TSP : Annual) and 35 mg/m²/day (dust deposition) have been added

Parameter	Year 30			
	$PM_{2.5}$ 24-hr	$PM_{2.5}$ Annual	TSP Annual	Dust Deposition Annual
Objective/Goal	25	8	90	120
Maximum at a receptor	13	7.4	37	52
Percent contribution of the Project	48%	8%	30%	33%
Percent of Objective/Goal	52%	93%	41%	43%

The maximum 24-hour average concentration of $PM_{2.5}$ (Figure 51) is predicted to occur at MLA-300. The concentration is approximately 52% of the $PM_{2.5}$ objective. This result includes a $PM_{2.5}$ background of 6.8 µg/m^3. The relative contribution of the Year 30 operations to the 24-hour average $PM_{2.5}$ concentrations is 48% at this receptor.

The maximum 24-hour average concentration of PM_{10} (Figure 52) is predicted to exceed the EPP(Air) objective of 50 µg/m^3 at one sensitive receptor locations due to the project in isolation. The maximum concentration is predicted to occur at MLA-300 (58 µg/m^3). Table 32 shows the number of days when the 24-hour EPP(Air) objective of 50 µg/m^3 for PM_{10} is exceeded due to natural events, due to the Project in isolation and the potential of an exceedence occurring due to natural events and the Project combined. Table 32 shows that the Project contributes to a maximum of ten extra exceedences (total of 16 minus the 6 natural events) of the 24-hour PM_{10} objective when the natural variability of PM_{10} concentrations is added at MLA-300. Table A5 in Appendix A contains the results for all sensitive receptors.

Figure 13 shows the seven sensitive receptors that are most representative of the impacts predicted for the Project in Year 30 of operations. Table 30 shows the number of days 24-hour PM_{10} concentrations are predicted to be below 20 µg/m^3 at the representative locations from the Project in isolation. This indicates that elevated levels of PM_{10} are relatively rare occurrences and are associated with adverse meteorological conditions (Figure A11).

Table 31 shows the average and maximum 24-hour PM_{10}, $PM_{2.5}$ and $PM_{2.5}$/PM_{10} ratio for the representative sensitive receptor locations. The low average PM_{10} and $PM_{2.5}$ relative the maximum concentration is seen across all representative receptors exemplifying the skew to the lower end of concentration spectrum.

As discussed in Section 6.1 the elevated concentrations are restricted to night-time events (Refer to Figure A11). Figure 53(a) show the 24-hour average time series and distribution of PM_{10} concentrations (Figure 53 (b) for the site that is predicted to exceed the 24-hour average PM_{10} concentration due to the Project in isolation. The figures indicate that there are a few individual events where the 24-hour average is elevated. However for the majority of the year the contribution of PM_{10} concentrations from the Project at the receptors are less than 20 µg/m^3 (Table 30).

The maximum annual average concentration of $PM_{2.5}$ (Figure 54) is predicted to occur at MLA-355. The predicted dust level is 93% of the $PM_{2.5}$ objective. This includes a background of 6.8 µg/m^3. The relative contribution of the Year 30 operations to the annual $PM_{2.5}$ concentration is 0.6 µg/m^3 or 8% at this receptor.

The maximum annual average concentration of TSP (Figure 55) and dust deposition rate (Figure 56) are predicted to occur at MLA-300. The predicted dust levels are 41% of the TSP objective and 43% of the recommended goal for dust deposition rate. These results include a TSP background of 26 µg/m^3 and a background dust deposition rate of 35 mg/m^2/day. The relative contribution of the Year 30 operations to these concentrations is approximately 30% and 33% at this receptor.

Table 30 Percentage of year and number of days PM_{10} is below 20 µg/m³ for Year 30 of operations

Sensitive receptor	Percentage (%) of year < 20 µg/m³	Number of days < 20 µg/m³
Town (MLA-450)	99%	363
MLA-300	88%	320
MLA-505	99%	363
MLA-355	94%	343
MLA-595	98%	358
MLA-50	100%	365
Accommodation facilities	100%	365

Table 31 Model results for Year 30 of operations for 24-hour average PM_{10}, $PM_{2.5}$ and $PM_{2.5}/PM_{10}$ ratio for the Project in isolation at representative receptor locations

Sensitive Receptor	PM_{10} (µg/m³)		$PM_{2.5}$ (µg/m³)		Ratio $PM_{2.5}/PM_{10}$	
	Average	Maximum	Average	Maximum	Average	Maximum
Town (MLA-450)	1.6	26.2	0.2	3.8	14%	64%
MLA-300	7.0	57.6	0.8	6.5	10%	63%
MLA-505	1.8	35.4	0.2	4.9	10%	56%
MLA-355	6.1	40.6	0.7	4.7	10%	56%
MLA-595	3.5	30.4	0.4	4.3	11%	73%
MLA-50	2.7	16.4	0.4	2.6	12%	71%
Accommodation facilities	1.1	7.3	0.1	0.9	14%	80%

Table 32 **Model results for Year 30 of operations for PM_{10} where the Project + background column expresses the amount of overlap the Projects impact has as it is shifted over the distribution of ambient background concentrations, blending the two distributions into one with all the possible combinations of the Projects impacts and the natural variability in the observations**

Sensitive Receptor	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
Town (MLA-450)	6	0	6
MLA-300	6	4	16
MLA-505	6	0	7
MLA-355	6	0	9
MLA-595	6	0	7
MLA-50	6	0	6
Accommodation facilities	6	0	6

7. Cumulative impacts

7.1 Adverse meteorology

The prevailing winds in the Wandoan region are generally north to northeast, for the majority of the year (approximately 40%) with only the spring seeing a relaxing of the north to northeast component (13%). These meteorological patterns form the basis of the dispersion modelling presented in the EIS, Volume 1, Chapter 13 Air Quality. For each modelled stage of development, the air quality model was re-run to ascertain the potential effect of the development under the meteorological conditions observed in the monitoring. The results of the dispersion modelling incorporate the seasonal variability in the wind speed, wind direction, temperature and humidity across the entire modelling domain (approximately 40 km^2), allowing for worst case scenario weather conditions to be modelled in the air quality model.

The natural variability of PM_{10} and $PM_{2.5}$ concentrations measured at the WSTN (Figure 4 and Figure 5) and TWN (Figure 6) monitoring stations shows that high concentration events are associated with strong south westerly winds due to the passage of fast moving cold fronts and that impacts occur mainly during the day-time. In contrast the dispersion modelling showed that the Projects impacts are restricted to night-time events (Figure 17) and the proximity of a sensitive receptor to the activity is the main contributing factors to elevated dust levels not wind direction or synoptic situation.

Natural levels of particulates are generated mainly by wind erosion, in extreme cases this can lead to dust storms. The meteorological conditions that lead to these natural events are usually associated with the large scale movement of air masses, such as cold fronts. The passage of fronts bring strong winds and vertical temperature gradients which can entrain large amounts of dust and erode loose surface material adding to the suspended load. The temperature gradient and hence vertical movement in the atmosphere is at its greatest during the day where the sun warms the surface and generates convective movement of air. In contrast the mines contribution to suspended dust loads occur mainly at night when the boundary layer is depressed due to the lack of convection. The main source of particulates is the mechanical movement of crustal matter from haul trucks and draglines/excavators.

The timing of elevated levels of the particualte matter for both natural events (i.e. monitoring data) and predicted levels for the mine (i.e. modelled) is an important distinction to make. The probability of the highest natural hour coinciding with the highest predicted hour from the mine is excceedingly small (0.3%). This is due to the difference in source and mechanism of particulate generation.

Therefore the implementation of a weather forecasting system will enable the operations manager to identify the synoptic and regional meteorological conditions associated with natural and mine generated high dust scenarios and take appropriate actions as required. The forecasting system should be utilised in conjunction with real-time dust monitoring from the progressive monitoring network at representative sensitive receptor locations (Figure 13).

With specific regards to the Wandoan Township, wind speeds from the southwest, west and northwest account for 10% of annual variability in direction observed at the TWN monitoring station. The hourly recorded wind speeds do not exceed 6 m/s for more than 0.05% of the year or 39 hours from this quadrant. This means that the likelihood of dust lift-off and long distance transportation from this quadrant towards the township is very unlikely. Best practice procedures for mine operations and dust management would be sufficient to mitigate most potential impacts. The application of high management controls indicated by real-time monitoring and the weather forecasting system would be sufficient to mitigate potential impacts under adverse meteorological conditions.

7.2 Dust characteristics and deposition

Although the Project is a coal mine, the majority of the dust suspended in the atmosphere as a result of the mine's operation is not in fact coal, but crustal matter (earth). The relative component of coal dust within the emission can be derived from the emission rate and the nature of the source emitting the particulates. For example a grader working on maintaining the road surface will have a very small, if any, proportion of coal in its emission, while a coal stockpile will have a large, if not all, of its emission profile consisting of coal particles. Overall the majority (70%) of the particulate generating activities consist of crustal matter (earth). For the remaining 30%, the activities consist of loading and unloading of ROM coal and coal stockpiles. ROM coal loading in the pits and unloading at dump stations will also consist of a proportion of crustal matter (earth), while the coal stockpile emission is likely to consist of 100% coal, but is less than 0.1% of the total emission for the Project. Therefore the amount of dust deposition in (mg/m^2/day) detailed in the EIS, Volume 1, Chapter 13 Air Quality, is not a deposition rate for coal dust, but of dust with a relatively small proportion of coal and the vast majority is crustal matter (earth).

Chow *et al* (1994) characterized over 200 dust sample from around the world and found that crustal matter (earth) typically contains large abundances of aluminium (Al), silicon (Si), potassium (K), calcium (Ca), and iron (Fe) and that the variability within the samples was no more that ± 10%. The natural profile of Al, Si, K and Fe has also been found to be similar among fugitive dust sources (Watson *et al* 2000).

Table 33 shows the elemental composition of the raw and washed product coal from the Wandoan deposit. The Primary Industries Ministerial Council – Natural Resource Management Ministerial Council has suggested a threshold for cumulative contaminant loading (CCL) of soil to protect irrigation water (PIMMC-NRMMC 2000).

The recommended dust deposition guideline of 120 mg/m^2/day was used as the benchmark for determining the deposition of heavy metals from the mine. A conservative estimate that 20% of the deposited material is coal was applied. As can be seen in Table 1 the amount of heavy metals that would be deposited from the mining operations at the guideline level of 120 µg/m^2/day is between 3000 and 6000 times lower than the suggested CCL.

The recommended dust deposition rate of 120 mg/m^2/day is an amenity guide where dust deposition rates higher than 120 mg/m^2/day will probably result in complaints of nuisance dust (i.e. visible dust or soiling of structures or residences) (NERDDC 1988). Deposition rates below 120 mg/m^2/day are unlikely to cause complaints or a deterioration of amenity. It is also important to note that a dust deposition rate of 120 mg/m^2/day is not legislated in the Queensland EPP(Air) 2008, but will be voluntarily adhered to by the Proponent.

The dust deposition rate for the Carmody Downs property, identified as sensitive receptors MLA-355 and 361, sees an increase in dust deposition of 10 mg/m^2/day above the ambient background in Year 20 of mining operations. Prior to this time, the ambient dust deposition rate is equivalent to the current natural ambient background rate. Therefore, the potential for impacts on roofs and upon the water quality of rainwater collected would be negligible and unlikely to be acid forming given the limited production of coal dust overall.

The dust deposition rate for the Grosmont property, identified as sensitive receptor MLA-199, sees a maximum increase of 3.8 mg/m^2/day above the ambient background in Year 20 of mining operations. Therefore, the potential for impacts on roofs and upon the water quality of rainwater collected would be negligible (Lucas *et al.* 2009).

Table 33 Elemental concentration of raw and washed coal from the Wandoan Project deposit. The deposition has been concerted to kg per hectare for comparison with the PIMMC-NRMMC suggested threshold for cumulative contaminant loading in soil (CCL).

Element	Elemental concentration of raw and washed coal (mg/kg in air dry coal)	Recommended guideline for dust deposition 120 $mg/m^2/day$ as kg/hectare	20% of guideline deposited as coal (kg/hectare)	Deposited concentration of heavy metals at recommended guideline level of 120 $mg/m^2/day$ (kg/hectare)	Suggested Soil CCL Kg/hectare
Arsenic (As)	1.2	12	2.4	0.0000050	20
Boron (B)	28	12	2.4	0.0001167	ND*
Cadmium (Cd)	0.04	12	2.4	0.0000002	2
Chromium (Cr)	5	12	2.4	0.0000208	ND*
Copper (Cu)	8	12	2.4	0.0000333	140
Flourine (F)	40	12	2.4	0.0001667	ND*
Mercury (Hg)	0.015	12	2.4	0.0000001	2
Molybdenum (Mo)	2	12	2.4	0.0000083	ND*
Nickle (Ni)	4	12	2.4	0.0000167	85
Lead (Pb)	8	12	2.4	0.0000333	260
Antimony (Sb)	0.3	12	2.4	0.0000013	ND*
Selenium (Se)	0.4	12	2.4	0.0000017	10
Thorium (Th)	2	12	2.4	0.0000083	ND*
Uranium (U)	0.7	12	2.4	0.0000029	ND*
Vanadium (V)	32	12	2.4	0.0001333	ND*
Zinc (Zn)	10	12	2.4	0.0000417	200
Note ND*: no data available					

7.3 Impacts on cattle from mine dust

The majority of dust generated by the mine is associated with crustal matter. However, regardless of the constituent profile of the emissions from the Project, the effects of coal dust on cattle productivity is important and has been the focus of a study undertaken at the University of Western Sydney (Andrews *et al*. 1992). The authors found that:

- Cattle did not find feed unpalatable if coal mine dust was present at a level equivalent to a dust deposition rate of 4,000 mg/m^2/day
- The presence of coal mine dust in feed did not affect the amount of feed that the cattle ate at a level equivalent to a dust deposition rate of 4,000 mg/m^2/day
- When the cattle were able to choose between feed that was free of coal mine dust, feed that contained 4,000 mg/m^2/day of coal mine dust, and feed that contained 8,000 mg/m^2/day of coal mine dust, the cattle did not preferentially eat feed that did not contain coal mine dust.

A report published by the Department of Veterinary Clinical Sciences at the University of Sydney (Kannegieter 2006) found that:

- There is little scientific literature which has demonstrated a definitive adverse effect of increases in "dust" levels alone on grazing animals
- Contamination of dust by feed, bedding, manure or urine is responsible for the majority of respiratory problems seen in production animals
- Given the absence of the above mentioned contaminants in coal dust, it is unlikely that an increase in dust deposition would adversely affect grazing animals.

The dust deposition rate predicted outside of the MLA areas average less than 60 mg/m^2/day, which is half the recommended daily average of 120 mg/m^2/day and 1.5% of the deposition rate used in the study conducted by the University of Western Sydney. These findings indicate that the recommended dust deposition rate of 120 mg/m^2/day is a conservative value aimed at maintaining amenity and avoiding complaints. The dust deposition rates presented in the EIS, Volume 1, Chapter 13 Air Quality consist of contours without an ambient background added to ascertain the net increase in dust deposition predicted for the Project, and contours with a background of 30 mg/m^2/day, taken from the monitoring, to ascertain the Project's cumulative impact. Therefore, the potential impact of dust (crustal earth and coal) on cattle and cattle feed as a result of operational mining activities, given that the dust deposition rate outside the MLA areas averages less than 60 mg/m^2/day, is predicted to be negligible.

A study conducted at the Colorado State University in the US (Johnson *et al* 1981) fed Hereford steers a diet containing heavy metal enriched sewage sludge and found that:

- Overall weight gain was equal to that expected from overall intake
- Heavy metal content of the sludge was Cd 98 ppm dry mass; Hg 18 ppm dry mass; Pb 466 ppm dry mass; Cu 1,733 ppm dry mass, and Zn 1,733 ppm dry mass. No retention of copper (Cu) or zinc (Zn) in any of the animals tissue
- Retention of cadmium (Cd) was 0.09%, mercury (Hg) was 0.06% and lead (Pb) was 0.3%
- No heavy metals were found to be absorbed into the muscle tissues

- Highest concentrations of Cd, Hg and Pb were found in the liver and kidneys.

The heavy metal content of the sewage sludge was 30 to 100 times that of normal feed and more than 1000 times higher than that normally found in crustal matter from a coal mine. The study found no evidence of meat contamination even at these high heavy metal content levels. The possibility of meat contamination due to the ingestion of particulates from a coal mining operation is extremely remote.

8. Conclusions

The revised air dispersion modelling and air quality assessment shows that the proposed Wandoan Joint Venture Project will meet all air quality objectives and project goals at sensitive receptors within the township of Wandoan and the surrounding region for the assessment scenarios.

The two kilometre buffer zone around the township is shown to effectively mitigate dust impacts within the township. The prospect of future mining within the buffer zone is achievable if appropriate mitigation measures are in place prior to commencement. As such it is recommended that the TWN monitoring station remains in place for the life of the mine. Concentrations of PM_{10} should be used as a marker for air quality in the region; hence a 24-hour rolling average PM_{10} concentration from the TWN monitoring site should be made available to the mine operations manager in real time. This will allow effective decisions to be made about equipment location and dust mitigation procedures, such as watering haul roads as required. A site specific weather forecast should be delivered to the mine operations manager in conjunction with the real-time monitoring data. This will provide mine management with a clear picture of the likely impact of the mine on sensitive receptors.

It is recommended that the EPP(Air) 2008 objective of 50 $\mu g/m^3$ of PM_{10} for a 24 hour average be applied with an allowable number of exceedences of 35 days, in conjuction with the previous EPP(Air) 1998 goal of 150 $\mu g/m^3$ of PM_{10} for a 24 hour average as the maximum allowable exceedence due to the Projects activities. This will bring the Projects environmental management plan in line with US EPA and European Union guidelines for extractive industries in non-industrialised regions.

The dust management plan should include an action trigger level equalling 80 percent (120 $\mu g/m^3$) of the PM_{10} project goal of 150 $\mu g/m^3$ for a 24-hour averaging period. This action trigger level should be based on the real-time monitoring of the 24-hour rolling average at the TWN station. This trigger level will initiate the assessment of the mines operations including:

- Review of real-time monitoring data trends and the site specific forecast to determine the likely cause of the dust levels that contribute to the trigger being reached
- Assessment of the duration of the event
- Implementation of a response to the event, if any, to be taken by the Project to ensure the air quality objectives and project goals are not exceeded at sensitive locations.

As the mine progresses monitoring should be implemented at locations that are representative of sensitive receptor locations as required so that the data can be used to trigger actions to mitigate any adverse dust impacts. For example monitoring may be implemented to the east of Woleebee Creek pit in Year 20 of operations, to mitigate the potential impacts at MLA-300 and surrounding receptors as required. The natural background variability of dust levels in the region may reach or exceed the air quality objectives and project goals therefore the need to distinguish between natural events (e.g. dust storms) and mine impacts is paramount for efficient operation of the mine and the protection of the public. With the extensive management controls and protocols detailed herein applied to the operation of the Project the likelyhood of an exceedence of Air Quality Objectives at any sensitive receptor locations is extremely remote.

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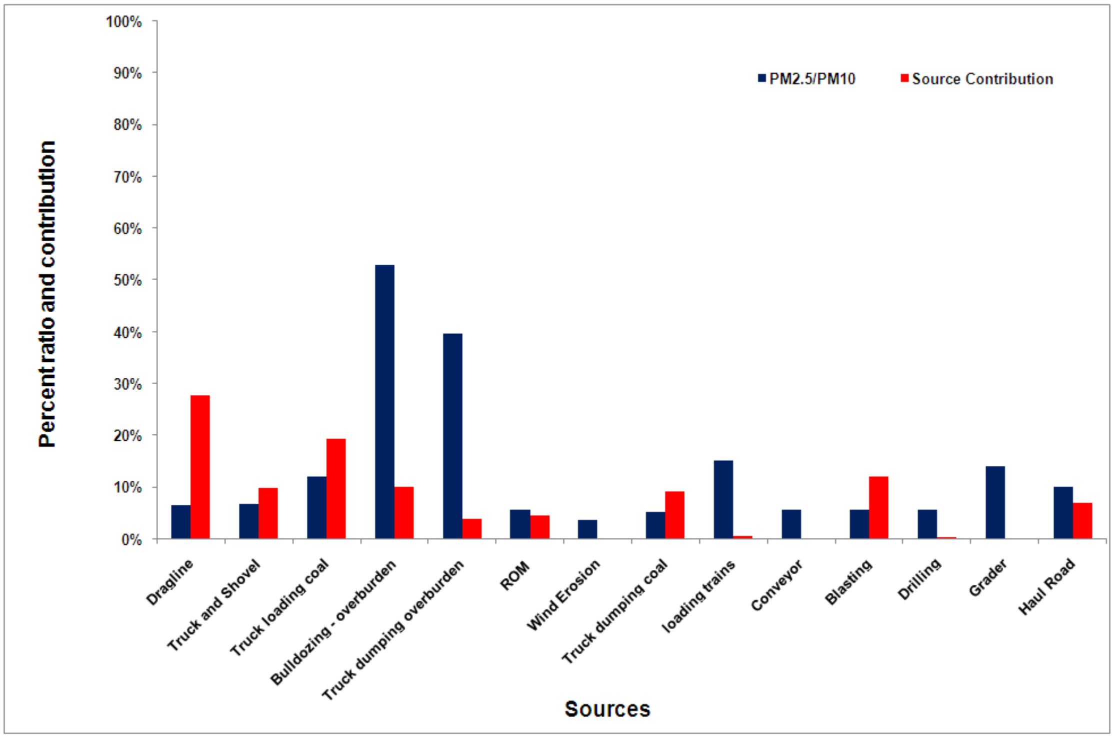


Figure 1	**Ratio of $PM_{2.5}$ to PM_{10} by source and the sources contribution as percentage to the total emission**	
Location:	**Data source:** US EPA AP-42 emission factors and source characteristics provided by Xenith Consulting	**Units:** Percent (%)
Type: Bar chart	**Prepared by:** Andrew Wiebe	**Date:** June 2009

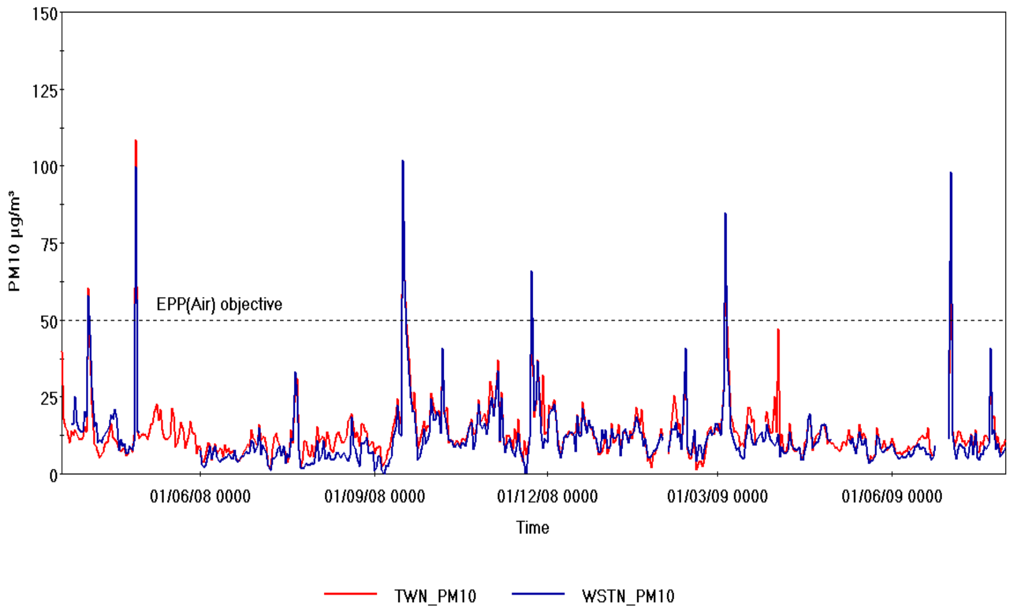


Figure 2	**Measured 24-hour average PM_{10} concentrations at the WSTN and TWN monitoring stations.**

Location: Wandoan Town and WSTN	**Period:** March 2008 – July 2009	**Data source:** Ecowise	**Units:** µg/m³
Type: Time-series	**Averaging period:** 24-hour	**Prepared by:** Andrew Wiebe	**Date:** August 2009

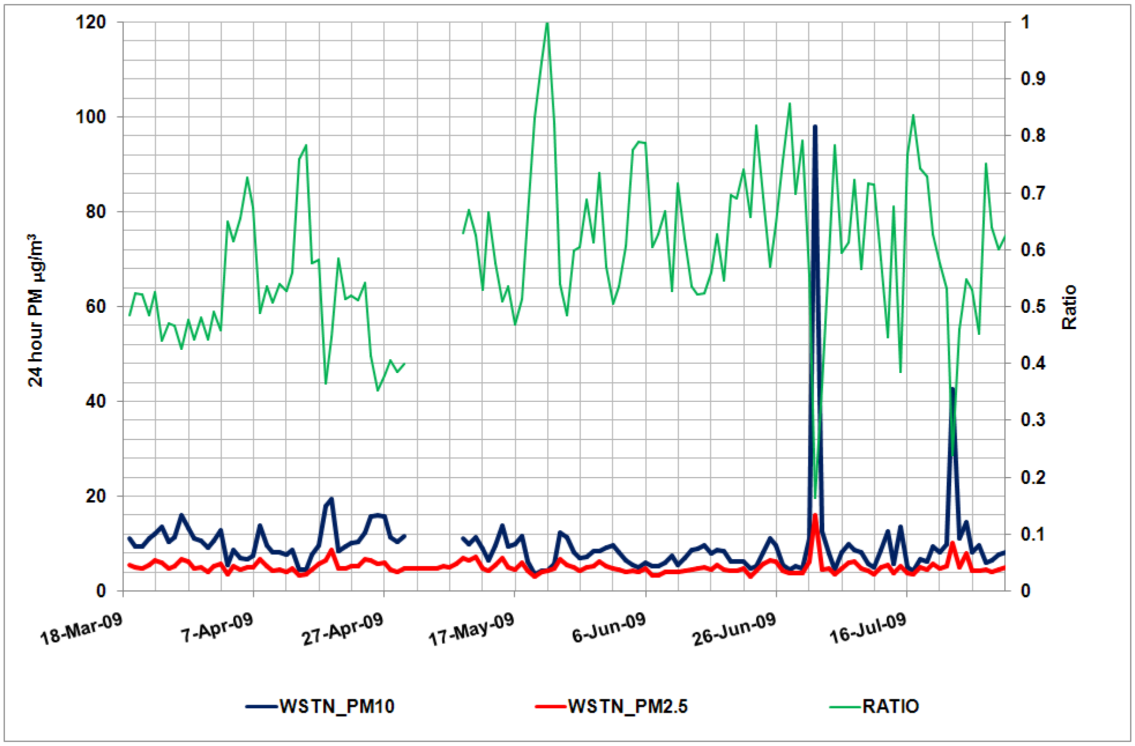
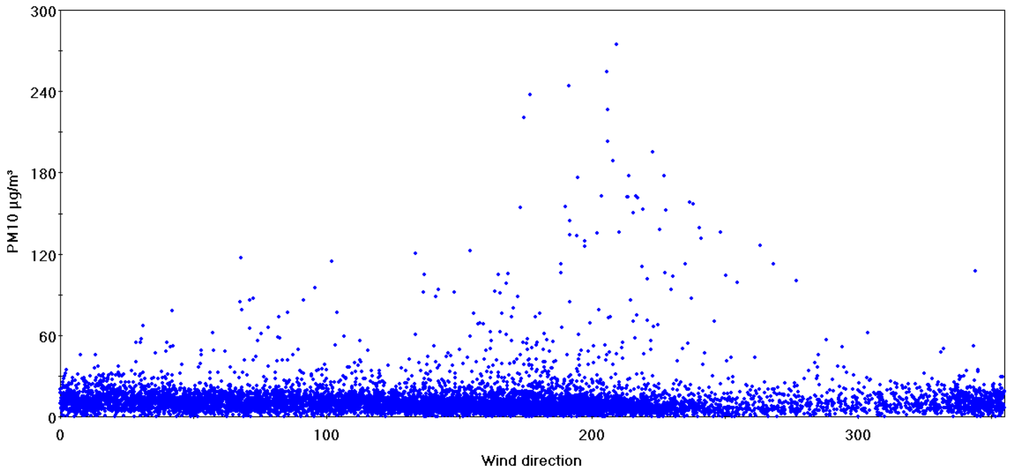
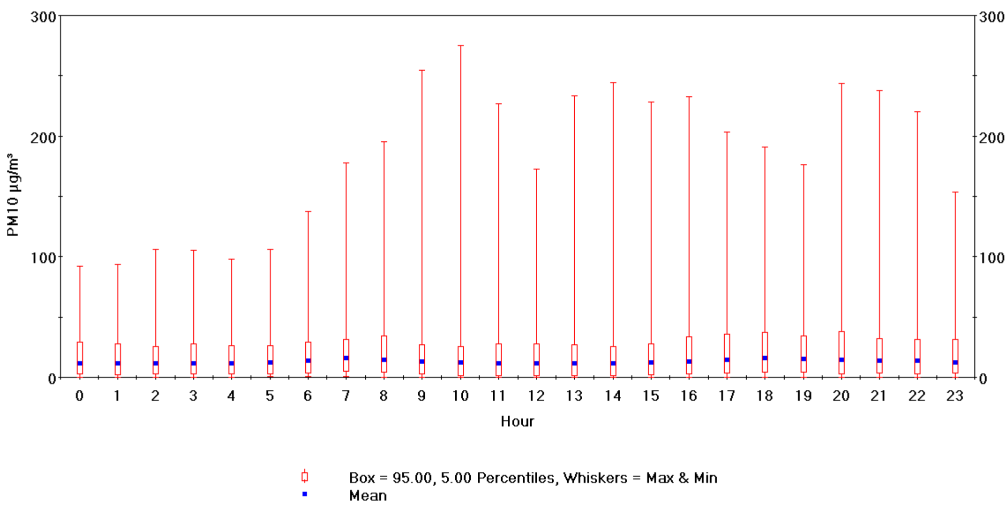


Figure 3	**Measured 24-hour PM_{10} and $PM_{2.5}$ concentrations for March 2009 to July 2009 at the WSTN monitoring site (y axis 1) and the ratio of $PM_{2.5}$ to PM_{10} (y axis 2)**		
Location: WSTN	**Period:** March to April 2009	**Data source:** Ecowise	**Units:** µg/m³
Type: Time-series	**Averaging period:** 24-hour	**Prepared by:** Andrew Wiebe	**Date:** August 2009



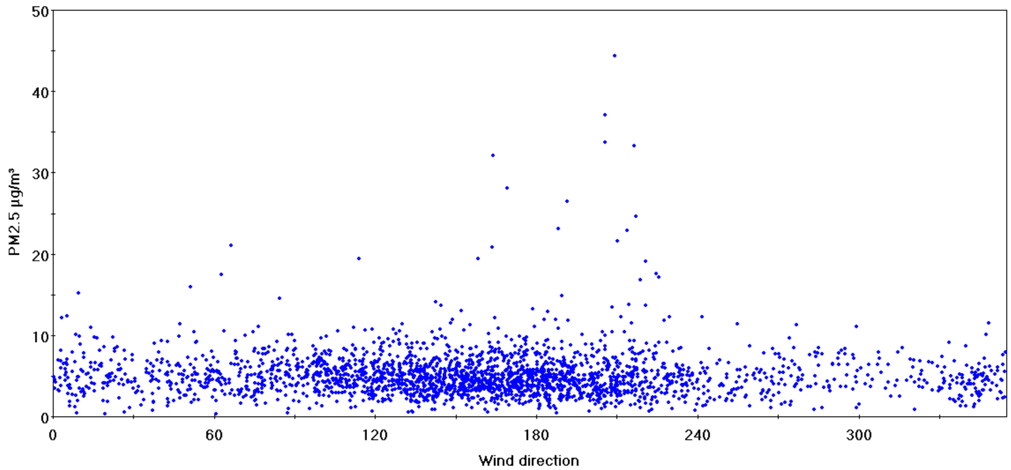
a)



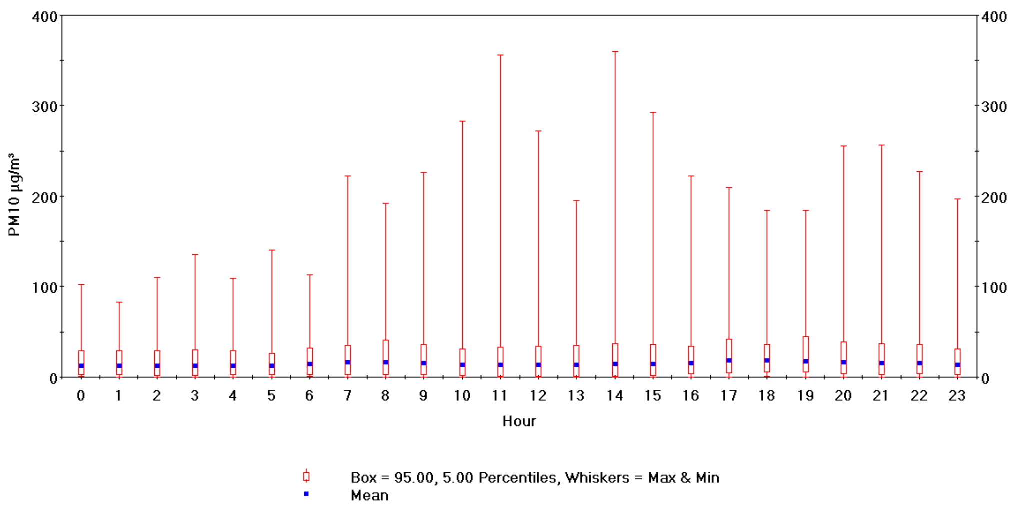
b)

Figure 4 1-hour average PM_{10} concentrations as a function of wind direction (a) and time of day (b) measured at the WSTN monitoring station

Location: WSTN monitoring station	**Period:** March 2008 to July 2009	**Data source:** Ecowise	**Units:** µg/m³
Type: a)XY scatter plot b)Box and whisker	**Averaging period:** 1-hour	**Prepared by:** Andrew Wiebe	**Date:** August 2009



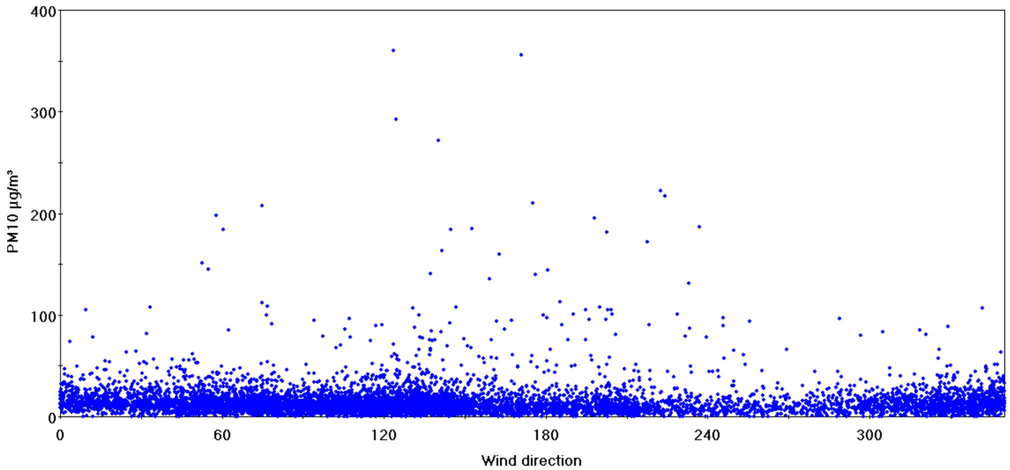
a)



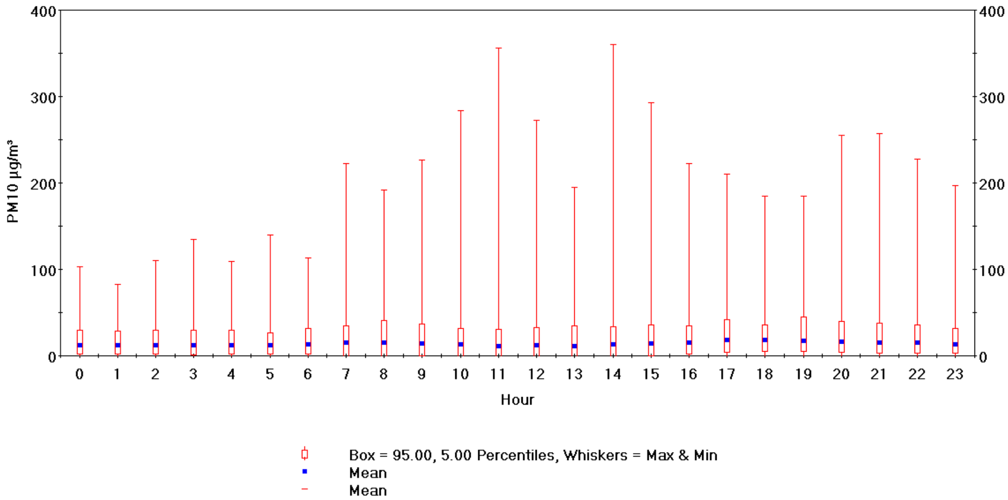
b)

Figure 5 **1-hour average $PM_{2.5}$ concentrations as a function of wind direction (a) and time of day (b) measured at the WSTN monitoring station**

Location: WSTN monitoring station	**Period:** March 2008 to July 2009	**Data source:** Ecowise	**Units:** µg/m³
Type: a)XY scatter plot b)Box and whisker	**Averaging period:** 1-hour	**Prepared by:** Andrew Wiebe	**Date:** August 2009



a)



b)

Figure 6 **1-hour average PM_{10} concentrations as a function of wind direction (a) and time of day (b) measured at the TWN monitoring station**

Location: TWN monitoring station	**Period:** March 2008 to July 2009	**Data source:** Ecowise	**Units:** µg/m³
Type: a)XY scatter plot b)Box and whisker	**Averaging period:** 1-hour	**Prepared by:** Andrew Wiebe	**Date:** August 2009

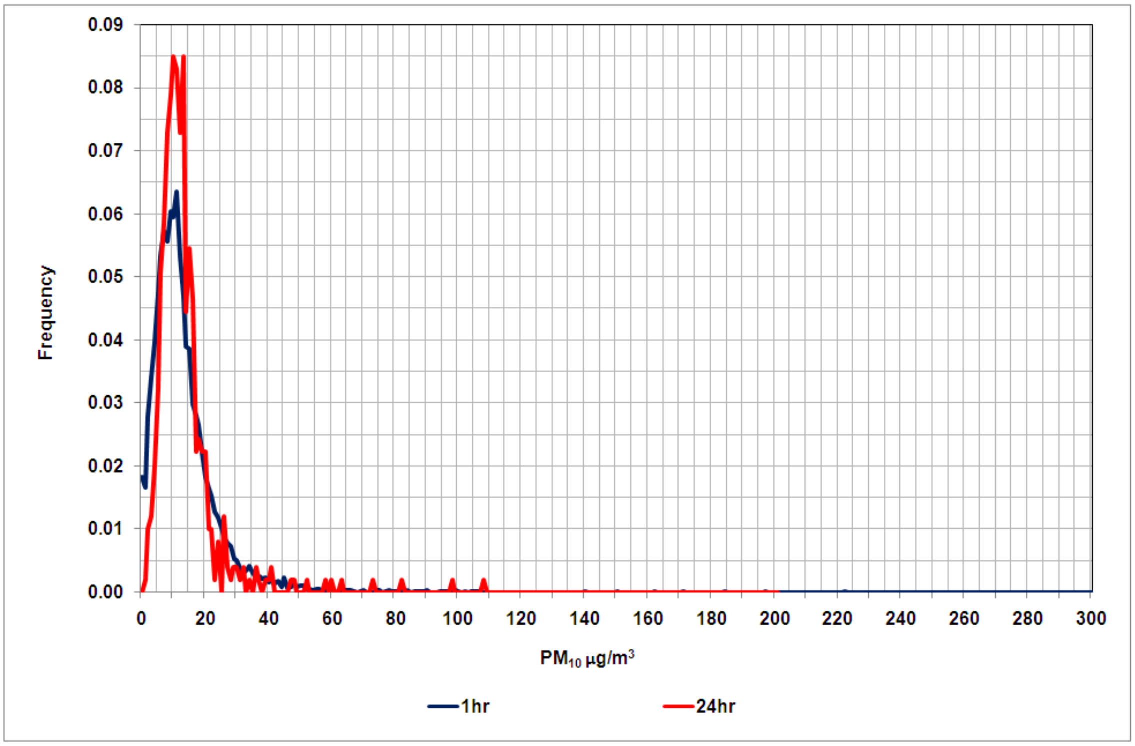


Figure 7 **Distribution of measured 1 hour average (blue line) and 24-hour average (red line) PM_{10} concentrations at the TWN monitoring station**

Location: Wandoan Town	**Period:** March 2008 to July 2009	**Data source:** Ecowise	**Units:** µg/m^3
Type: Probability density function	**Averaging period:** 1 hour (blue line) 24-hour (red line)	**Prepared by:** Andrew Wiebe	**Date:** August 2009

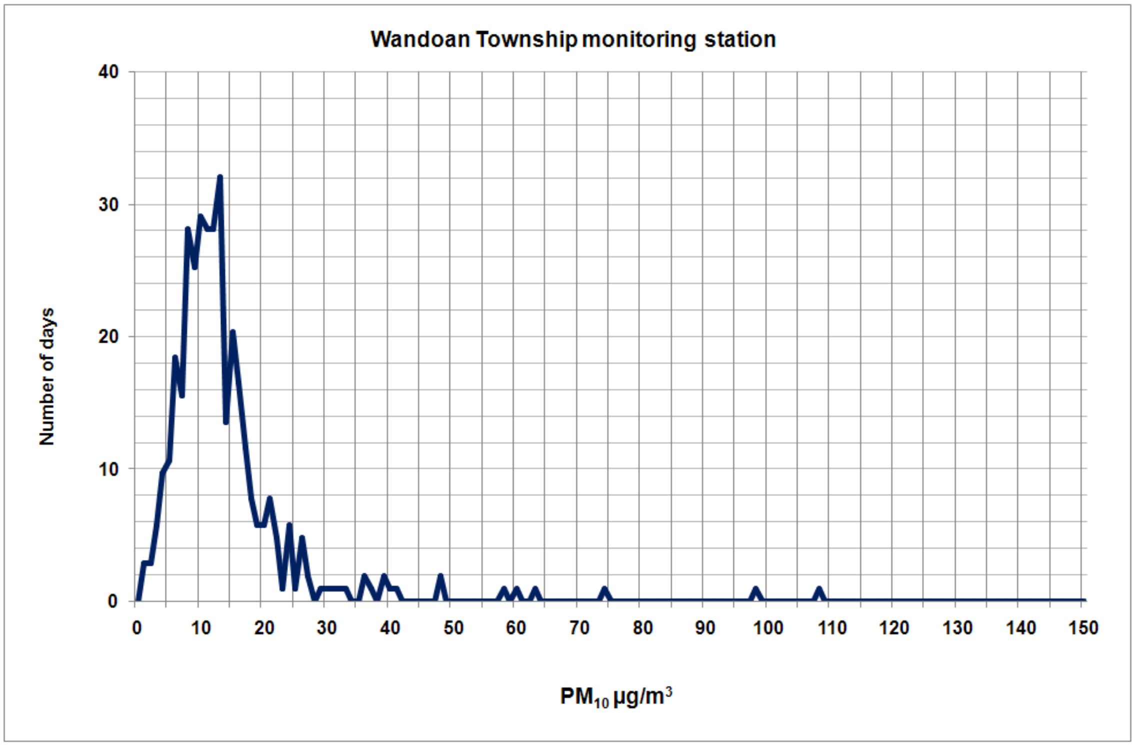


Figure 8	**Distribution of measured PM_{10} concentrations at the TWN monitoring station**		
Location: Wandoan Town	**Period:** March 2008 to July 2009	**Data source:** Ecowise	**Units:** µg/m³
Type: Probability density function	**Averaging period:** 24-hour	**Prepared by:** Andrew Wiebe	**Date:** August 2009

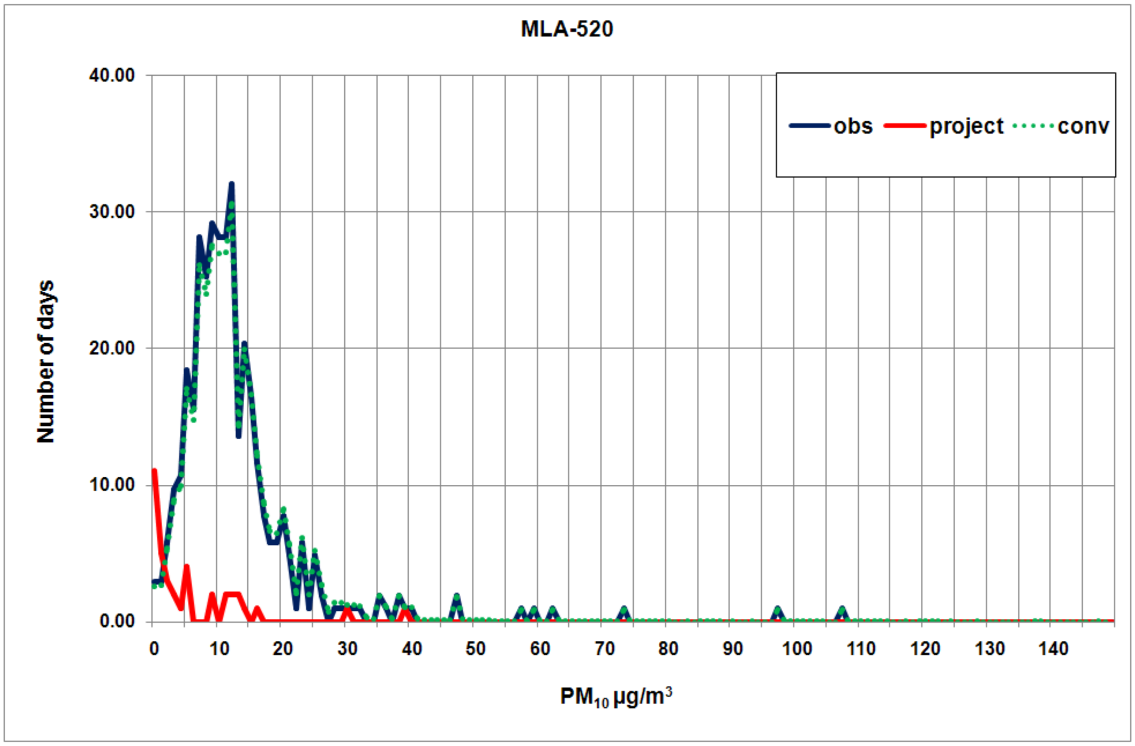


Figure 9 **Distribution of measured PM_{10} concentrations at the TWN monitoring station (blue line), contribution from the project at MLA-520 (red line) for Year 5 and the convolution of the two distributions (green dotted line)**

Location: MLA-520	**Period:** 12 months of data	**Data source:** Ecowise monitoring and CALPUFF	**Units:** µg/m³
Type: Probability density function	**Averaging period:** 24-hour	**Prepared by:** Andrew Wiebe	**Date:** August 2009

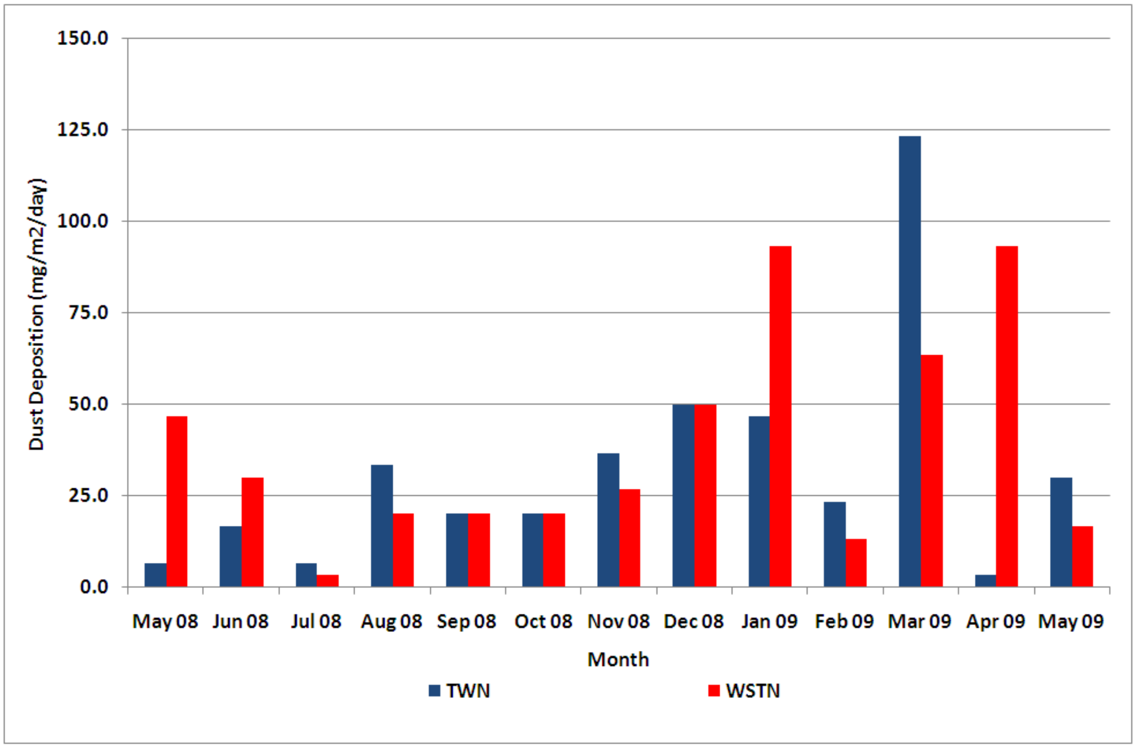


Figure 10 Measured dust deposition rate at the TWN and WSTN monitoring stations			
Location: Wandoan Town and WSTN	**Period:** May 2008 to January 2009	**Data source:** Ecowise	**Units:** µg/m³
Type: Bar chart	**Averaging period:** 30 day	**Prepared by:** Sarah Menzel	**Date:** 25 June 2009

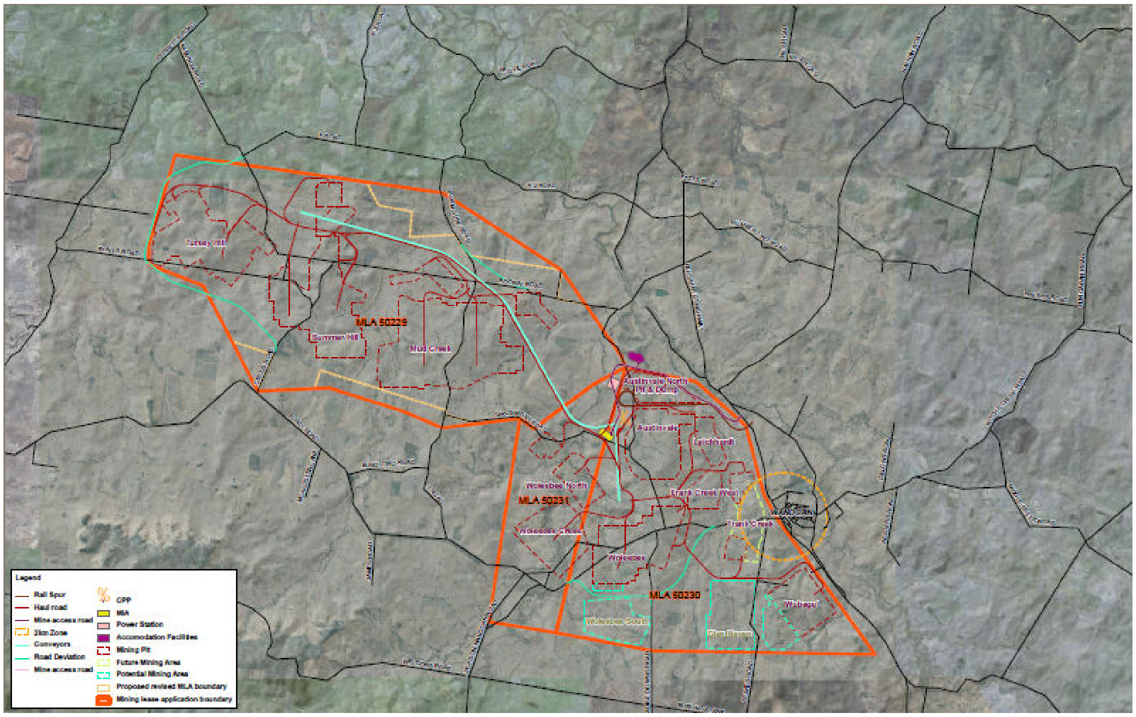


Figure 11	Alterations to the mines layout. Note the 2 kilometre high management zone buffering the Wandoan Township from Frank Creek Pit.		
Location: Wandoan	**Period:** n/a	**Data source:** Parsons Brinckerhoff	**Units:** n/a
Type: map	**Averaging period:** n/a	**Prepared by:** Andrew Wiebe	**Date:** August 2009

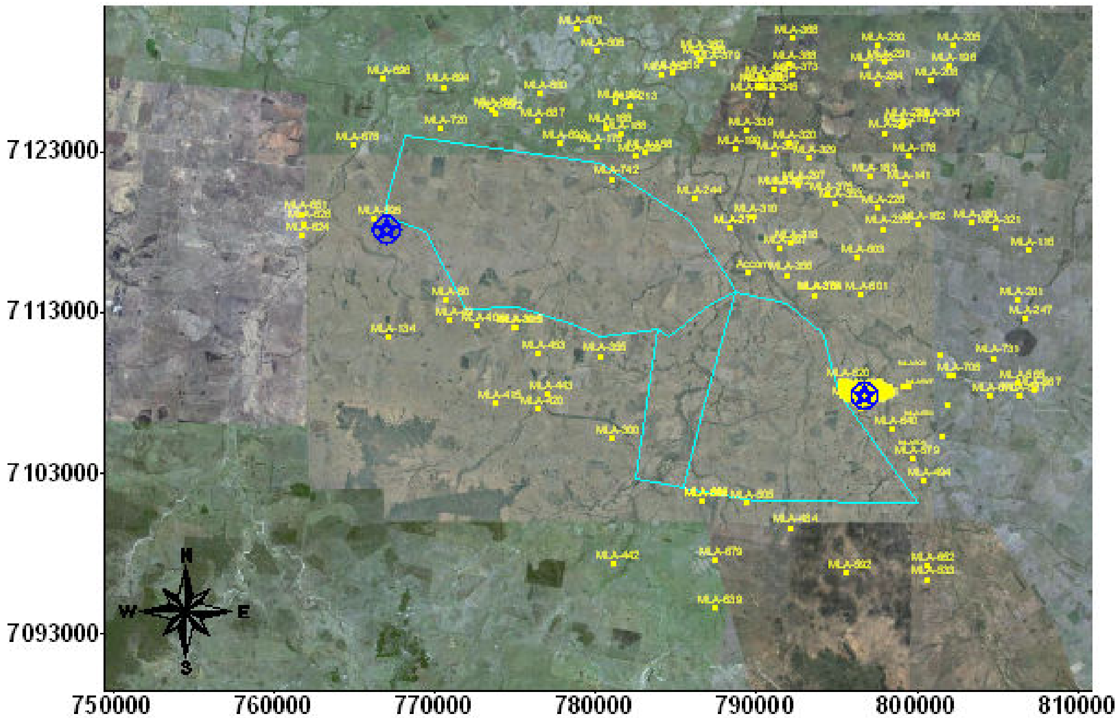


Figure 12 Indicative meteorological monitoring station locations

Location: Wandoan	**Data source:** Parsons Brinckerhoff	**Units:** GDA94
Type: Aerial photograph	**Prepared by:** Andrew Wiebe	**Date:** August 2009

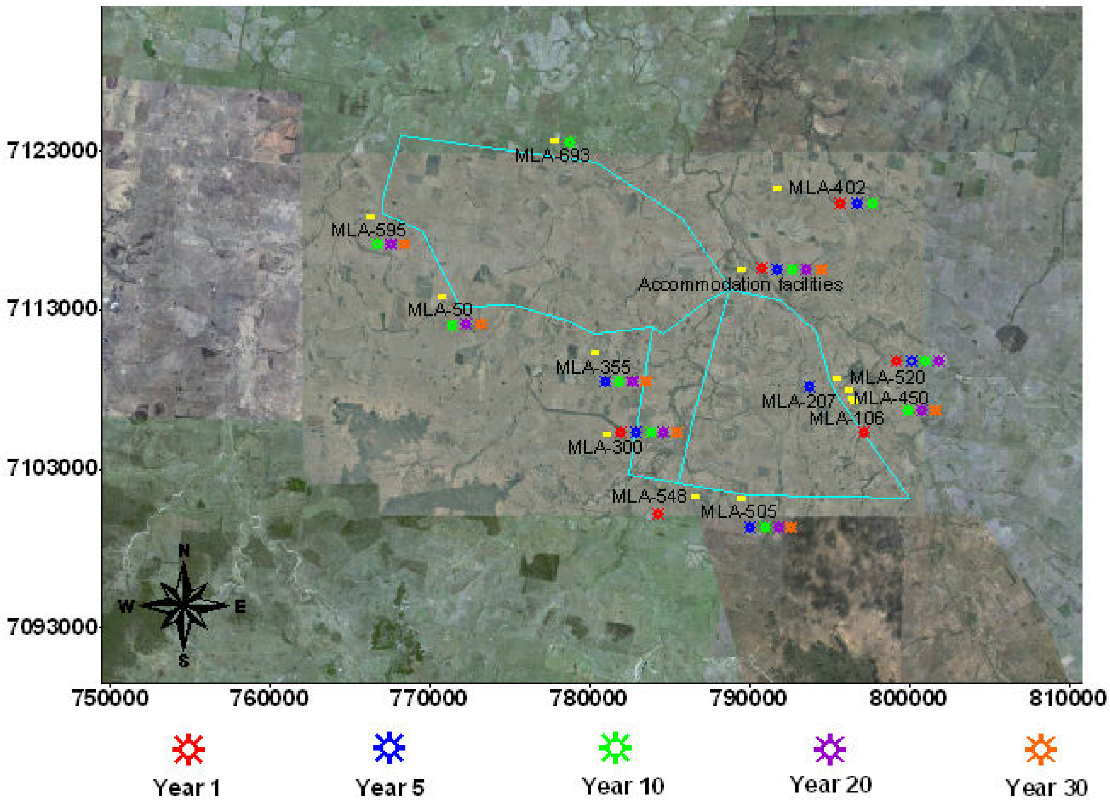


Figure 13 Representative sensitive receptors for progressive dust monitoring station locations

Location: Wandoan	**Data source:** Parsons Brinckerhoff	**Units:** GDA94
Type: Aerial photograph	**Prepared by:** Andrew Wiebe	**Date:** August 2009

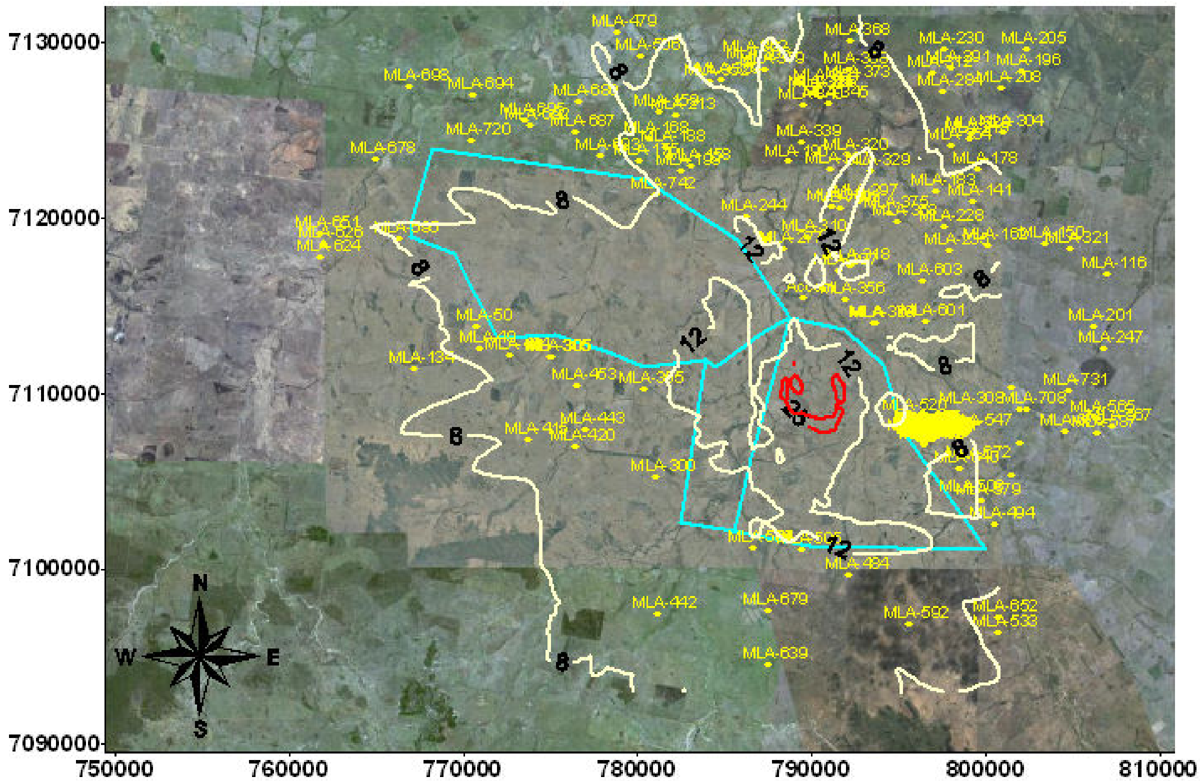


Figure 14 Year 1 maximum predicted 24-hour average $PM_{2.5}$ ground level concentrations including background concentration of 6.8 µg/m³

Location: Wandoan Joint Venture Project site	**Averaging Period:** 24-hour	**Data source:** CALPUFF	**Units:** µg/m³
Type: Contour plot	**Objective:** 25 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009

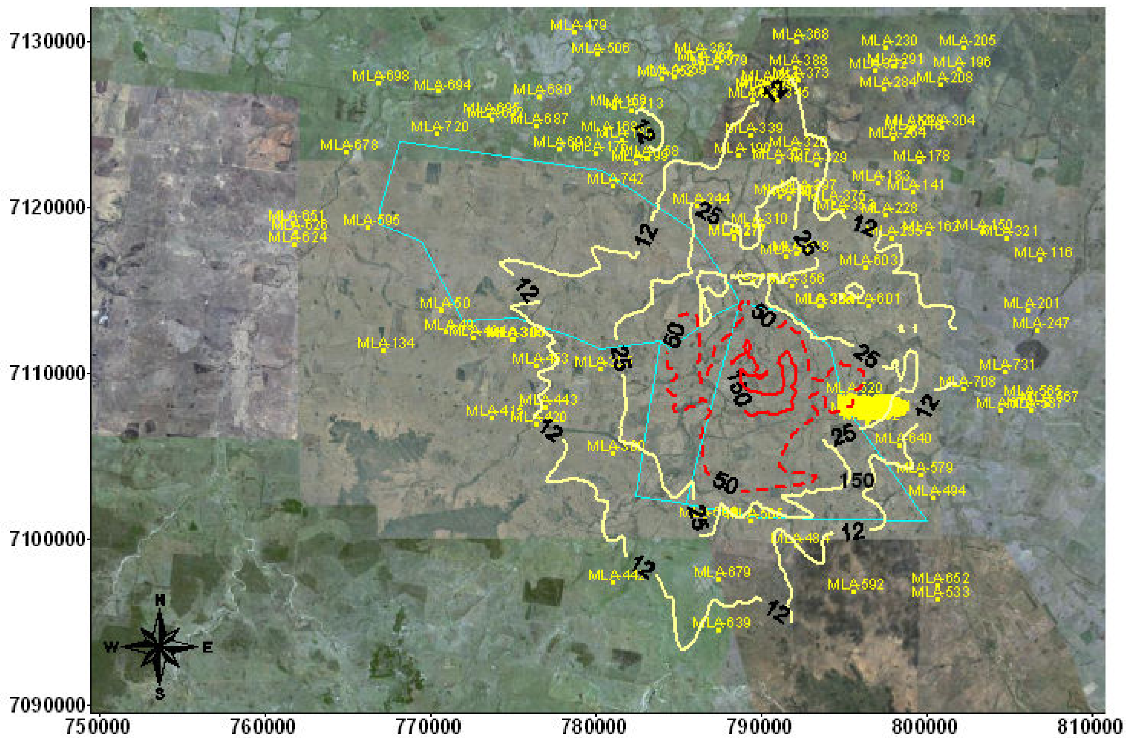


Figure 15 Year 1 maximum predicted 24-hour average PM_{10} ground level concentrations from the project in isolation

Location:	**Averaging Period:**	**Data source:**	**Units:**
Wandoan Joint Venture Project site	24-hour	CALPUFF	µg/m³
Type: Contour plot	**Project Goal:** 150 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009

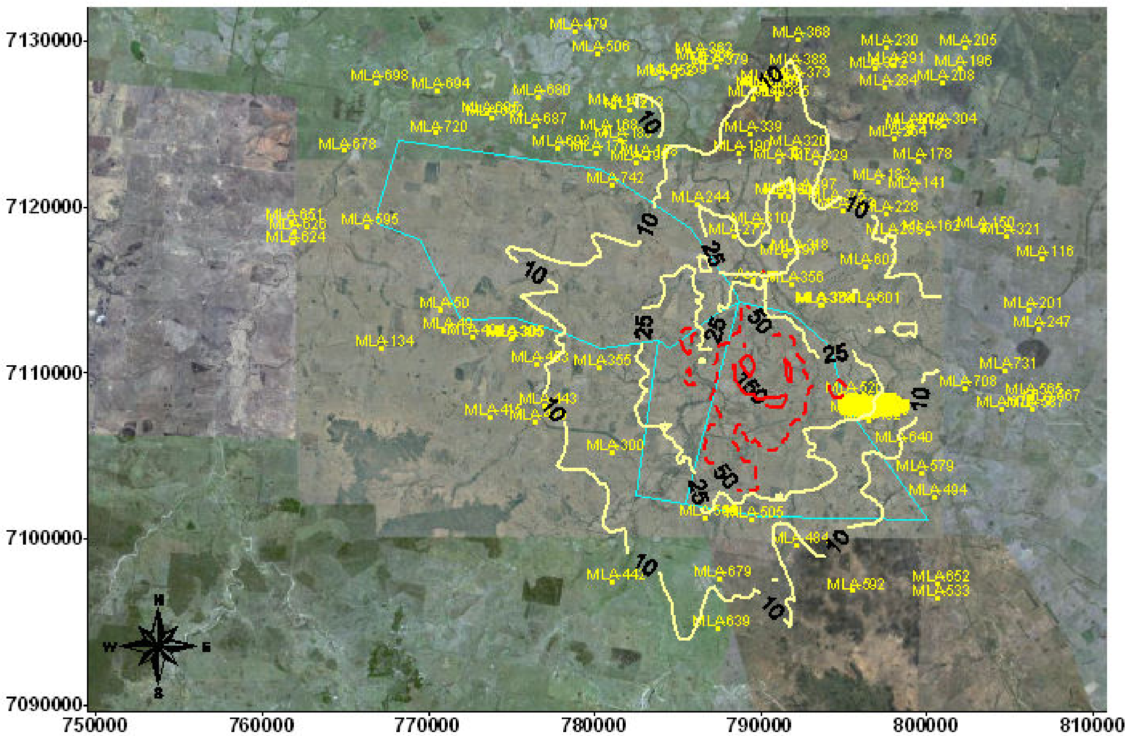


Figure 16 Year 1 maximum predicted 24-hour average PM_{10} ground level concentrations from the project in isolation with high management strategies employed

Location: Wandoan Joint Venture Project site	**Averaging Period:** 24-hour	**Data source:** CALPUFF	**Units:** µg/m³
Type: Contour plot	**Project Goal:** 150 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009

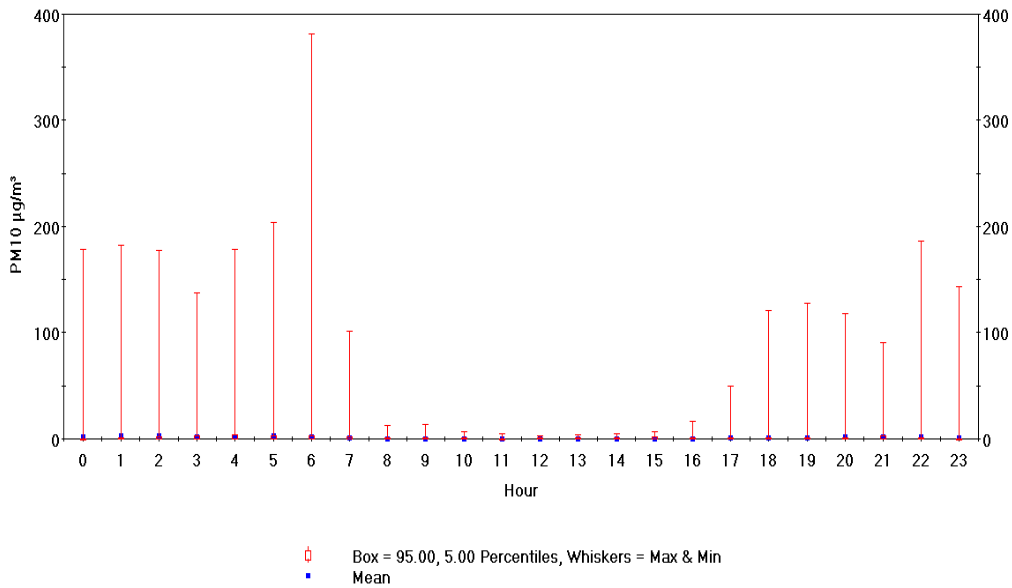


Figure 17 Year 1 Box and whisker plot of the predicted 1-hour average PM_{10} ground level concentrations for the project in isolation at MLA-520

Location: Wandoan Joint Venture Project site	**Averaging Period:** 1-hour	**Data source:** CALPUFF	**Units:** µg/m³
Type: Box and whisker plot	**EPP(Air) objective:** n/a	**Prepared by:** Andrew Wiebe	**Date:** August 2009

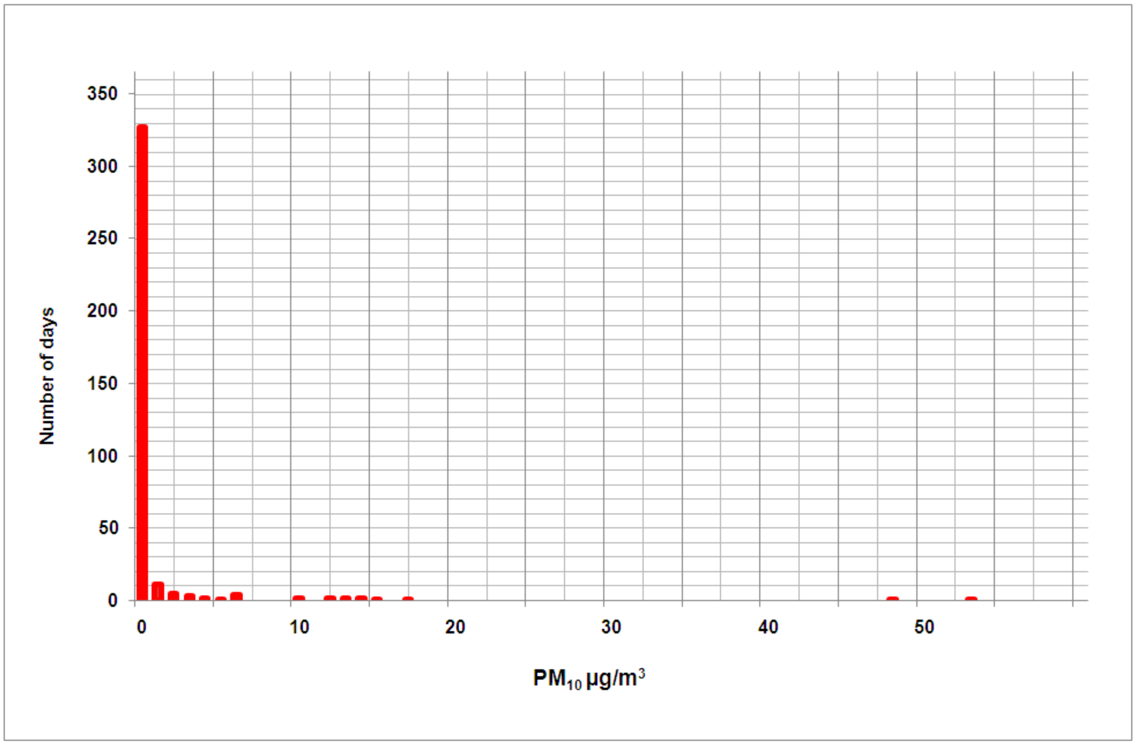
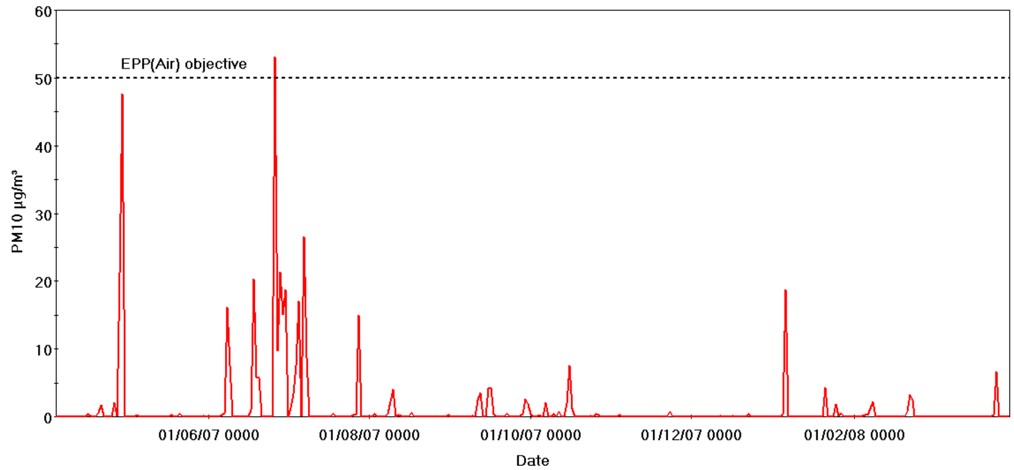
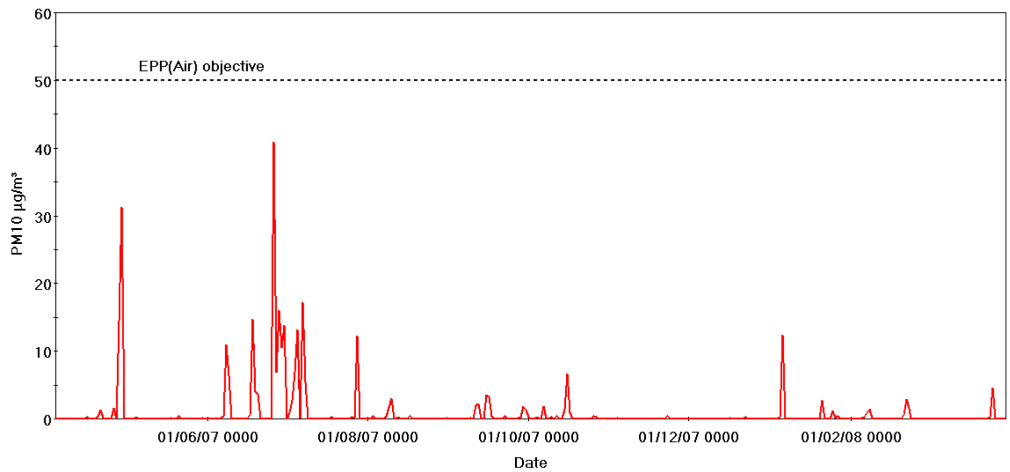


Figure 18 Year 1 distribution of the predicted 24-hour average PM_{10} ground level concentrations for the project in isolation at MLA-520

Location: Wandoan Joint Venture Project site	**Averaging Period:** 24-hour	**Data source:** CALPUFF	**Units:** µg/m^3
Type: Bar chart	**EPP(Air) objective:** 50	**Prepared by:** Andrew Wiebe	**Date:** August 2009



a)



b)

Figure 19 Year 1 maximum predicted 24-hour average PM_{10} ground level concentrations from the project in isolation at MLA-520 without chemical suppressants on haul roads (a) and with chemical suppressants on haul roads (b)

Location: Wandoan Joint Venture Project site	**Averaging Period:** 24-hour	**Data source:** CALPUFF	**Units:** µg/m³
Type: Timeseries	**EPP(Air) objective:** 50 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** August 2009

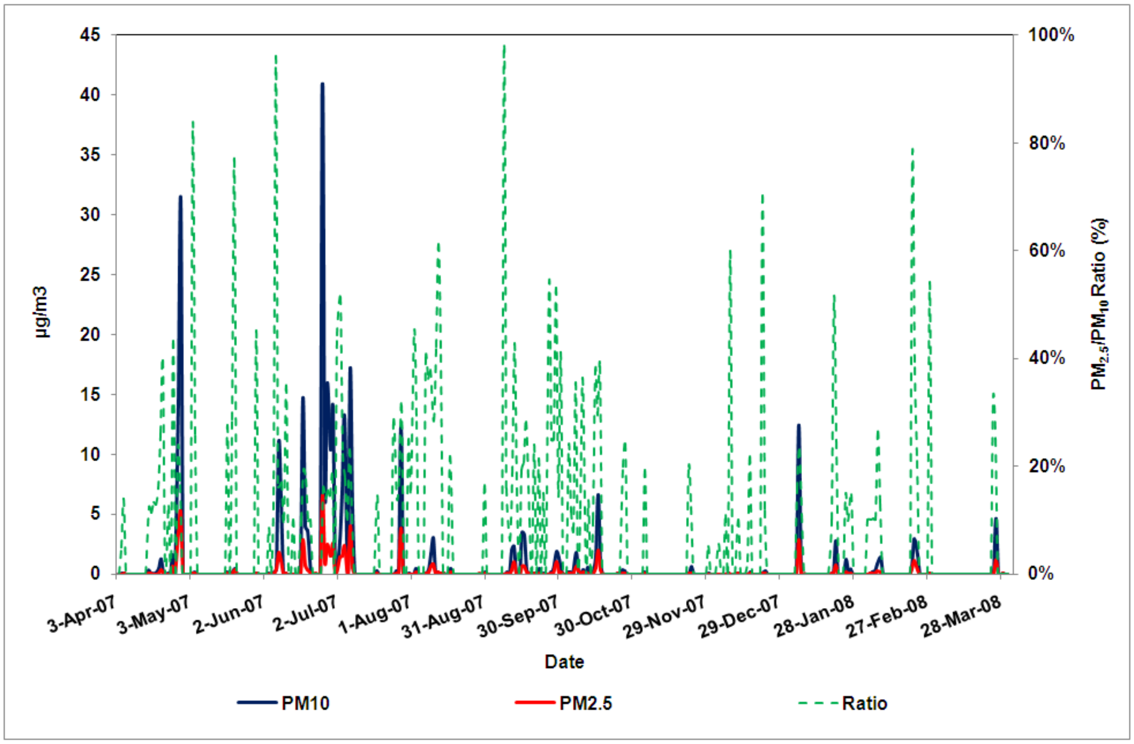


Figure 20	**Year 1 maximum predicted 24-hour average PM_{10}, $PM_{2.5}$ and $PM_{2.5}/PM_{10}$ ratios of modelled ground level concentrations from the project in isolation at MLA-520**		
Location: Wandoan Joint Venture Project site	**Averaging Period:** 24-hour	**Data source:** CALPUFF	**Units:** µg/m^3
Type: Timeseries	**EPP(Air) objective:** 50 µg/m^3	**Prepared by:** Andrew Wiebe	**Date:** August 2009

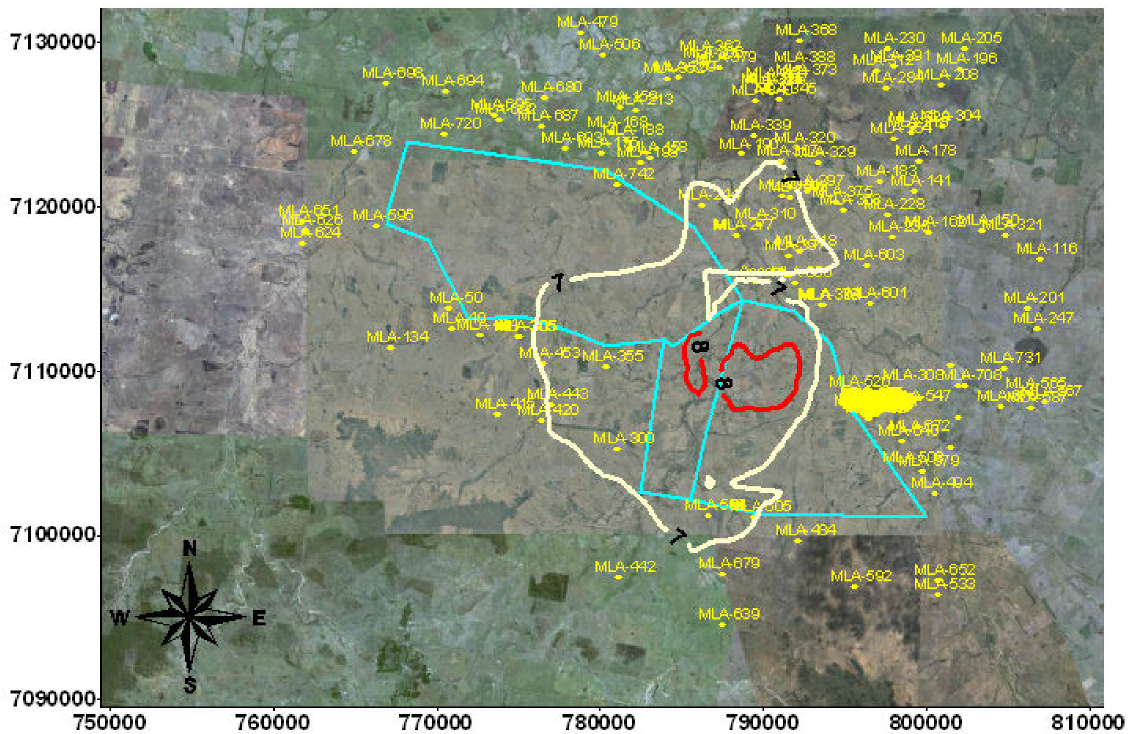


Figure 21 Year 1 predicted annual average $PM_{2.5}$ ground level concentrations including background concentration of 6.8 µg/m³

Location: Wandoan Joint Venture Project site	**Averaging Period:** Annual	**Data source:** CALPUFF	**Units:** µg/m³
Type: Contour plot	**Objective:** 8 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009

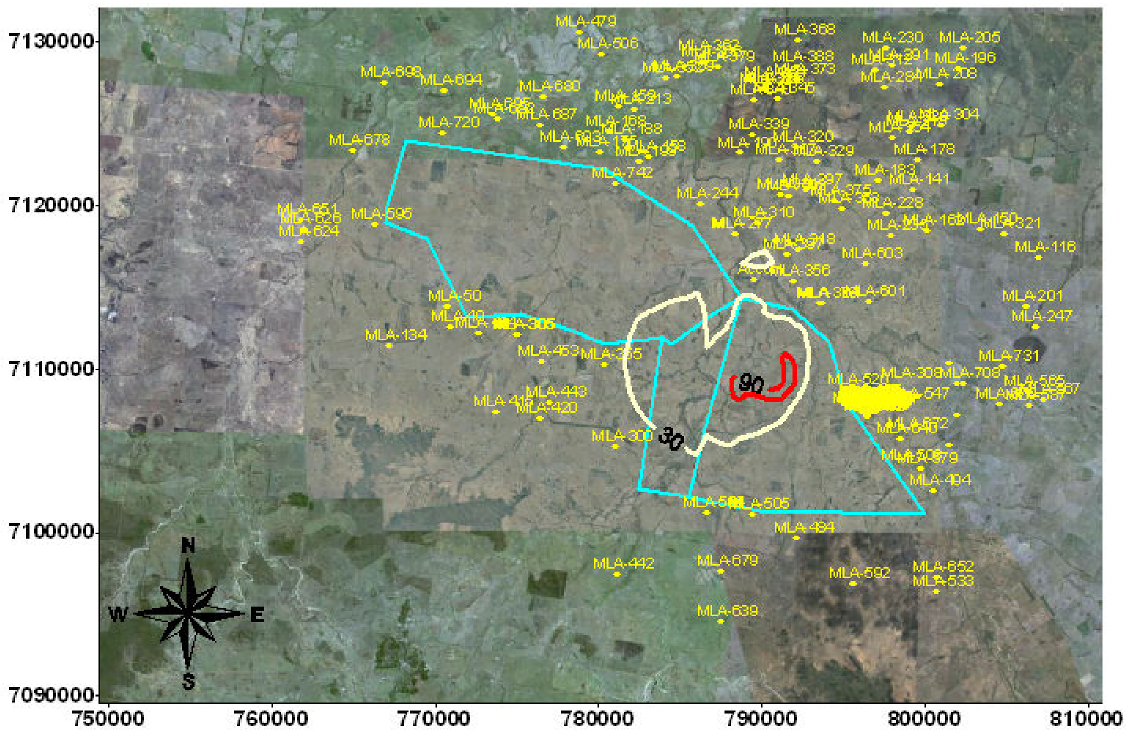


Figure 22 **Year 1 predicted annual average TSP ground level concentrations including background concentration of 26 µg/m³**

Location: Wandoan Joint Venture Project site	**Averaging Period:** Annual	**Data source:** CALPUFF	**Units:** µg/m³
Type: Contour plot	**Objective:** 90 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009

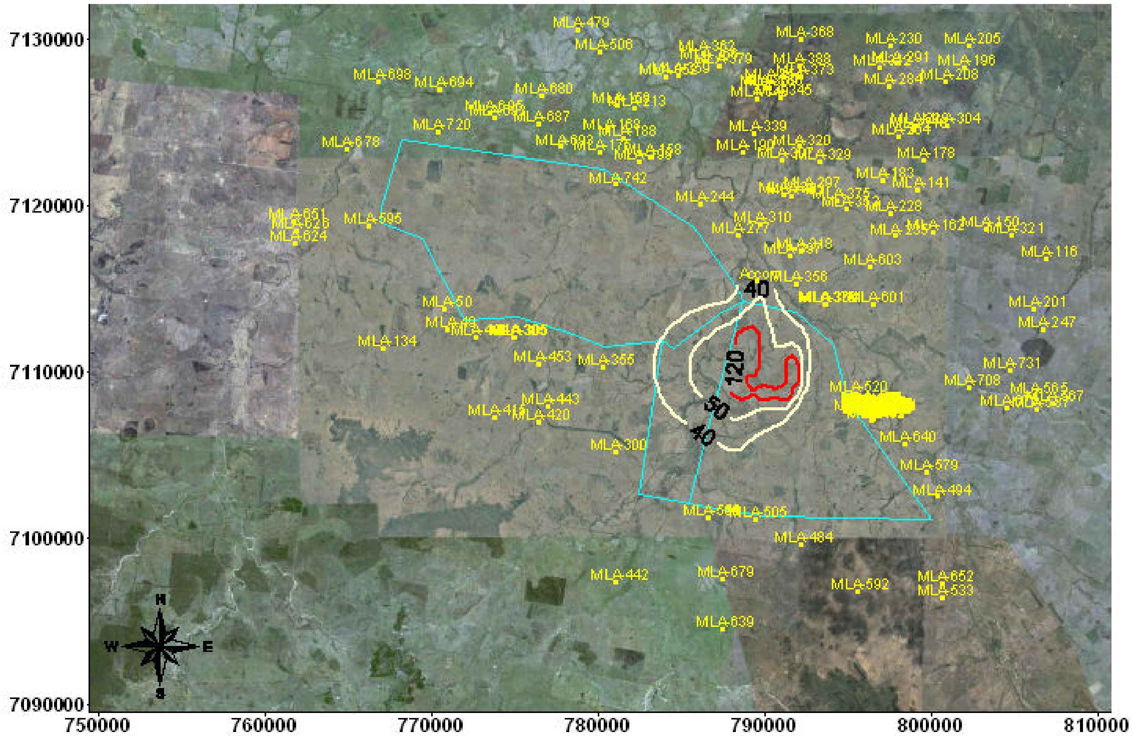


Figure 23 **Year 1 predicted daily dust deposition rate including a background deposition rate of 30 mg/m²/day**

Location: Wandoan Joint Venture Project site	**Averaging Period:** Annual	**Data source:** CALPUFF	**Units:** mg/m²/day
Type: Contour plot	**Project Goal:** 120 mg/m²/day	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009

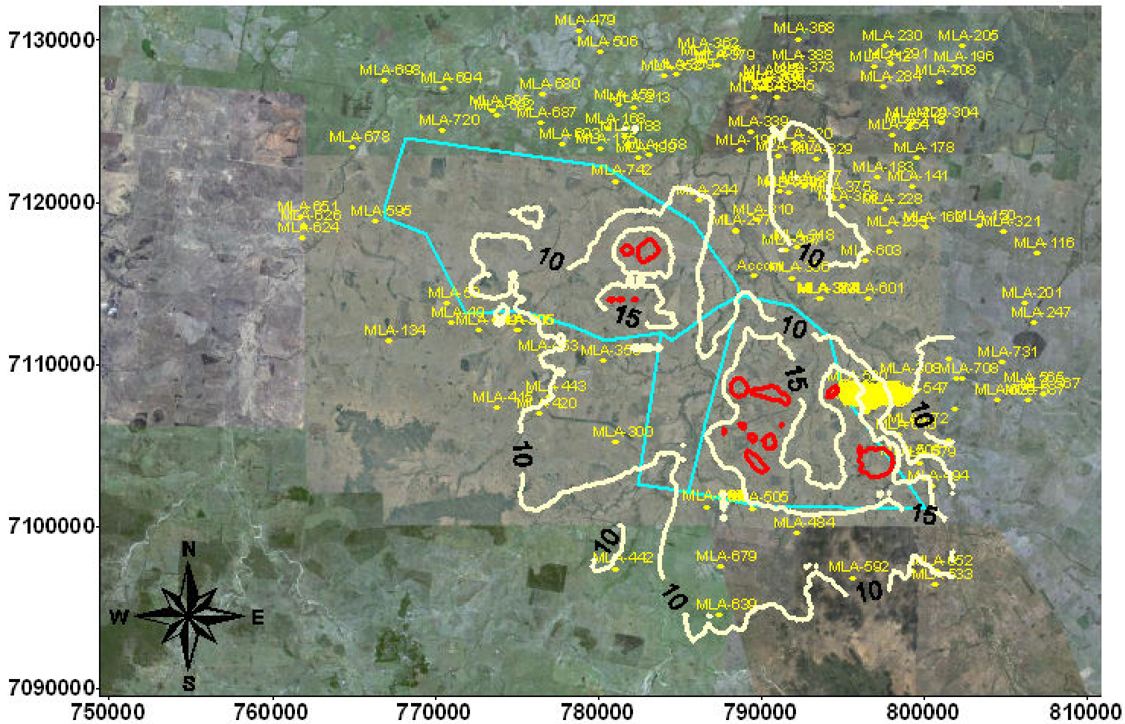


Figure 24 Year 5 maximum predicted 24-hour average $PM_{2.5}$ ground level concentrations including a background concentration of 6.8 µg/m^3.

Location: Wandoan Joint Venture Project site	**Averaging Period:** 24-hour	**Data source:** CALPUFF	**Units:** µg/m^3
Type: Contour plot	**Objective:** 25 µg/m^3	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009

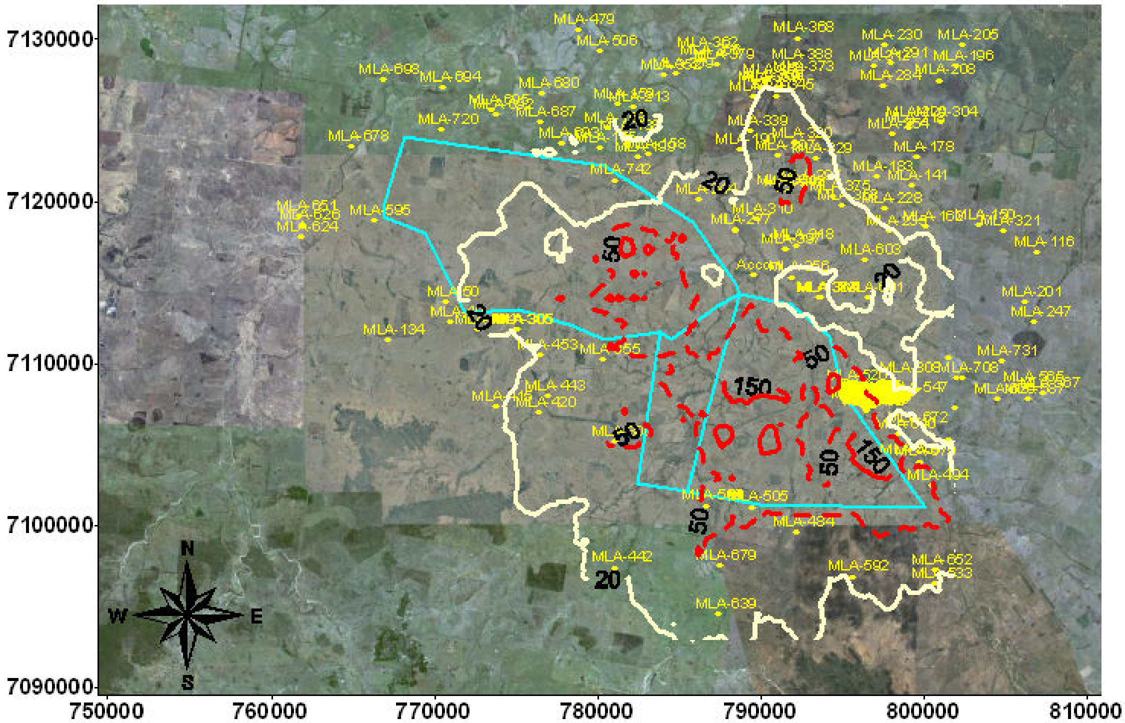
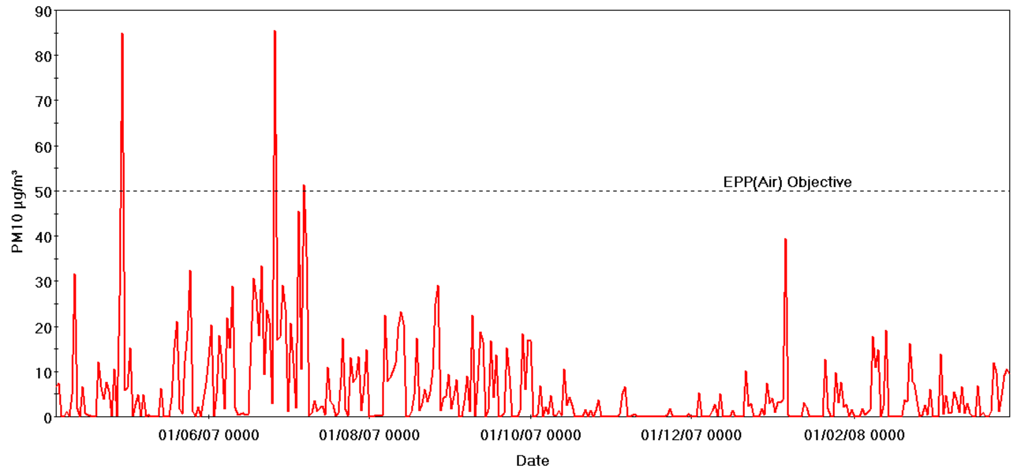
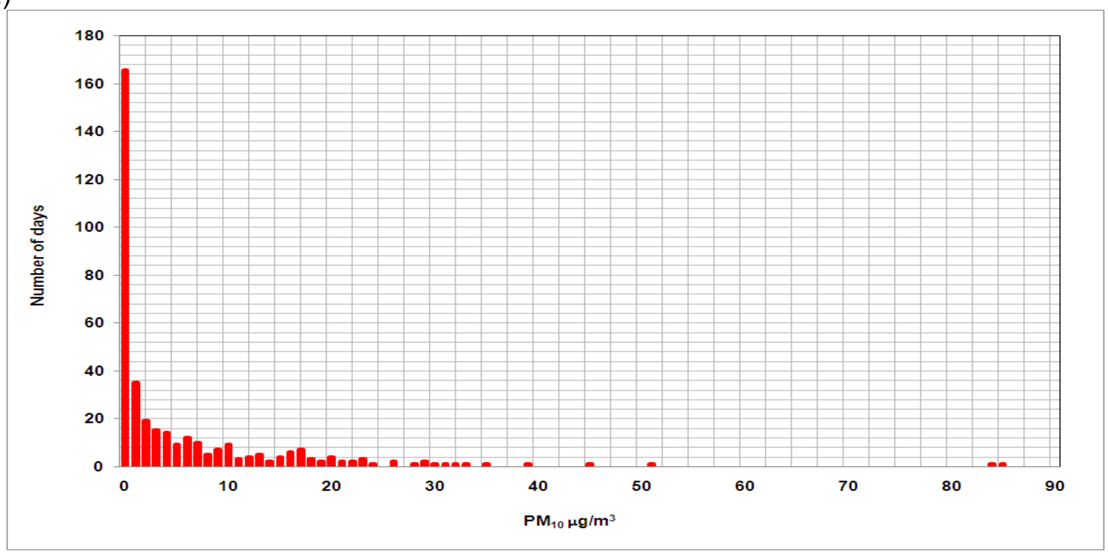


Figure 25 **Year 5 maximum predicted 24-hour average PM_{10} ground level concentrations for the project in isolation**

Location: Wandoan Joint Venture Project site	**Averaging Period:** 24-hour	**Data source:** CALPUFF	**Units:** µg/m³
Type: Contour plot	**Project Goal:** 150 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009



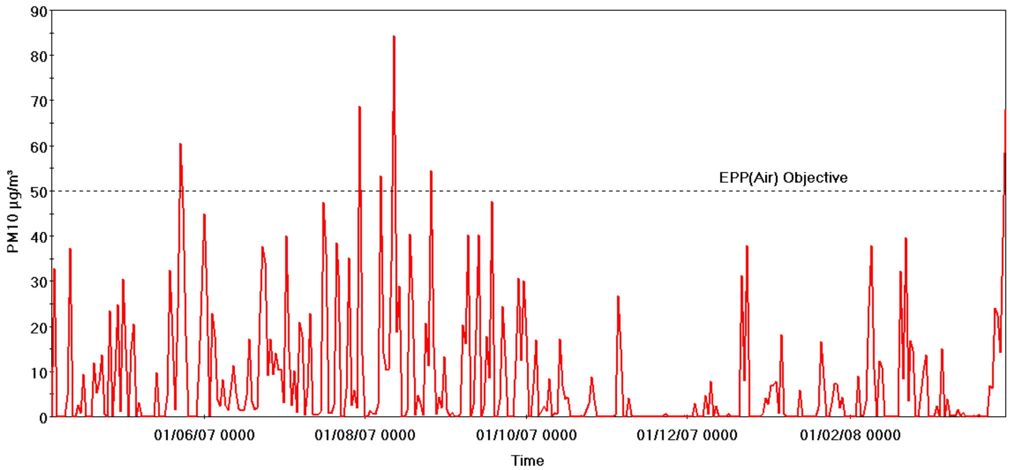
a)



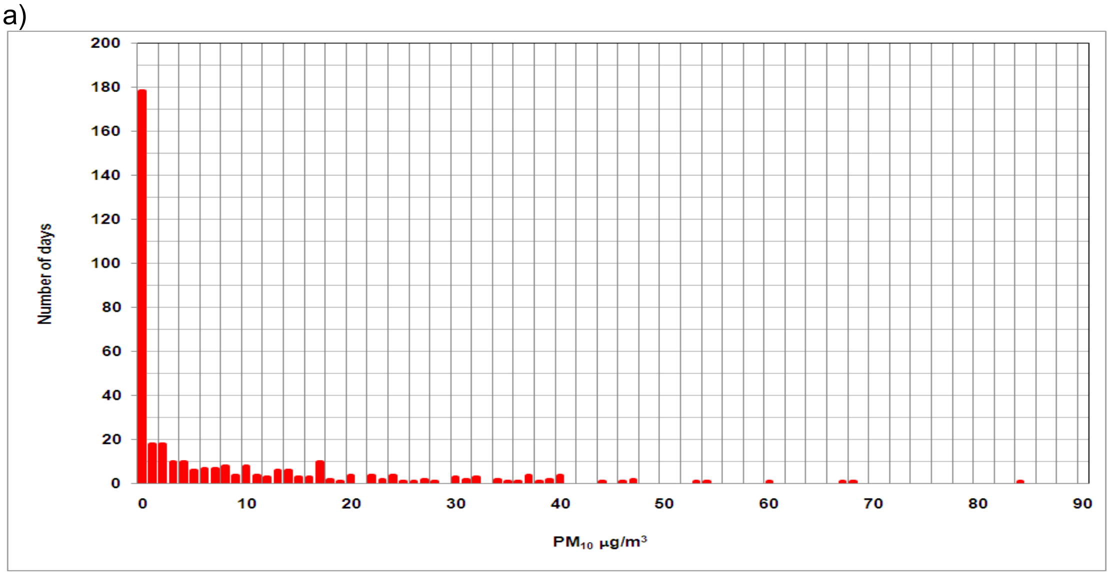
b)

Figure 26 Year 5 maximum predicted 24-hour average PM_{10} ground level concentrations at MLA-520 for the project in isolation, a) 24 hour average time-series and b) frequency distribution.

Location: MLA-520	**Averaging Period:** 24-hour	**Data source:** CALPUFF	**Units:** µg/m^3
Type: a) Time-series b) Bar chart	**EPP(Air) objective:** 50 µg/m^3	**Prepared by:** Andrew Wiebe	**Date:** August 2009



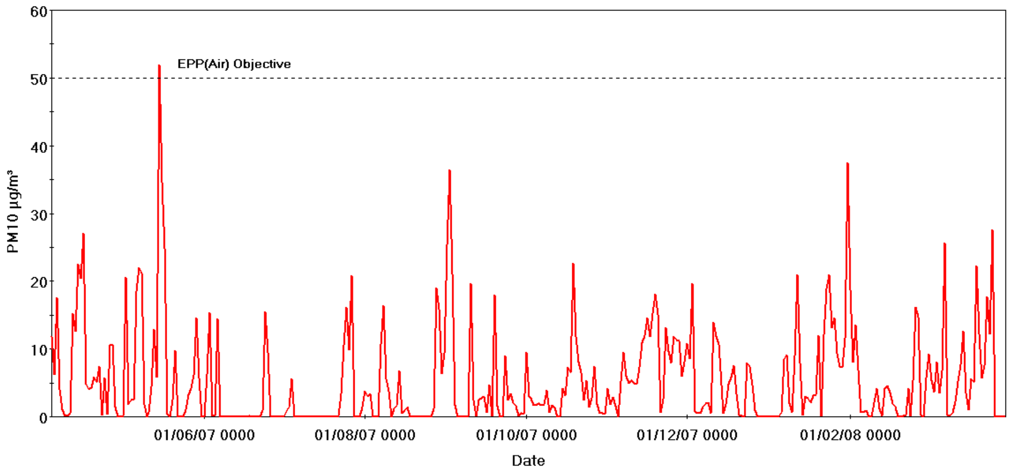
a)



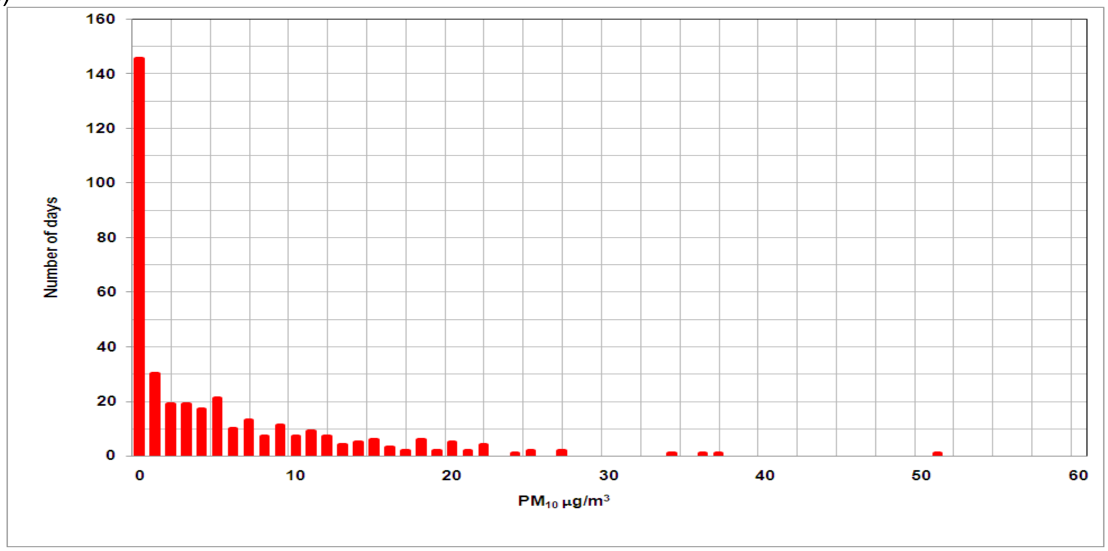
b)

Figure 27 Year 5 maximum predicted 24-hour average PM_{10} ground level concentrations at MLA-207 for the project in isolation, a) 24 hour average time-series and b) frequency distribution.

Location:	**Averaging Period:**	**Data source:**	**Units:**
MLA-207	24-hour	CALPUFF	µg/m³
Type: a) Timeseries b) Bar chart	**EPP(Air) objective:** 50 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** August 2009



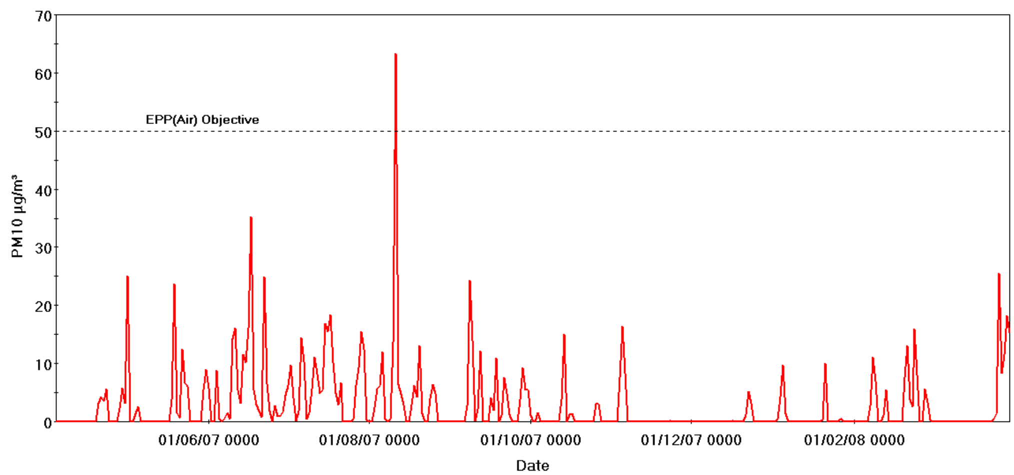
a)



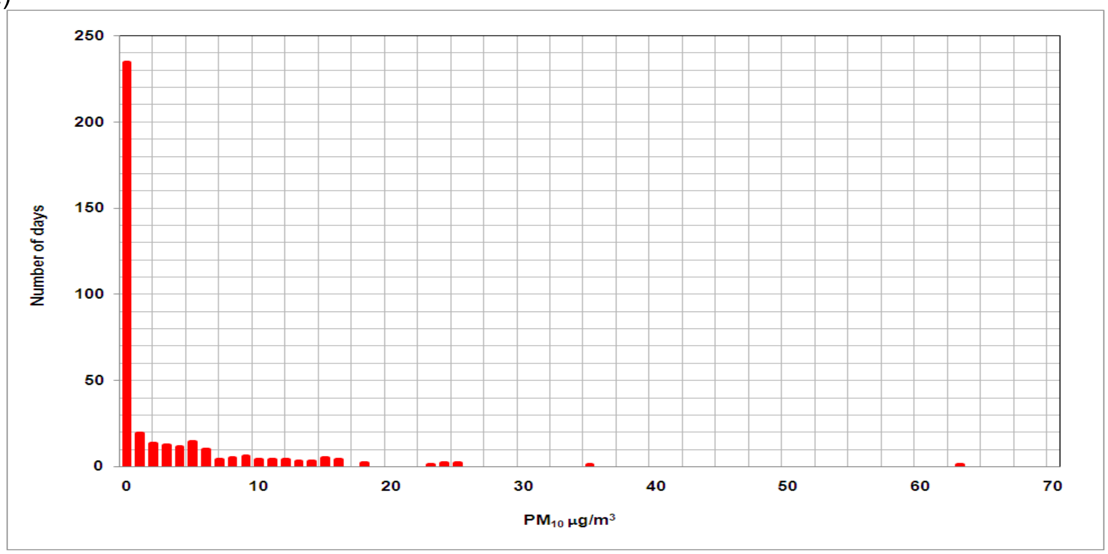
b)

Figure 28 Year 5 maximum predicted 24-hour average PM_{10} ground level concentrations at MLA-300 for the project in isolation, a) 24 hour average time-series and b) frequency distribution.

Location: MLA-300	**Averaging Period:** 24-hour	**Data source:** CALPUFF	**Units:** µg/m³
Type: a) Timeseries b) Bar chart	**EPP(Air) objective:** 50 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** August 2009



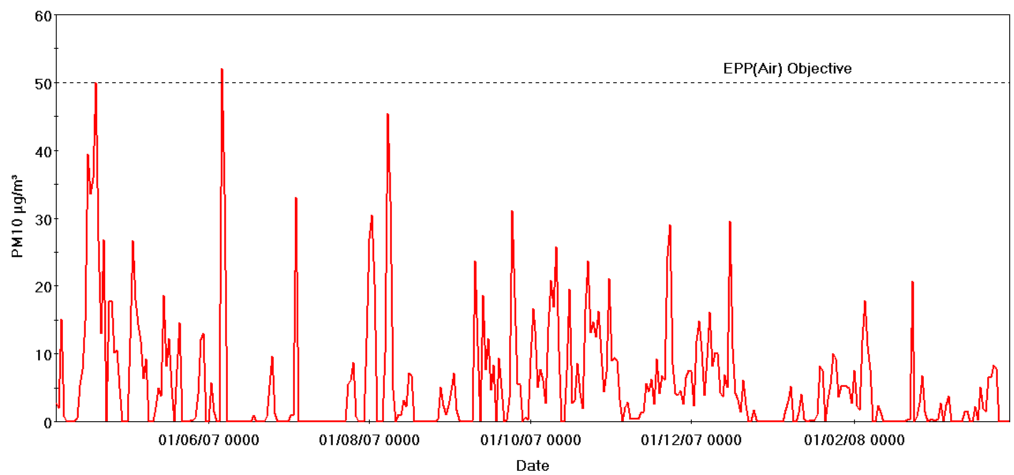
a)



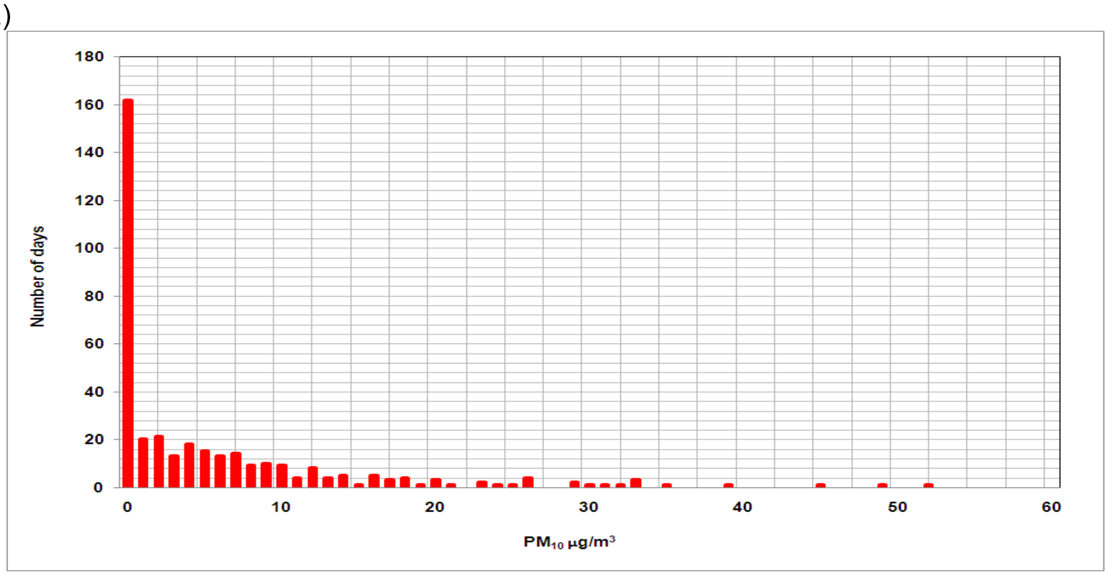
b)

Figure 29 Year 5 maximum predicted 24-hour average PM_{10} ground level concentrations at MLA-402 for the project in isolation, a) 24 hour average time-series and b) frequency distribution.

Location: MLA-402	**Averaging Period:** 24-hour	**Data source:** CALPUFF	**Units:** µg/m³
Type: a) Timeseries b) Bar chart	**EPP(Air) objective:** 50 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** August 2009



a)



b)

Figure 30 Year 5 maximum predicted 24-hour average PM_{10} ground level concentrations at MLA-505 for the project in isolation, a) 24 hour average time-series and b) frequency distribution.

Location: MLA-505	**Averaging Period:** 24-hour	**Data source:** CALPUFF	**Units:** µg/m³
Type: a) Timeseries b) Bar chart	**EPP(Air) objective:** 50 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** August 2009

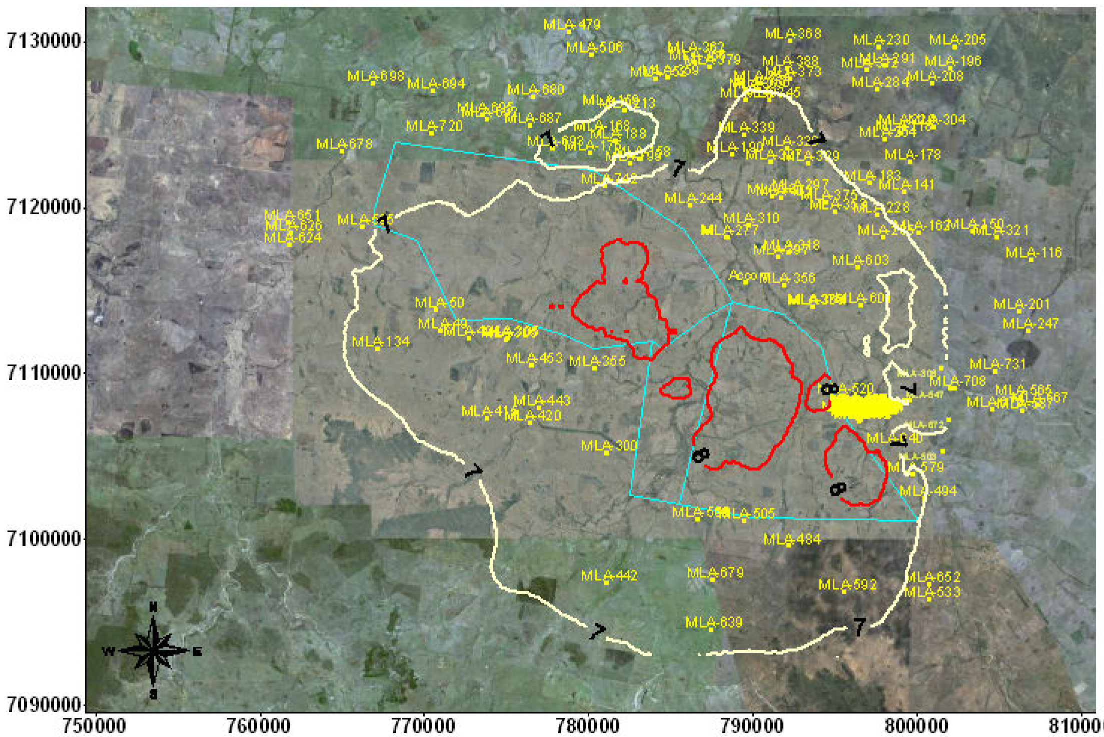


Figure 31	**Year 5 predicted annual average $PM_{2.5}$ ground level concentrations including background concentration of 6.8 µg/m³**		
Location: Wandoan Joint Venture Project site	**Averaging Period:** Annual	**Data source:** CALPUFF	**Units:** µg/m³
Type: Contour plot	**Objective:** 8 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009

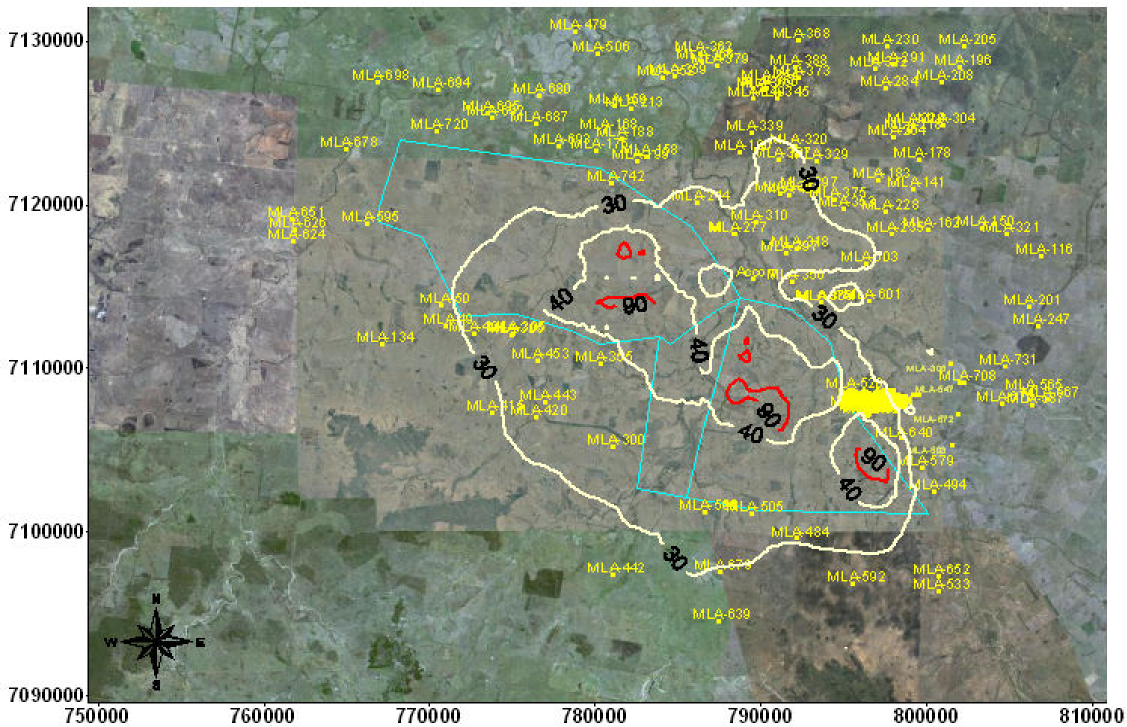


Figure 32 Year 5 predicted annual average TSP ground level concentrations including background concentration of 26 µg/m³			
Location: Wandoan Joint Venture Project site	**Averaging Period:** Annual	**Data source:** CALPUFF	**Units:** µg/m³
Type: Contour plot	**Objective:** 90 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009

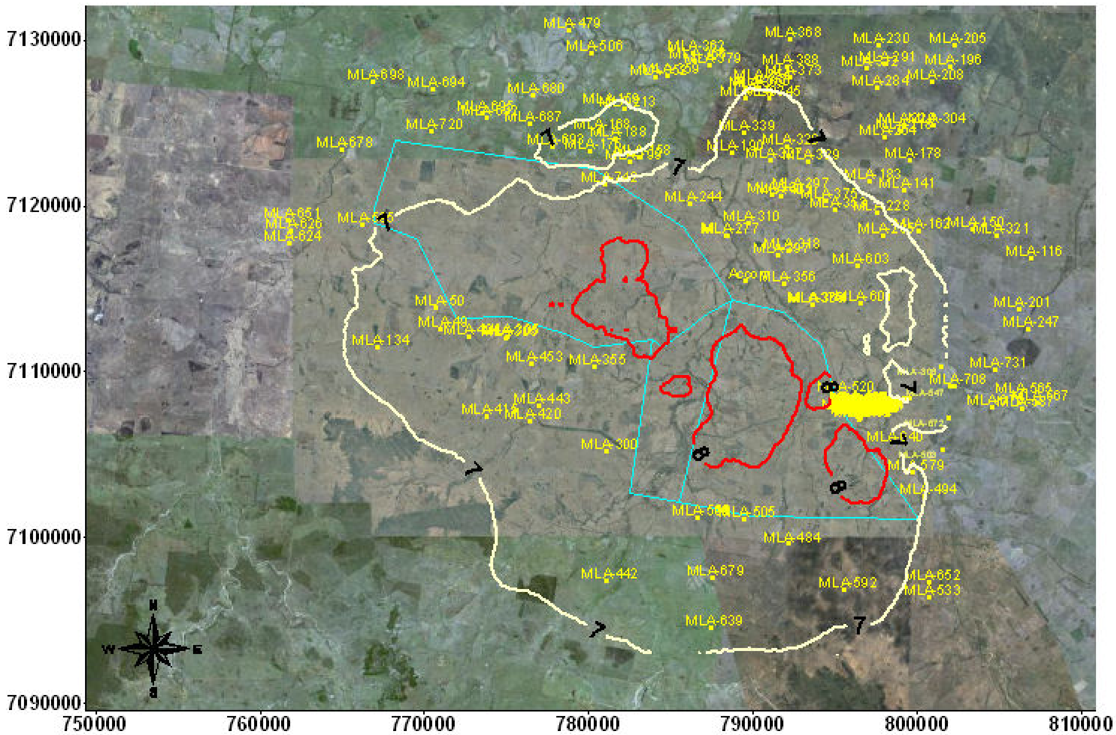


Figure 33 Year 5 predicted annual average $PM_{2.5}$ ground level concentrations including background concentration of 6.8 µg/m³

Location: Wandoan Joint Venture Project site	**Averaging Period:** Annual	**Data source:** CALPUFF	**Units:** µg/m³
Type: Contour plot	**Objective:** 8 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009

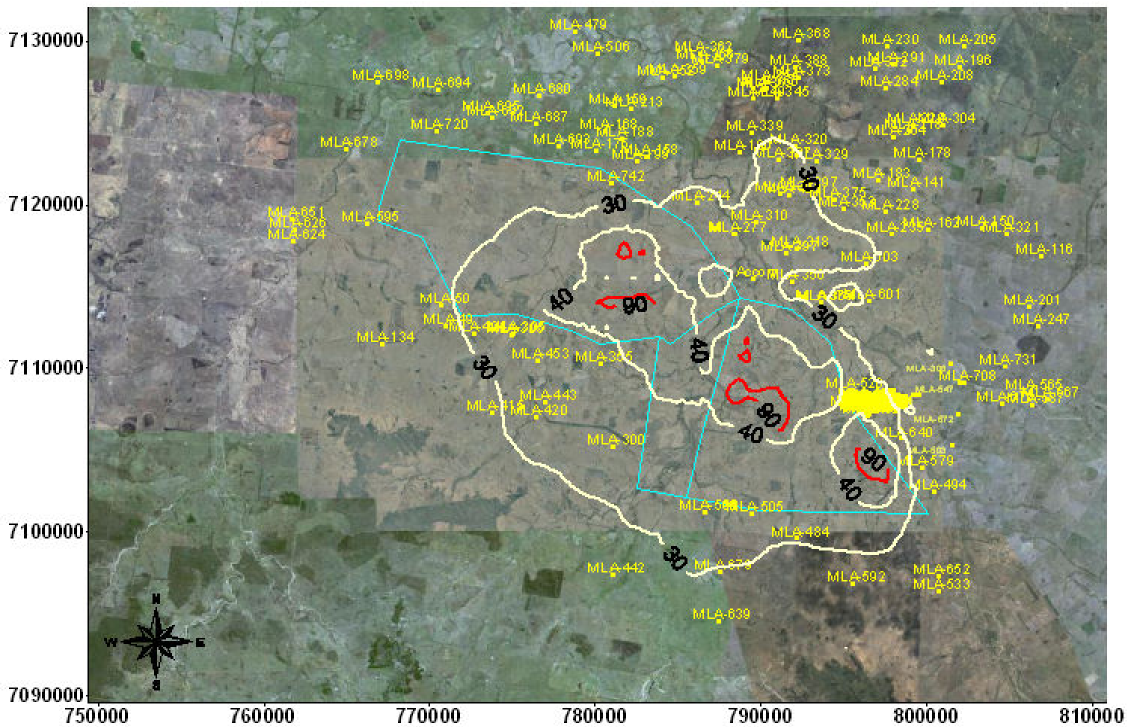


Figure 34	**Year 5 predicted annual average TSP ground level concentrations including background concentration of 26 µg/m³**		
Location: Wandoan Joint Venture Project site	**Averaging Period:** Annual	**Data source:** CALPUFF	**Units:** µg/m³
Type: Contour plot	**Objective:** 90 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009

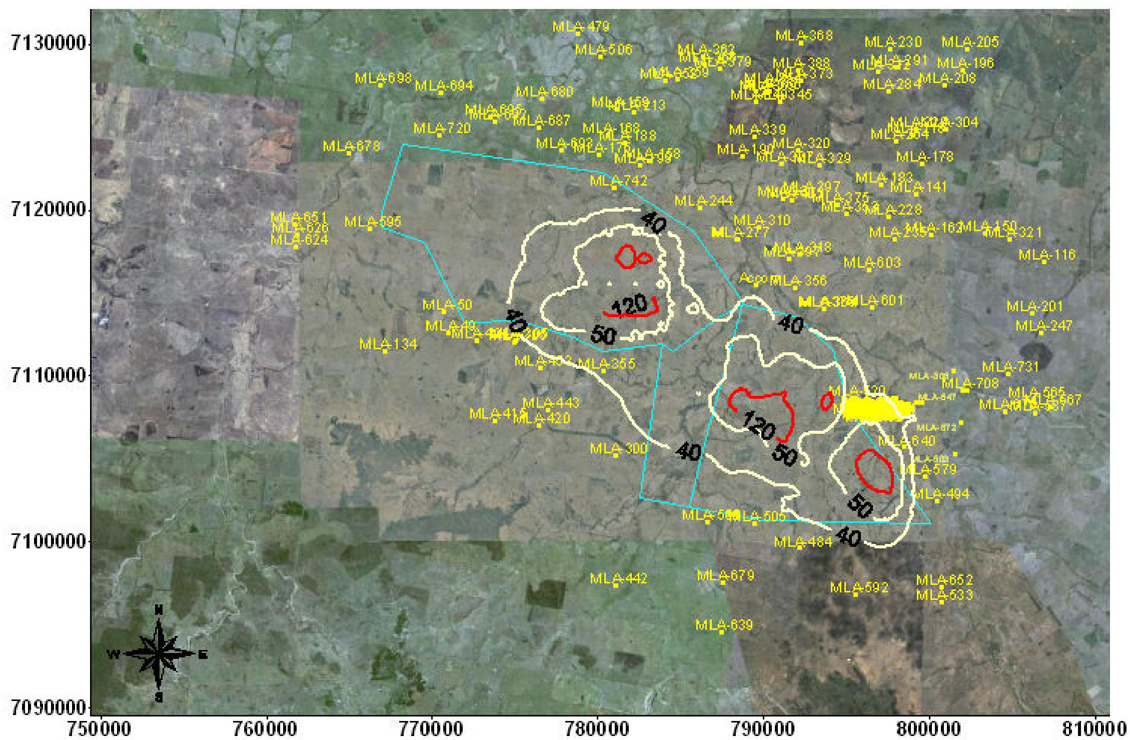


Figure 35	**Year 5 predicted daily dust deposition rate including a background deposition rate of 30 mg/m²/day**		
Location: Wandoan Joint Venture Project site	**Averaging Period:** Annual	**Data source:** CALPUFF	**Units:** mg/m²/day
Type: Contour plot	**Project Goal:** 120 mg/m²/day	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009

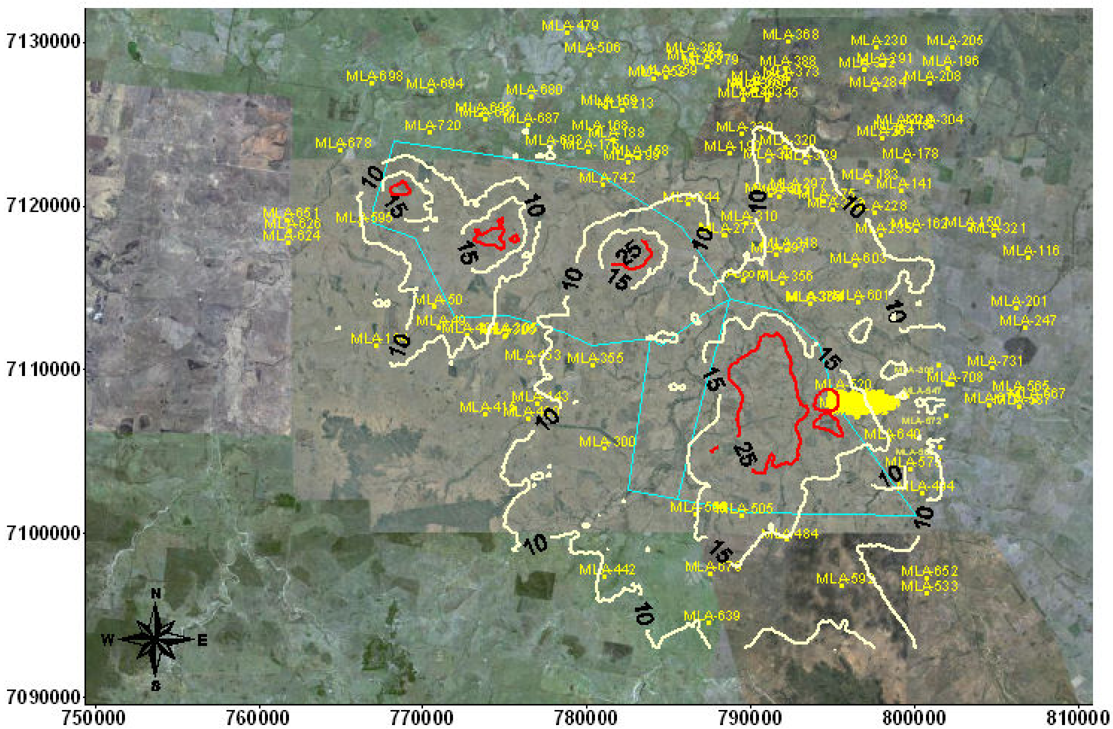


Figure 36	**Year 10 maximum predicted 24-hour average $PM_{2.5}$ ground level concentrations including a background concentration of 6.8 µg/m³.**		
Location: Wandoan Joint Venture Project site	**Averaging Period:** 24-hour	**Data source:** CALPUFF	**Units:** µg/m³
Type: Contour plot	**Objective:** 25 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009

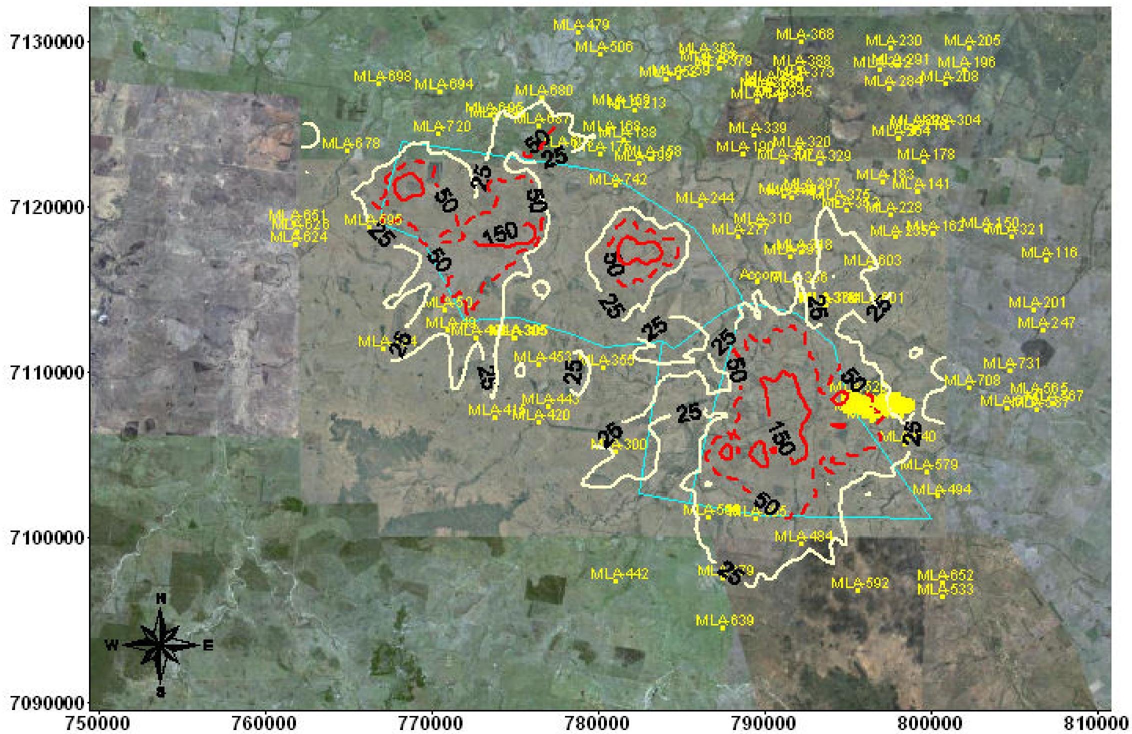
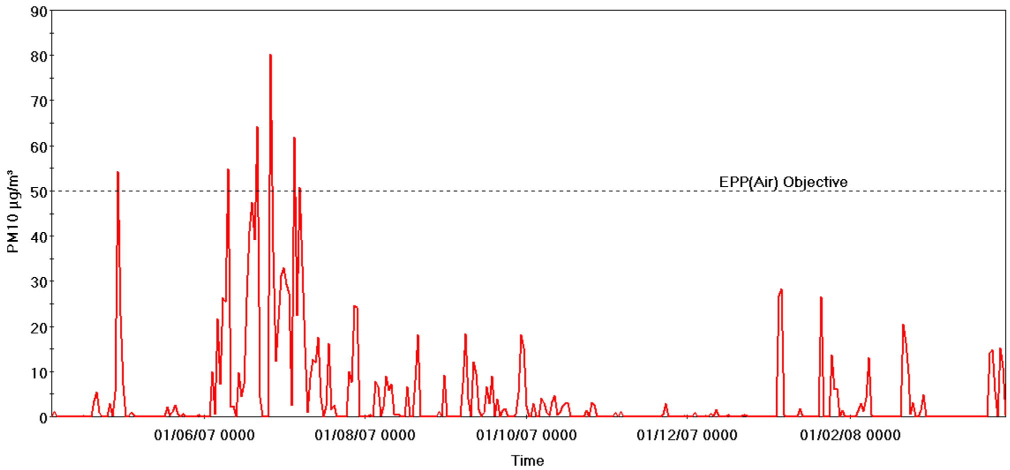
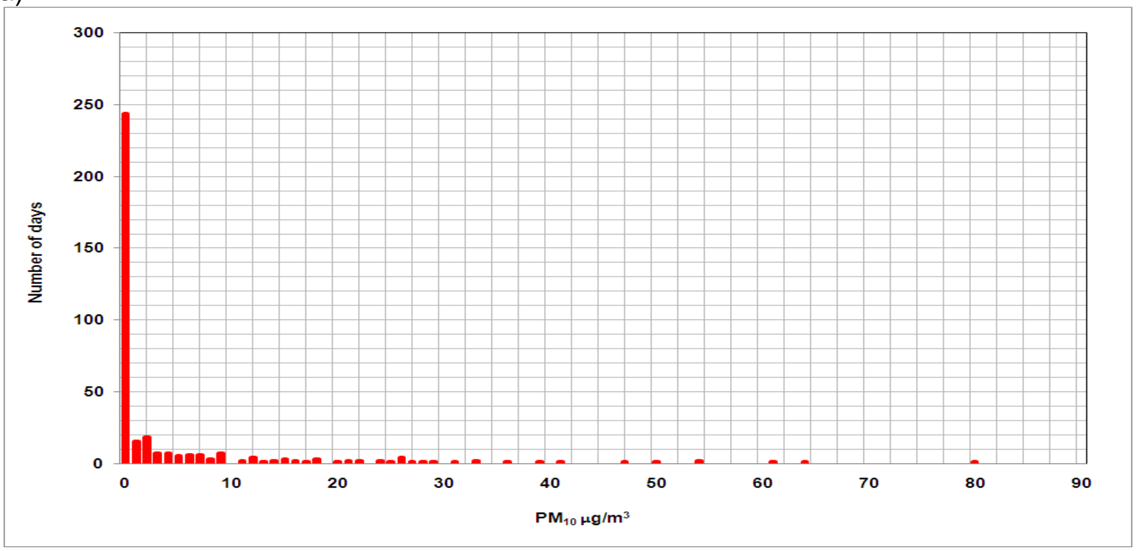


Figure 37 **Year 10 maximum predicted 24-hour average PM_{10} ground level concentrations for the project in isolation**			
Location: Wandoan Joint Venture Project site	**Averaging Period:** 24-hour	**Data source:** CALPUFF	**Units:** µg/m³
Type: Contour plot	**Project Goal:** 150 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009

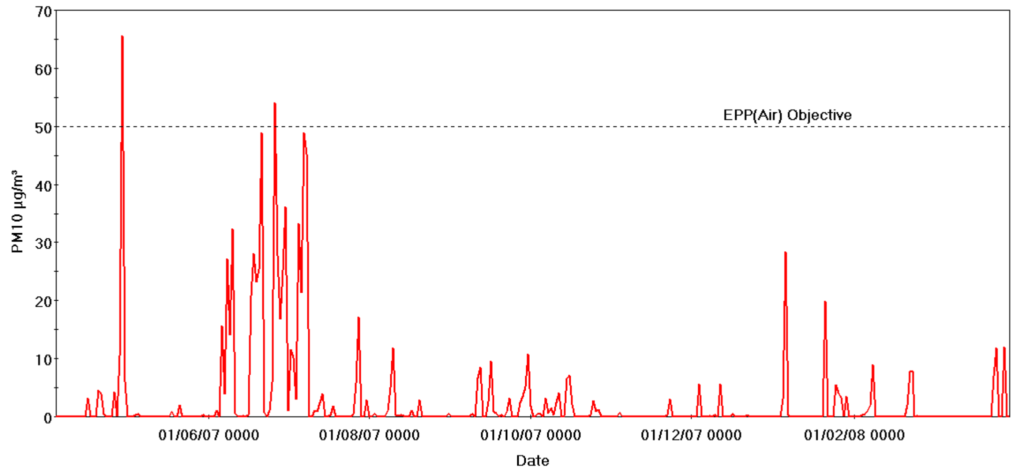


a)

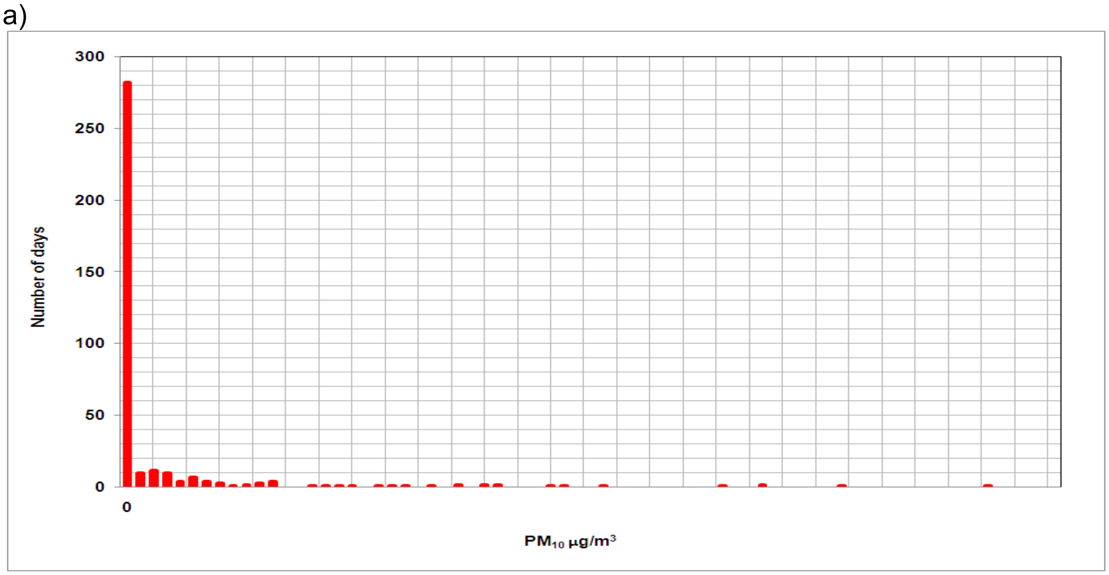


b)

Figure 38	**Year 10 maximum predicted 24-hour average PM_{10} ground level concentrations for the project in isolation, a) 24 hour average time-series and b) frequency distribution.**		
Location: MLA-520	**Averaging Period:** 24-hour	**Data source:** CALPUFF	**Units:** µg/m³
Type: a) Timeseries b) Bar chart	**EPP(Air) objective:** 50 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** August 2009



a)

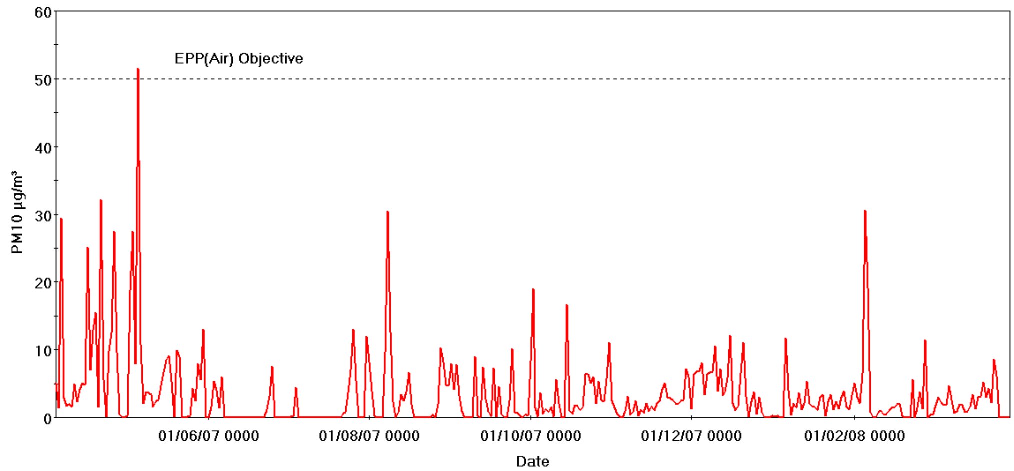


b)

Figure 39 **Year 10 maximum predicted 24-hour average PM_{10} ground level concentrations for the project in isolation, a) 24 hour average time-series and b) frequency distribution.**

Location:	**Averaging Period:**	**Data source:**	**Units:**
MLA-450	24-hour	CALPUFF	µg/m^3
Type: a) Timeseries b) Bar chart	**EPP(Air) objective:** 50 µg/m^3	**Prepared by:** Andrew Wiebe	**Date:** August 2009

a)



b)

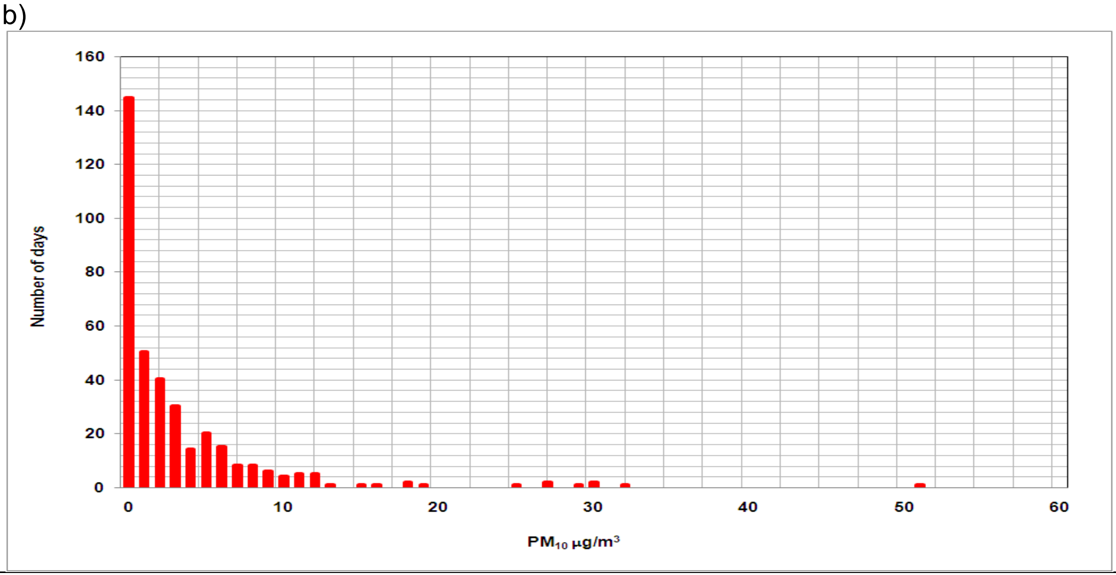


Figure 40	Year 10 maximum predicted 24-hour average PM_{10} ground level concentrations for the project in isolation, a) 24 hour average time-series and b) frequency distribution.		
Location: MLA-50	**Averaging Period:** 24-hour	**Data source:** CALPUFF	**Units:** µg/m³
Type: a) Timeseries b) Bar chart	**EPP(Air) objective:** 50 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** August 2009

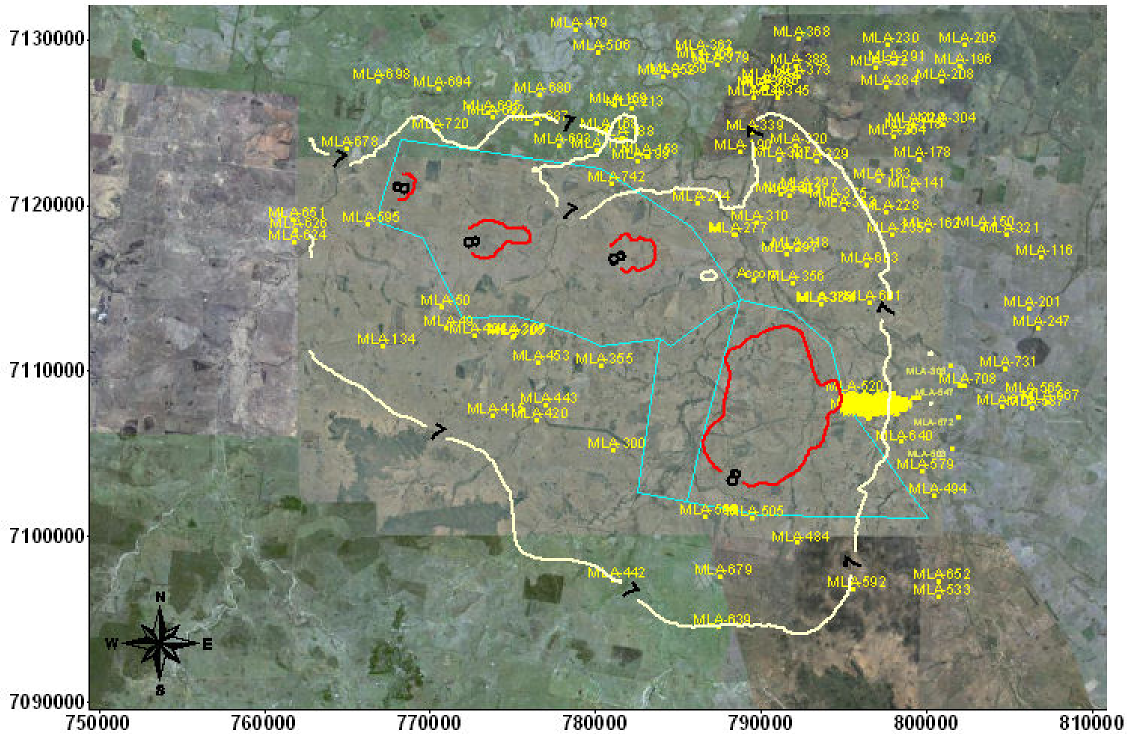


Figure 41 Year 10 predicted annual average $PM_{2.5}$ ground level concentrations including background concentration of 6.8 µg/m³

Location: Wandoan Joint Venture Project site	**Averaging Period:** Annual	**Data source:** CALPUFF	**Units:** µg/m³
Type: Contour plot	**Objective:** 8 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009

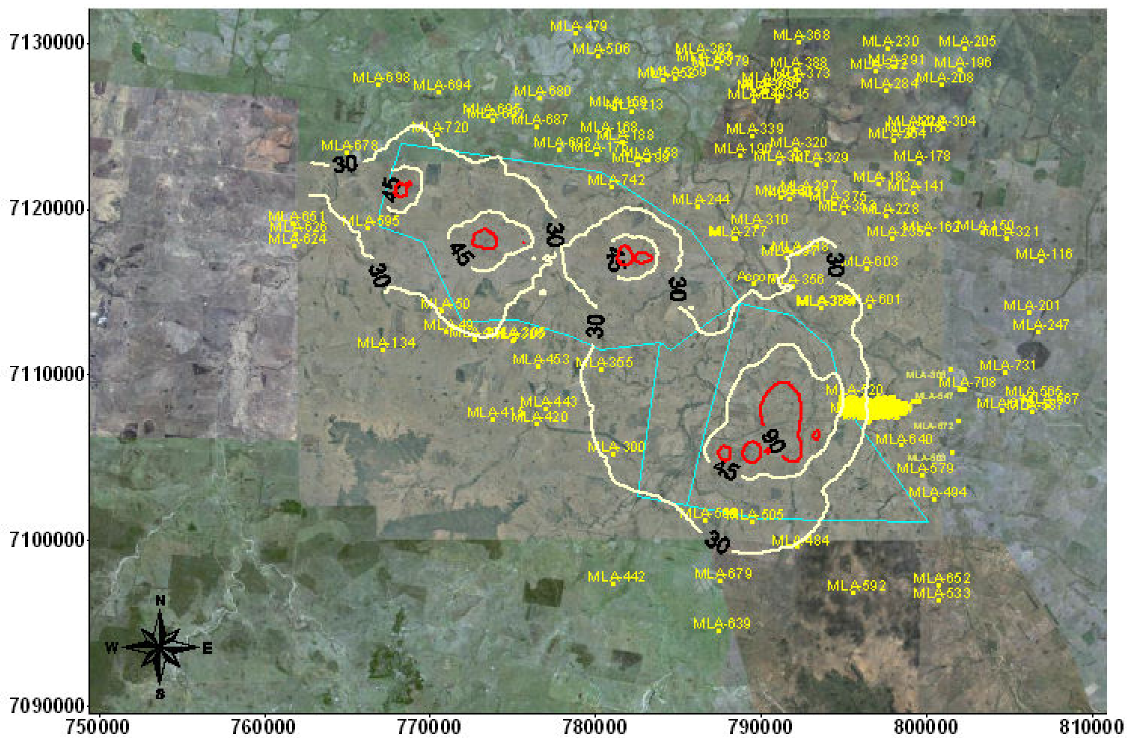


Figure 42 **Year 10 predicted annual average TSP ground level concentrations including background concentration of 26 µg/m³**

Location: Wandoan Joint Venture Project site	**Averaging Period:** Annual	**Data source:** CALPUFF	**Units:** µg/m³
Type: Contour plot	**Objective:** 90 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009

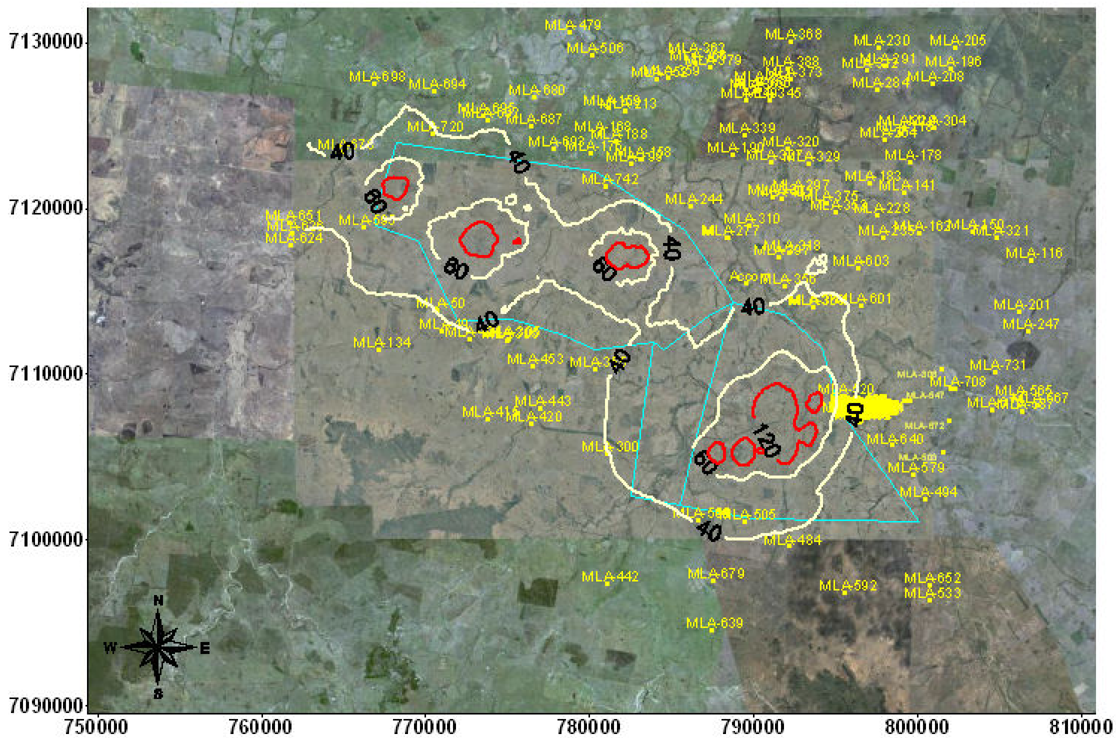


Figure 43 Year 10 predicted daily dust deposition rate including a background deposition rate of 30 mg/m²/day

Location: Wandoan Joint Venture Project site	**Averaging Period:** Annual	**Data source:** CALPUFF	**Units:** mg/m²/day
Type: Contour plot	**Project Goal:** 120 mg/m²/day	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009

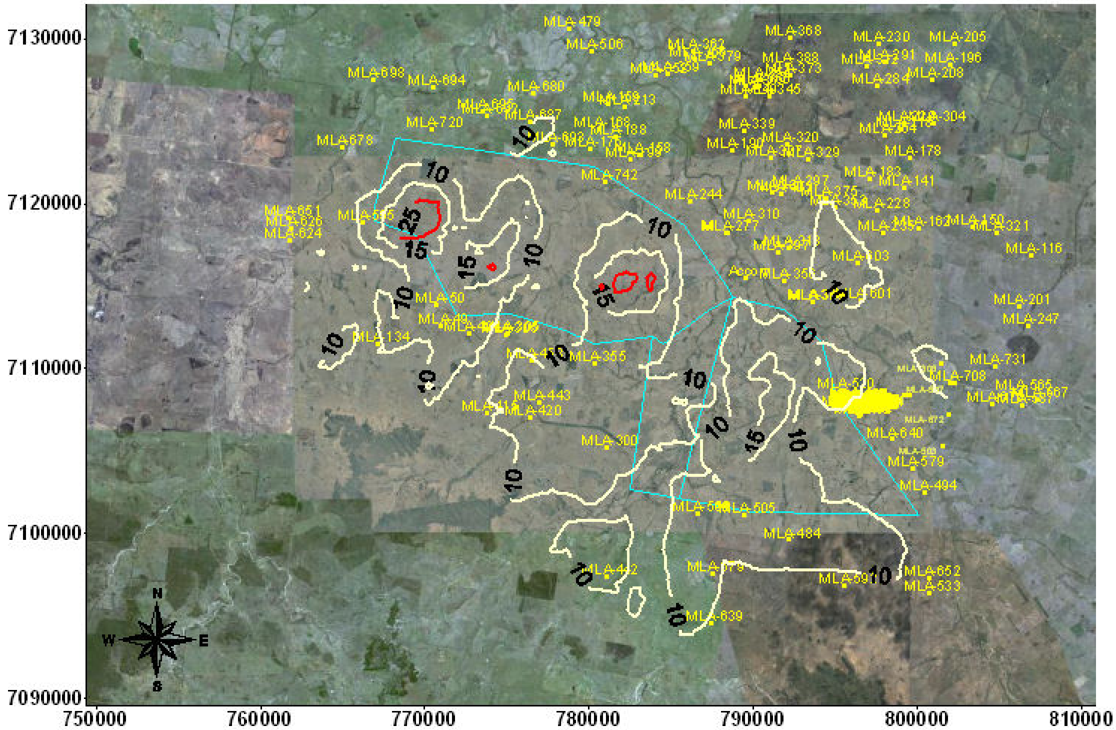


Figure 44	**Year 20 maximum predicted 24-hour average $PM_{2.5}$ ground level concentrations for the project in isolation**		
Location: Wandoan Joint Venture Project site	**Averaging Period:** 24-hour	**Data source:** CALPUFF	**Units:** µg/m³
Type: Contour plot	**Objective:** 25 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009

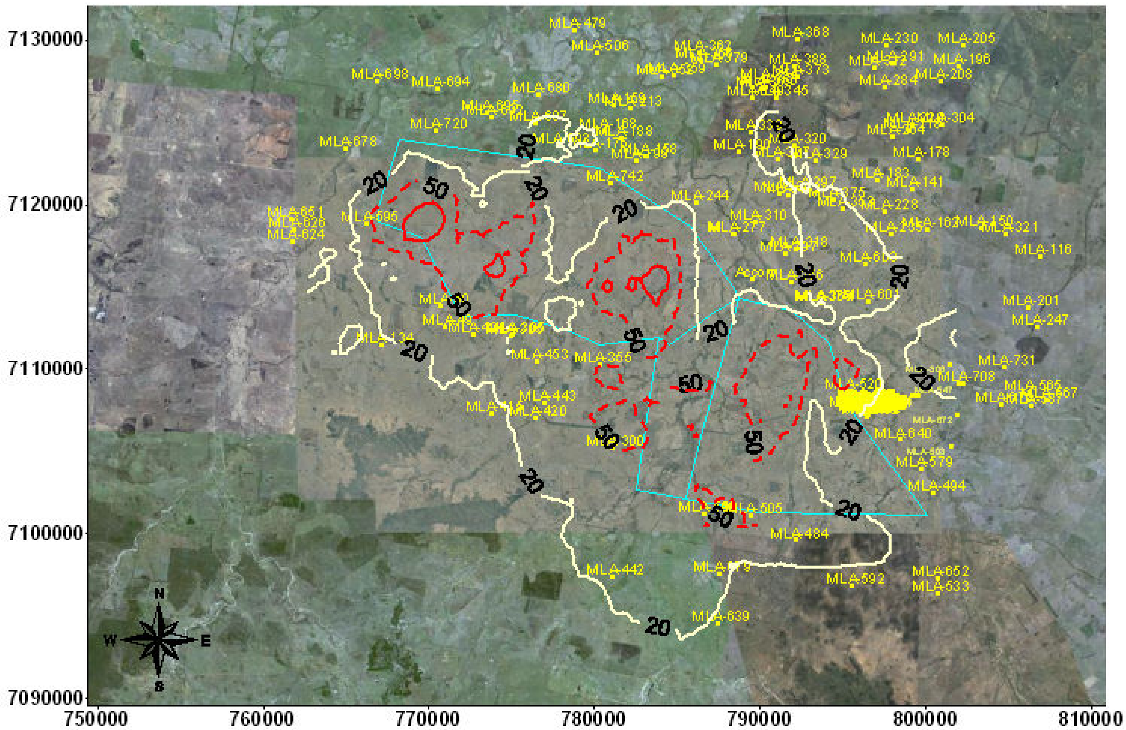
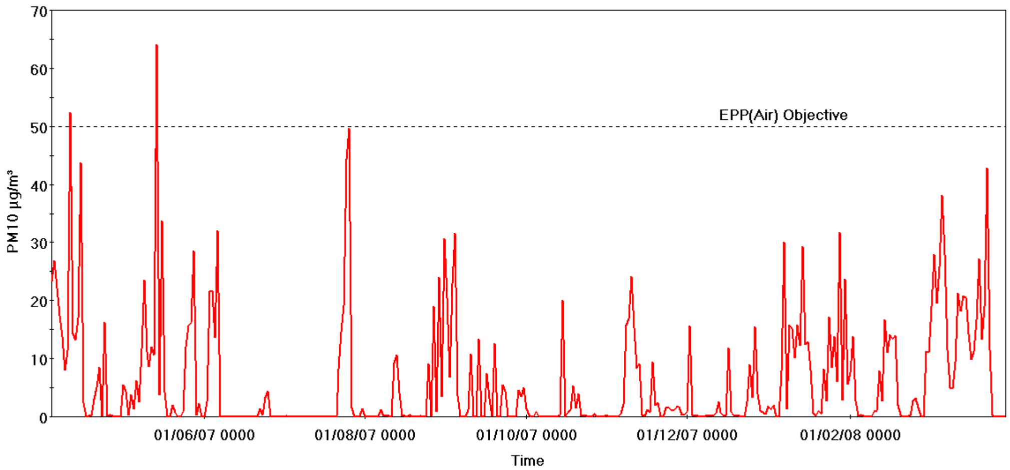
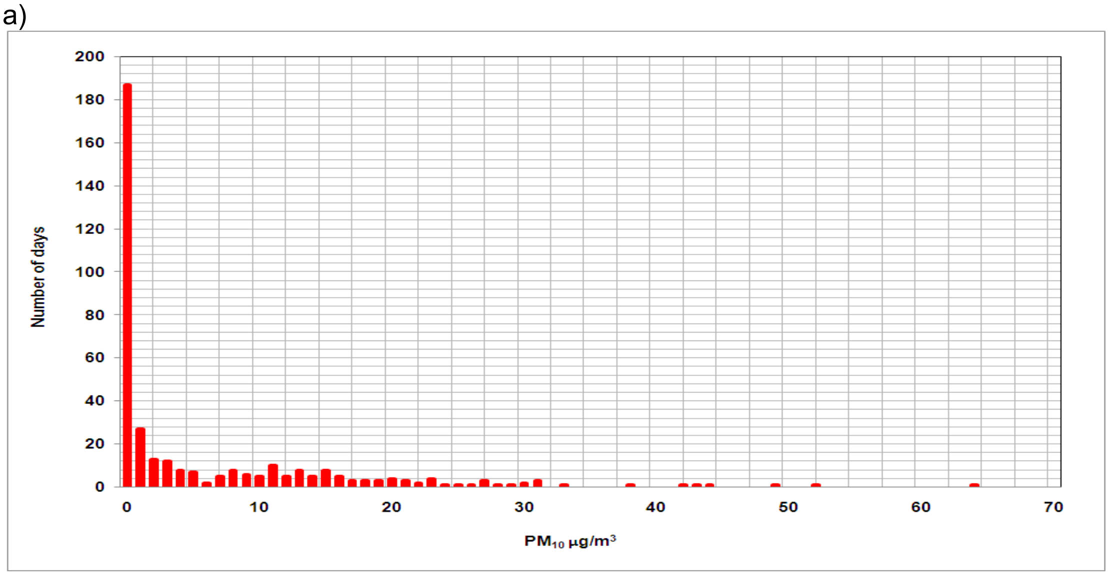


Figure 45 Year 20 maximum predicted 24-hour average PM_{10} ground level concentrations for the project in isolation

Location: Wandoan Joint Venture Project site	**Averaging Period:** 24-hour	**Data source:** CALPUFF	**Units:** µg/m³
Type: Contour plot	**Project Goal:** 150 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009



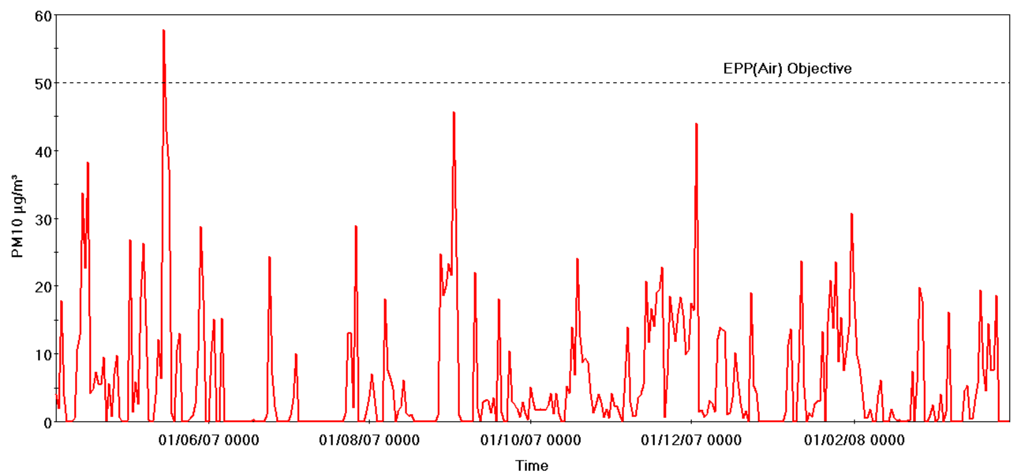
a)



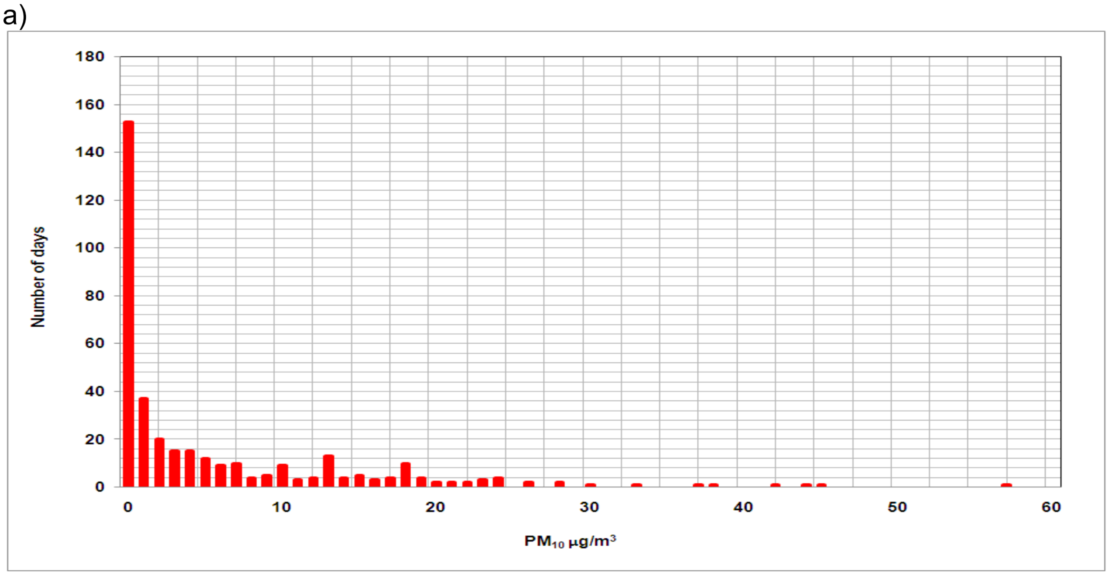
b)

Figure 46	**Year 20 maximum predicted 24-hour average PM_{10} ground level concentrations for the project in isolation, a) 24 hour average time-series and b) frequency distribution.**

Location:	**Averaging Period:**	**Data source:**	**Units:**
MLA-595	24-hour	CALPUFF	µg/m³
Type: a) Timeseries b) Bar chart	**EPP(Air) objective:** 50 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** August 2009



a)



b)

Figure 47 Year 20 maximum predicted 24-hour average PM_{10} ground level concentrations for the project in isolation, a) 24 hour average time-series and b) frequency distribution.

Location:	**Averaging Period:**	**Data source:**	**Units:**
MLA-300	24-hour	CALPUFF	µg/m^3
Type: a) Timeseries b) Bar chart	**EPP(Air) objective:** 50 µg/m^3	**Prepared by:** Andrew Wiebe	**Date:** August 2009

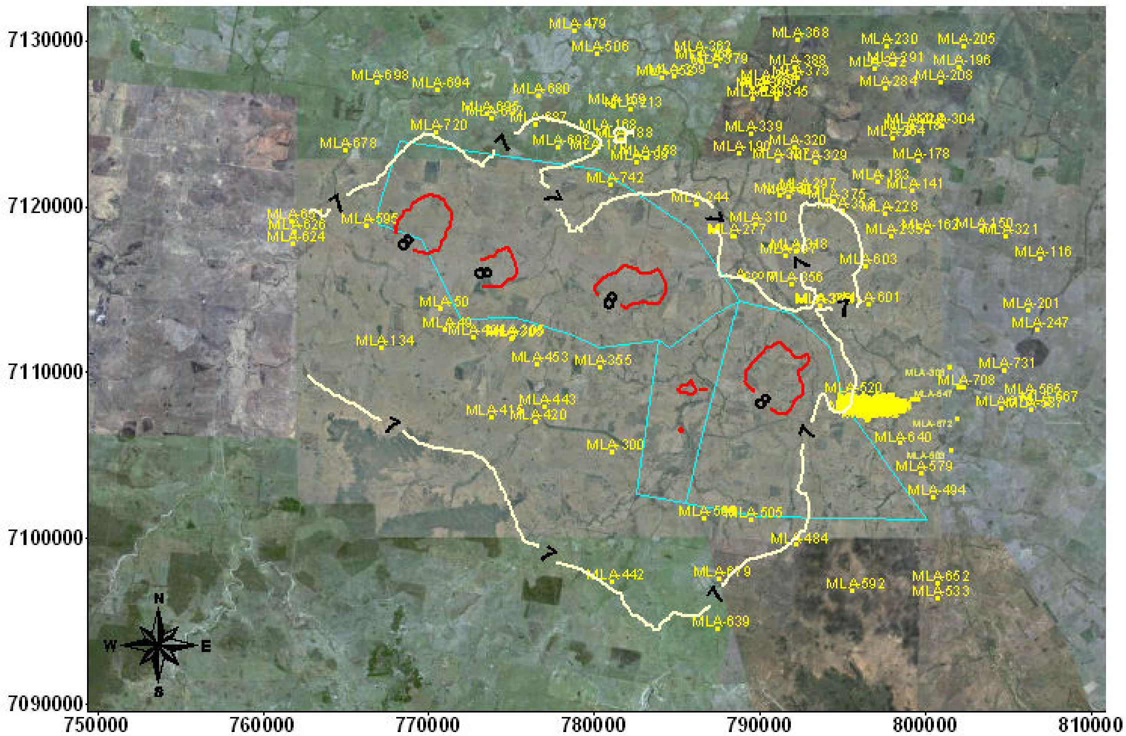


Figure 48 **Year 20 predicted annual average $PM_{2.5}$ ground level concentrations including background concentration of 6.8 µg/m³**

Location: Wandoan Joint Venture Project site	**Averaging Period:** Annual	**Data source:** CALPUFF	**Units:** µg/m³
Type: Contour plot	**Objective:** 8 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009

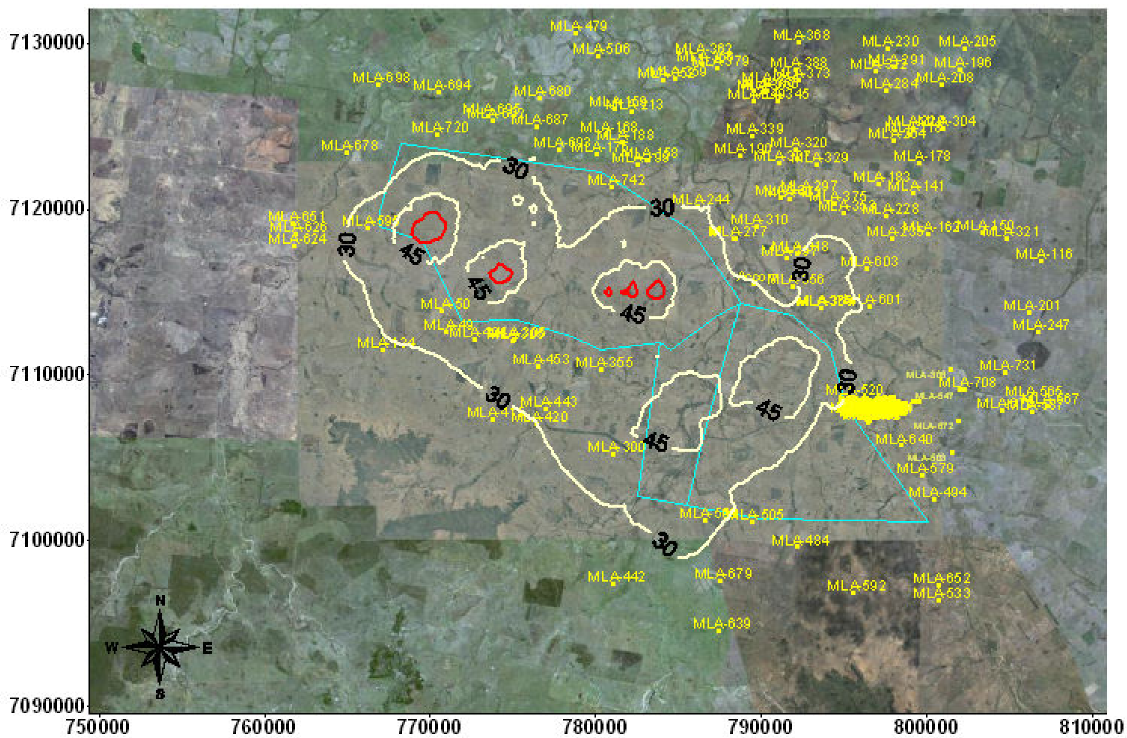


Figure 49	Year 20 predicted annual average TSP ground level concentrations including background concentration of 26 µg/m³		
Location: Wandoan Joint Venture Project site	**Averaging Period:** Annual	**Data source:** CALPUFF	**Units:** µg/m³
Type: Contour plot	**Objective:** 90 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009

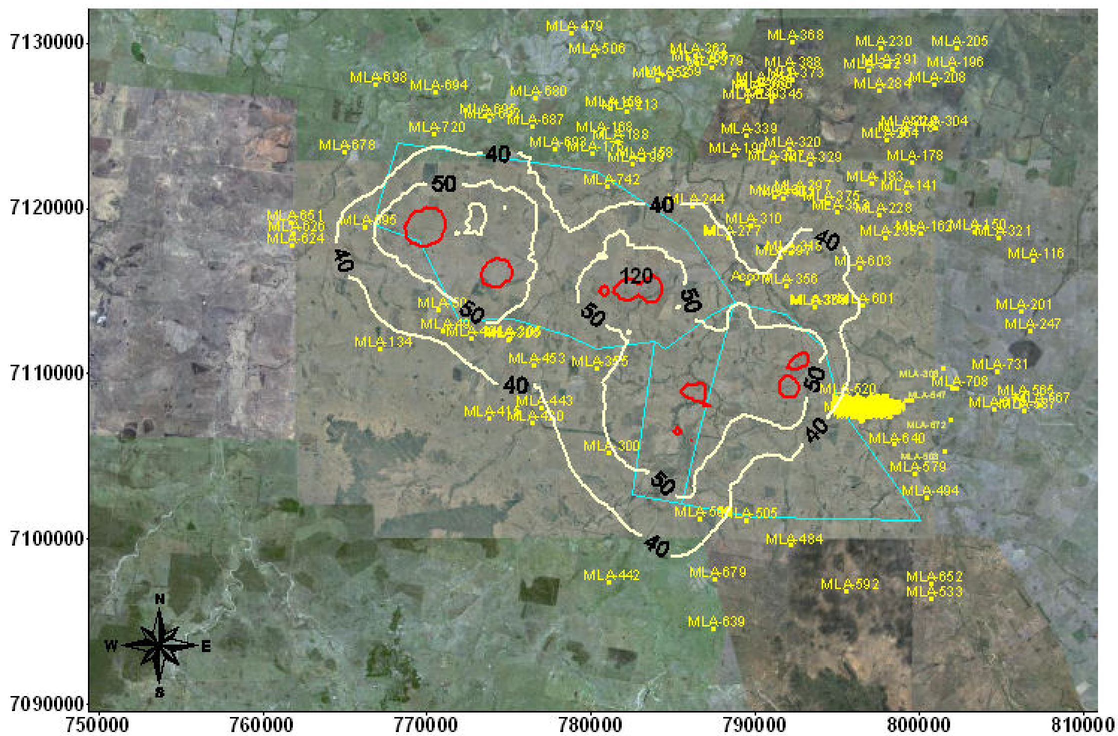


Figure 50 Year 20 predicted daily dust deposition rate including a background deposition rate of 30 mg/m²/day

Location: Wandoan Joint Venture Project site	**Averaging Period:** Annual	**Data source:** CALPUFF	**Units:** mg/m²/day
Type: Contour plot	**Project Goal:** 120 mg/m²/day	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009

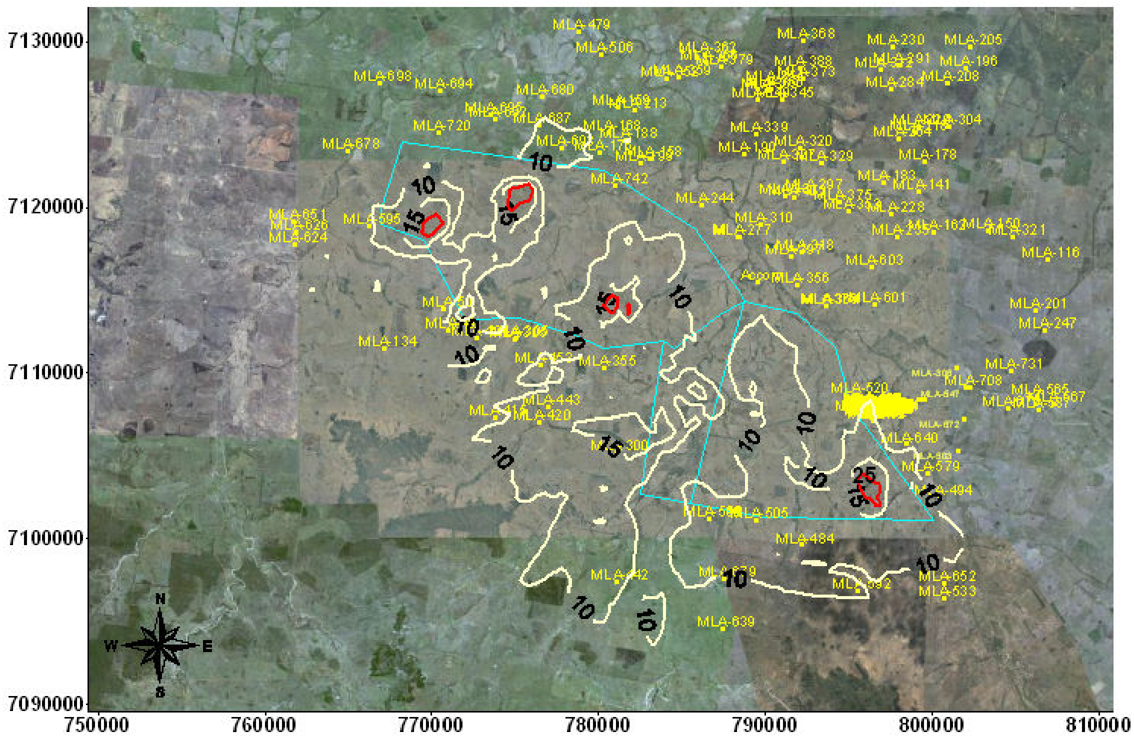


Figure 51	**Year 30 maximum predicted 24-hour average $PM_{2.5}$ ground level concentrations including a background concentration of 6.8 µg/m³.**		
Location: Wandoan Joint Venture Project site	**Averaging Period:** 24-hour	**Data source:** CALPUFF	**Units:** µg/m³
Type: Contour plot	**Objective:** 25 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009

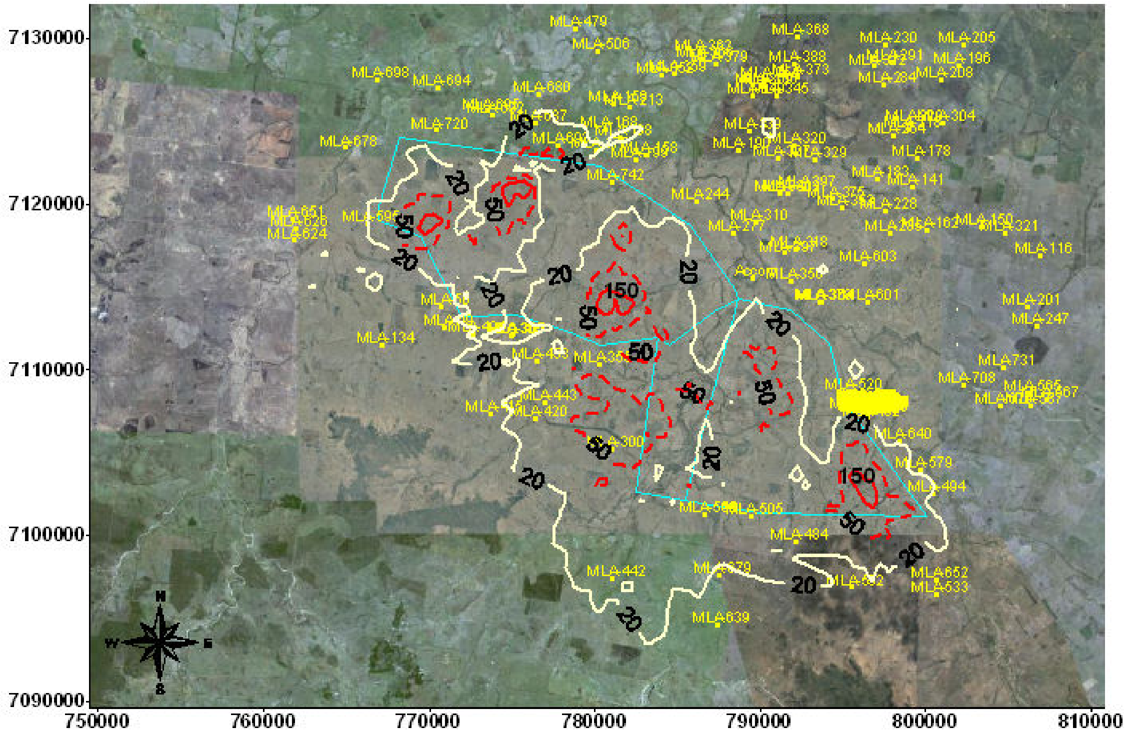
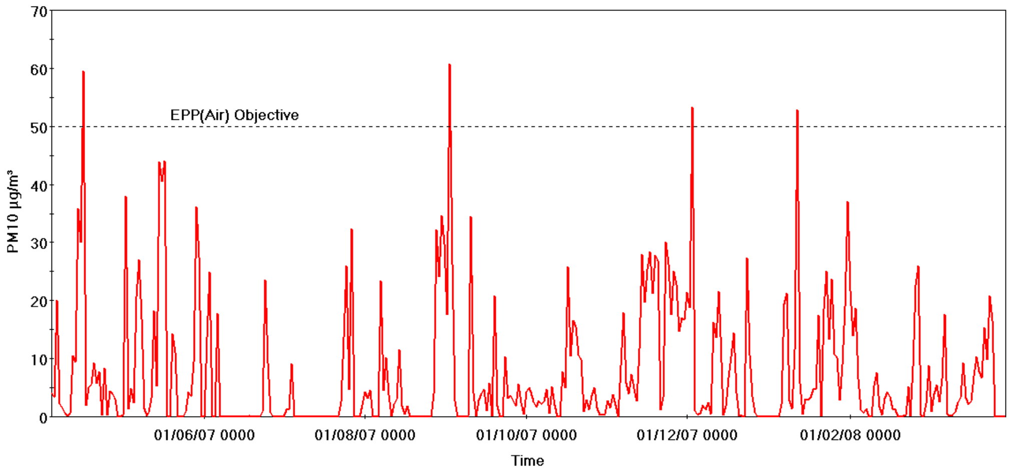
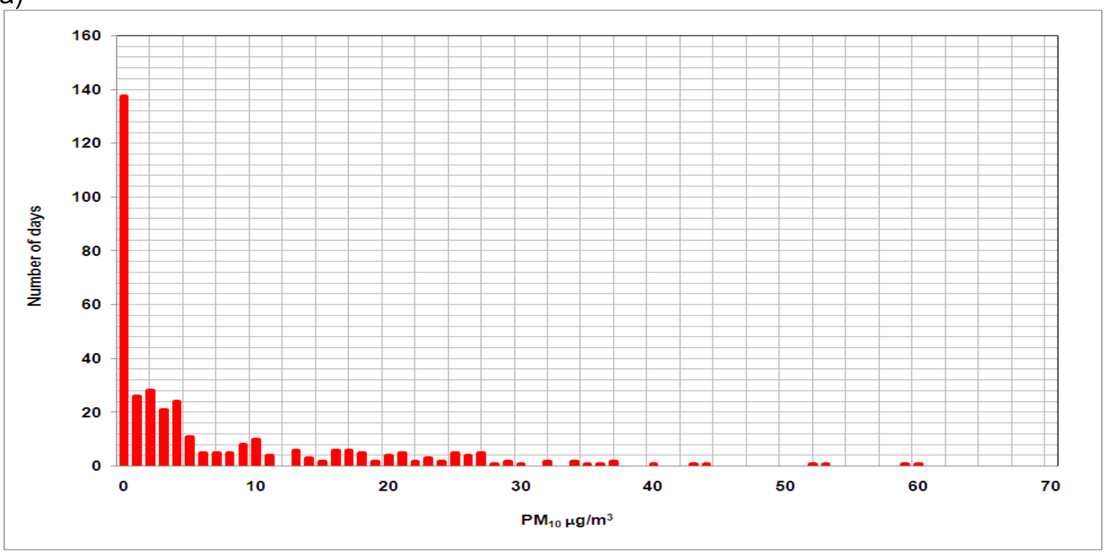


Figure 52	**Year 30 maximum predicted 24-hour average PM_{10} ground level concentrations for the project in isolation**		
Location: Wandoan Joint Venture Project site	**Averaging Period:** 24-hour	**Data source:** CALPUFF	**Units:** µg/m³
Type: Contour plot	**Project Goal:** 150 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009



a)



b)

Figure 53 Year 30 maximum predicted 24-hour average PM_{10} ground level concentrations for the project in isolation, a) 24 hour average time-series and b) frequency distribution.

Location: MLA-300	**Averaging Period:** 24-hour	**Data source:** CALPUFF	**Units:** µg/m³
Type: a) Timeseries b) Bar chart	**EPP(Air) objective:** 50 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** August 2009

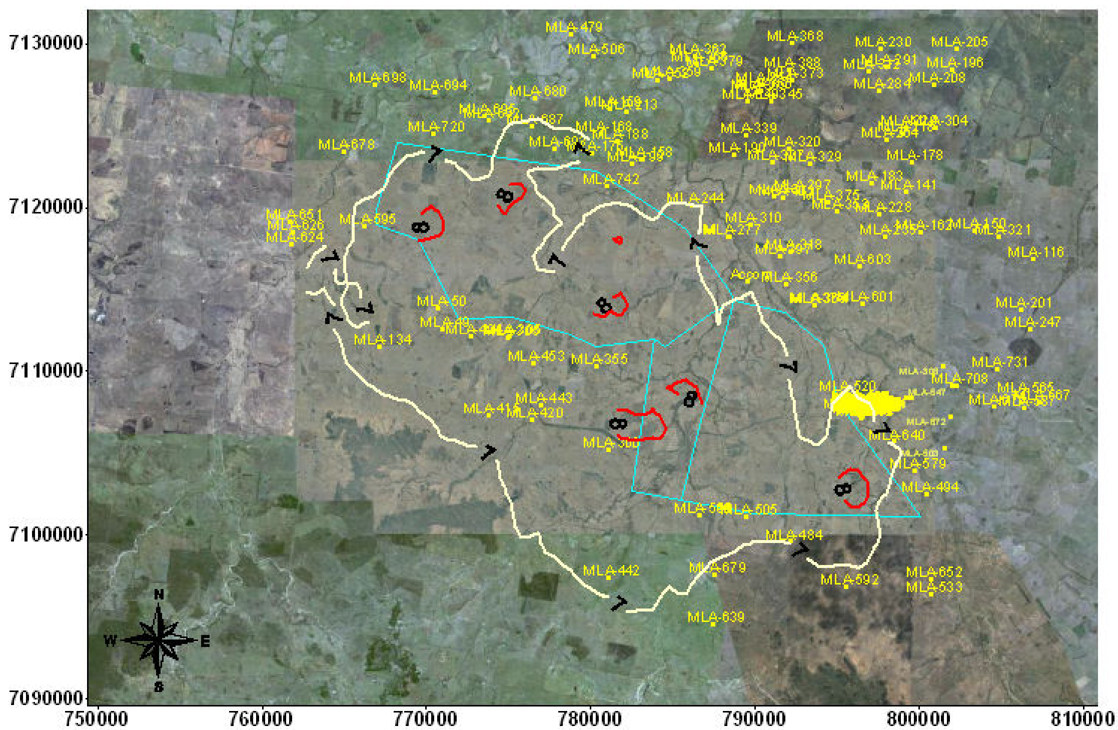


Figure 54	Year 30 predicted annual average $PM_{2.5}$ ground level concentrations including background concentration of 6.8 µg/m³		
Location: Wandoan Joint Venture Project site	**Averaging Period:** Annual	**Data source:** CALPUFF	**Units:** µg/m³
Type: Contour plot	**Objective:** 8 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009

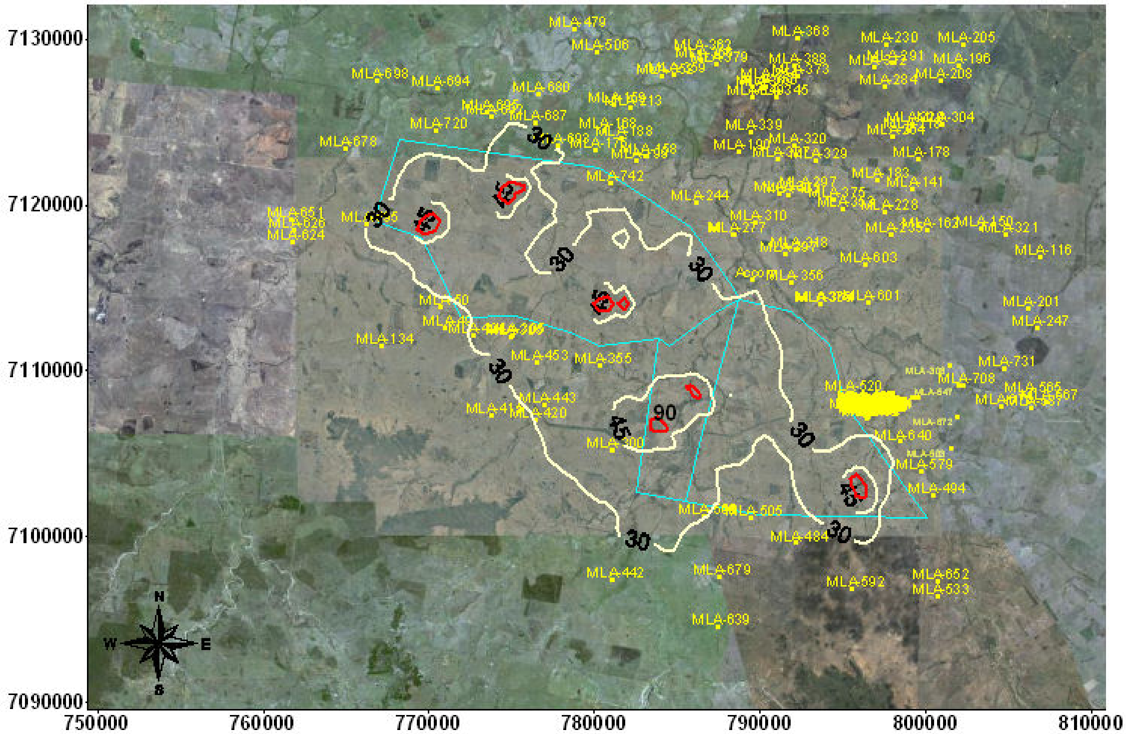


Figure 55 Year 30 predicted annual average TSP ground level concentrations including background concentration of 26 µg/m³

Location: Wandoan Joint Venture Project site	**Averaging Period:** Annual	**Data source:** CALPUFF	**Units:** µg/m³
Type: Contour plot	**Objective:** 90 µg/m³	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009

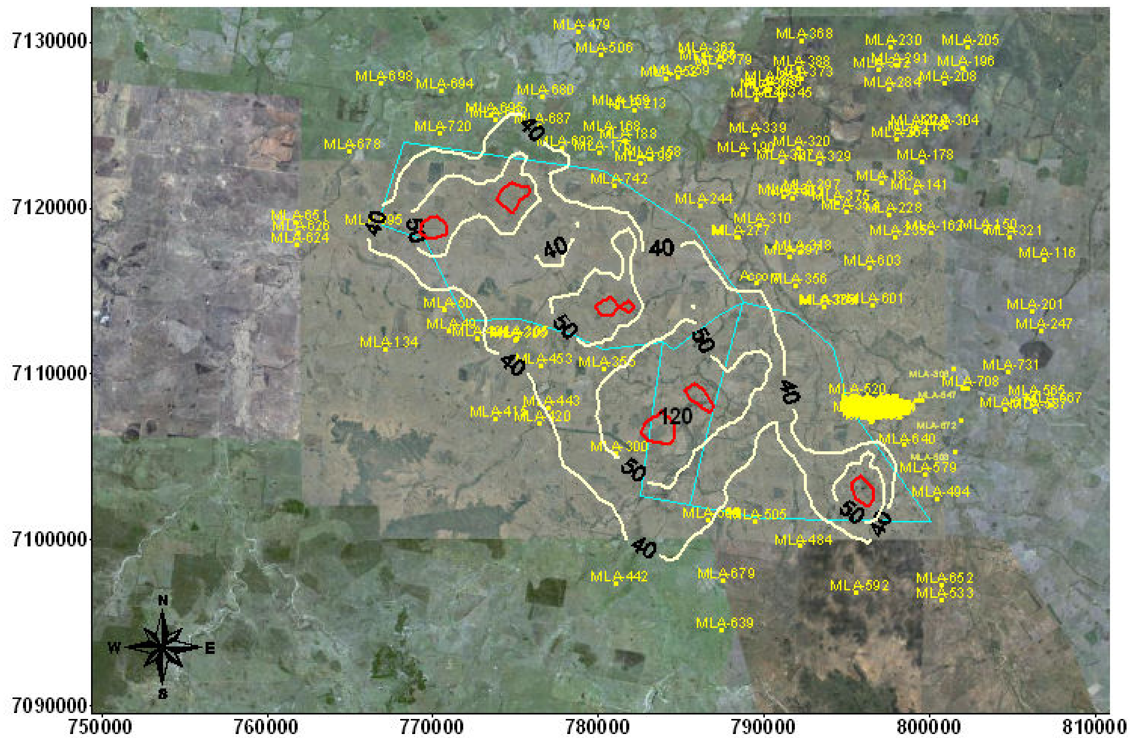


Figure 56 **Year 30 predicted daily dust deposition rate including a background deposition rate of 30 mg/m²/day**

Location: Wandoan Joint Venture Project site	**Averaging Period:** Annual	**Data source:** CALPUFF	**Units:** mg/m²/day
Type: Contour plot	**Project Goal:** 120 mg/m²/day	**Prepared by:** Andrew Wiebe	**Date:** JULY 2009

Appendix A Individual receptor results

Table A1 Year 1 24-hour PM_{10}

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + natural background
MLA-520	0.8	40.9	6	0	7
MLA-106	0.6	30.3	6	0	6
MLA-81	0.6	30.3	6	0	6
MLA-79	0.6	30.3	6	0	6
MLA-616	0.6	30.2	6	0	6
MLA-407	0.6	30.2	6	0	6
MLA-115	0.6	30.2	6	0	6
MLA-112	0.6	30.2	6	0	6
MLA-168	0.6	29.9	6	0	6
MLA-412	0.6	29.6	6	0	6
MLA-113	0.6	29.6	6	0	6
MLA-108	0.6	29.6	6	0	6
MLA-107	0.6	29.6	6	0	6
MLA-105	0.6	29.6	6	0	6
MLA-78	0.6	29.6	6	0	6
MLA-77	0.6	29.6	6	0	6
MLA-76	0.6	29.6	6	0	6
MLA-13	0.6	29.6	6	0	6
MLA-12	0.6	29.6	6	0	6
MLA-11	0.6	29.6	6	0	6
MLA-3	0.6	29.6	6	0	6
MLA-2	0.6	29.6	6	0	6
MLA-406	0.6	29.5	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + natural background
MLA-24	0.6	29.5	6	0	6
MLA-19	0.6	29.5	6	0	6
MLA-17	0.6	29.5	6	0	6
MLA-16	0.6	29.5	6	0	6
MLA-14	0.6	29.5	6	0	6
MLA-1	0.6	29.5	6	0	6
MLA-103	0.6	28.8	6	0	6
MLA-82	0.6	28.8	6	0	6
MLA-73	0.6	28.6	6	0	6
MLA-69	0.6	28.6	6	0	6
MLA-67	0.6	28.6	6	0	6
MLA-66	0.6	28.6	6	0	6
MLA-33	0.6	28.6	6	0	6
MLA-31	0.6	28.6	6	0	6
MLA-28	0.6	28.6	6	0	6
MLA-25	0.6	28.6	6	0	6
MLA-23	0.6	28.6	6	0	6
MLA-22	0.6	28.6	6	0	6
MLA-15	0.6	28.6	6	0	6
MLA-10	0.6	28.6	6	0	6
MLA-9	0.6	28.6	6	0	6
MLA-8	0.6	28.6	6	0	6
MLA-7	0.6	28.6	6	0	6
MLA-137	0.6	27.8	6	0	6
MLA-136	0.6	27.8	6	0	6
MLA-132	0.6	27.8	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + natural background
MLA-72	0.6	27.8	6	0	6
MLA-30	0.6	27.8	6	0	6
MLA-29	0.6	27.8	6	0	6
MLA-397	1.7	27.4	6	0	6
MLA-513	0.6	27.0	6	0	6
MLA-512	0.6	27.0	6	0	6
MLA-510	0.6	27.0	6	0	6
MLA-461	0.6	27.0	6	0	6
MLA-458	0.6	27.0	6	0	6
MLA-457	0.6	27.0	6	0	6
MLA-109	0.6	27.0	6	0	6
MLA-92	0.6	27.0	6	0	6
MLA-91	0.6	27.0	6	0	6
MLA-84	0.6	27.0	6	0	6
MLA-32	0.6	27.0	6	0	6
MLA-554	1.4	26.9	6	0	6
MLA-548	1.4	26.9	6	0	6
MLA-541	1.4	26.9	6	0	6
MLA-531	1.4	26.9	6	0	6
MLA-450	0.6	26.7	6	0	6
MLA-716	0.5	26.4	6	0	6
MLA-713	0.5	26.4	6	0	6
MLA-710	0.5	26.4	6	0	6
MLA-701	0.5	26.4	6	0	6
MLA-699	0.5	26.4	6	0	6
MLA-690	0.5	26.4	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + natural background
MLA-665	0.5	26.4	6	0	6
MLA-663	0.5	26.4	6	0	6
MLA-658	0.5	26.4	6	0	6
MLA-593	0.5	26.4	6	0	6
MLA-540	0.5	26.4	6	0	6
MLA-537	0.5	26.4	6	0	6
MLA-536	0.5	26.4	6	0	6
MLA-462	0.5	26.4	6	0	6
MLA-200	0.5	26.4	6	0	6
MLA-119	0.5	26.4	6	0	6
MLA-118	0.5	26.4	6	0	6
MLA-117	0.5	26.4	6	0	6
MLA-86	0.5	26.4	6	0	6
MLA-36	0.5	26.4	6	0	6
MLA-35	0.5	26.4	6	0	6
MLA-34	0.5	26.4	6	0	6
MLA-465	0.5	26.0	6	0	6
MLA-463	0.5	26.0	6	0	6
MLA-448	0.5	26.0	6	0	6
MLA-195	0.5	26.0	6	0	6
MLA-177	0.5	26.0	6	0	6
MLA-133	0.5	26.0	6	0	6
MLA-130	0.5	26.0	6	0	6
MLA-124	0.5	26.0	6	0	6
MLA-121	0.5	26.0	6	0	6
MLA-98	0.5	26.0	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + natural background
MLA-57	0.5	26.0	6	0	6
MLA-719	0.5	25.9	6	0	6
MLA-715	0.5	25.9	6	0	6
MLA-714	0.5	25.9	6	0	6
MLA-597	0.5	25.9	6	0	6
MLA-594	0.5	25.9	6	0	6
MLA-589	0.5	25.9	6	0	6
MLA-588	0.5	25.9	6	0	6
MLA-559	0.5	25.9	6	0	6
MLA-558	0.5	25.9	6	0	6
MLA-408	0.5	25.9	6	0	6
MLA-436	0.5	25.6	6	0	6
MLA-276	0.5	25.6	6	0	6
MLA-216	0.5	25.6	6	0	6
MLA-209	0.5	25.6	6	0	6
MLA-197	0.5	25.6	6	0	6
MLA-126	0.5	25.6	6	0	6
MLA-123	0.5	25.6	6	0	6
MLA-59	0.5	25.6	6	0	6
MLA-58	0.5	25.6	6	0	6
MLA-56	0.5	25.6	6	0	6
MLA-402	1.0	25.4	6	0	6
MLA-491	0.5	25.1	6	0	6
MLA-447	0.5	25.1	6	0	6
MLA-422	0.5	25.1	6	0	6
MLA-421	0.5	25.1	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + natural background
MLA-410	0.5	25.1	6	0	6
MLA-409	0.5	25.1	6	0	6
MLA-224	0.5	25.1	6	0	6
MLA-221	0.5	25.1	6	0	6
MLA-87	0.5	25.1	6	0	6
MLA-71	0.5	25.1	6	0	6
MLA-70	0.5	25.1	6	0	6
MLA-88	0.5	25.0	6	0	6
MLA-85	0.5	25.0	6	0	6
MLA-83	0.5	25.0	6	0	6
MLA-39	0.5	25.0	6	0	6
MLA-4	0.5	25.0	6	0	6
MLA-543	0.5	24.6	6	0	6
MLA-532	0.5	24.6	6	0	6
MLA-270	0.5	24.6	6	0	6
MLA-127	0.5	24.6	6	0	6
MLA-499	0.5	24.2	6	0	6
MLA-493	0.5	24.2	6	0	6
MLA-438	0.5	24.2	6	0	6
MLA-437	0.5	24.2	6	0	6
MLA-405	0.5	24.2	6	0	6
MLA-246	0.5	24.2	6	0	6
MLA-122	0.5	24.2	6	0	6
MLA-120	0.5	24.2	6	0	6
MLA-114	0.5	24.2	6	0	6
MLA-111	0.5	24.2	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + natural background
MLA-99	0.5	24.2	6	0	6
MLA-90	0.5	24.2	6	0	6
MLA-75	0.5	24.2	6	0	6
MLA-74	0.5	24.2	6	0	6
MLA-65	0.5	24.2	6	0	6
MLA-46	0.5	24.2	6	0	6
MLA-20	0.5	24.2	6	0	6
MLA-6	0.5	24.2	6	0	6
MLA-5	0.5	24.2	6	0	6
MLA-553	0.5	24.0	6	0	6
MLA-550	0.5	24.0	6	0	6
MLA-549	0.5	24.0	6	0	6
MLA-516	0.5	24.0	6	0	6
MLA-515	0.5	24.0	6	0	6
MLA-514	0.5	24.0	6	0	6
MLA-511	0.5	24.0	6	0	6
MLA-104	0.5	24.0	6	0	6
MLA-68	0.5	24.0	6	0	6
MLA-38	0.5	24.0	6	0	6
MLA-27	0.5	24.0	6	0	6
MLA-26	0.5	24.0	6	0	6
MLA-347	0.5	23.8	6	0	6
MLA-227	0.5	23.8	6	0	6
MLA-219	0.5	23.8	6	0	6
MLA-97	0.5	23.6	6	0	6
MLA-63	0.5	23.6	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + natural background
MLA-62	0.5	23.6	6	0	6
MLA-110	0.5	23.4	6	0	6
MLA-93	0.5	23.4	6	0	6
MLA-61	0.5	23.4	6	0	6
MLA-40	0.5	23.4	6	0	6
MLA-419	0.5	23.3	6	0	6
MLA-416	0.5	23.3	6	0	6
MLA-413	0.5	23.3	6	0	6
MLA-215	0.5	23.3	6	0	6
MLA-210	0.5	23.3	6	0	6
MLA-125	0.5	23.3	6	0	6
MLA-95	0.5	23.3	6	0	6
MLA-94	0.5	23.3	6	0	6
MLA-80	0.5	23.3	6	0	6
MLA-64	0.5	23.3	6	0	6
MLA-45	0.5	23.3	6	0	6
MLA-44	0.5	23.3	6	0	6
MLA-41	0.5	23.3	6	0	6
Accommodation facilities	2.2	23.2	6	0	6
MLA-451	0.5	23.2	6	0	6
MLA-277	1.6	22.9	6	0	6
MLA-207	0.5	22.9	6	0	6
MLA-142	0.5	22.9	6	0	6
MLA-542	0.5	22.0	6	0	6
MLA-331	1.2	22.0	6	0	6
MLA-43	0.5	22.0	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + natural background
MLA-42	0.5	22.0	6	0	6
MLA-21	0.5	22.0	6	0	6
MLA-18	0.5	22.0	6	0	6
MLA-310	1.7	21.2	6	0	6
MLA-640	0.5	21.1	6	0	6
MLA-318	1.3	20.1	6	0	6
MLA-244	1.1	17.9	6	0	6
MLA-300	1.4	17.1	6	0	6
MLA-355	2.1	16.7	6	0	6
MLA-297	0.7	16.5	6	0	6
MLA-601	0.6	15.7	6	0	6
MLA-307	0.8	14.4	6	0	6
MLA-505	0.9	14.1	6	0	6
MLA-364	1.3	14.1	6	0	6
MLA-679	0.7	13.9	6	0	6
MLA-320	0.6	13.8	6	0	6
MLA-339	0.7	13.0	6	0	6
MLA-378	1.3	12.9	6	0	6
MLA-190	0.8	12.8	6	0	6
MLA-356	1.4	12.3	6	0	6
MLA-329	0.4	12.3	6	0	6
MLA-576	6.6	12.2	6	0	9
MLA-556	6.6	12.2	6	0	9
MLA-603	0.4	12.0	6	0	6
MLA-443	1.0	11.6	6	0	6
MLA-420	0.9	10.5	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + natural background
MLA-574	0.2	10.4	6	0	6
MLA-579	0.4	10.1	6	0	6
MLA-308	0.2	10.0	6	0	6
MLA-345	0.4	9.8	6	0	6
MLA-369	0.4	9.7	6	0	6
MLA-340	0.5	9.7	6	0	6
MLA-353	0.3	9.4	6	0	6
MLA-213	0.3	9.4	6	0	6
MLA-365	0.4	9.1	6	0	6
MLA-375	0.4	8.4	6	0	6
MLA-373	0.3	8.3	6	0	6
MLA-442	0.4	8.0	6	0	6
MLA-388	0.3	8.0	6	0	6
MLA-354	0.3	8.0	6	0	6
MLA-228	0.2	8.0	6	0	6
MLA-235	0.3	7.8	6	0	6
MLA-305	0.8	7.4	6	0	6
MLA-639	0.4	7.0	6	0	6
MLA-141	0.2	6.9	6	0	6
MLA-162	0.2	6.8	6	0	6
MLA-368	0.3	6.6	6	0	6
MLA-352	0.3	6.6	6	0	6
MLA-533	0.2	6.5	6	0	6
MLA-366	0.4	6.3	6	0	6
MLA-183	0.2	6.2	6	0	6
MLA-693	0.2	6.1	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + natural background
MLA-415	0.5	6.1	6	0	6
MLA-362	0.3	6.0	6	0	6
MLA-687	0.3	5.9	6	0	6
MLA-359	0.3	5.8	6	0	6
MLA-188	0.3	5.7	6	0	6
MLA-158	0.4	5.5	6	0	6
MLA-592	0.3	5.4	6	0	6
MLA-506	0.3	5.4	6	0	6
MLA-379	0.4	5.4	6	0	6
MLA-404	0.5	5.3	6	0	6
MLA-178	0.1	5.1	6	0	6
MLA-595	0.2	5.0	6	0	6
MLA-49	0.4	4.8	6	0	6
MLA-321	0.2	4.7	6	0	6
MLA-742	0.3	4.6	6	0	6
MLA-50	0.4	4.3	6	0	6
MLA-494	0.1	4.2	6	0	6
MLA-150	0.2	4.2	6	0	6
MLA-567	0.3	4.1	6	0	6
MLA-254	0.1	4.1	6	0	6
MLA-503	0.1	3.9	6	0	6
MLA-159	0.2	3.7	6	0	6
MLA-587	0.2	3.6	6	0	6
MLA-247	0.3	3.6	6	0	6
MLA-201	0.3	3.6	6	0	6
MLA-680	0.2	3.4	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + natural background
MLA-304	0.1	3.4	6	0	6
MLA-116	0.3	3.4	6	0	6
MLA-565	0.2	3.2	6	0	6
MLA-199	0.1	3.2	6	0	6
MLA-229	0.1	3.1	6	0	6
MLA-218	0.1	3.1	6	0	6
MLA-175	0.1	3.1	6	0	6
MLA-670	0.2	2.8	6	0	6
MLA-538	0.1	2.6	6	0	6
MLA-134	0.3	2.6	6	0	6
MLA-284	0.1	2.5	6	0	6
MLA-731	0.2	2.3	6	0	6
MLA-692	0.1	2.3	6	0	6
MLA-652	0.0	2.3	6	0	6
MLA-695	0.1	2.2	6	0	6
MLA-312	0.1	2.2	6	0	6
MLA-291	0.1	2.2	6	0	6
MLA-708	0.2	2.1	6	0	6
MLA-452	0.0	1.9	6	0	6
MLA-230	0.1	1.9	6	0	6
MLA-672	0.1	1.8	6	0	6
MLA-547	0.1	1.8	6	0	6
MLA-720	0.1	1.7	6	0	6
MLA-678	0.1	1.7	6	0	6
MLA-208	0.0	1.5	6	0	6
MLA-694	0.1	1.4	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + natural background
MLA-698	0.1	1.1	6	0	6
MLA-205	0.0	0.6	6	0	6
MLA-196	0.0	0.6	6	0	6

Table A2 Year 5 24-hour PM_{10}

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-207	8	84	6	6	23
MLA-142	8	84	6	6	23
MLA-543	8	84	6	5	22
MLA-532	8	84	6	5	22
MLA-450	8	83	6	6	22
MLA-270	8	84	6	5	22
MLA-127	8	84	6	5	22
MLA-347	8	81	6	5	21
MLA-227	8	81	6	5	21
MLA-219	8	81	6	5	21
MLA-640	8	73	6	4	20
MLA-465	7	80	6	3	20
MLA-463	7	80	6	3	20
MLA-448	7	80	6	3	20
MLA-405	8	81	6	4	20
MLA-195	7	80	6	3	20

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-177	7	80	6	3	20
MLA-133	7	80	6	3	20
MLA-130	7	80	6	3	20
MLA-124	7	80	6	3	20
MLA-121	7	80	6	3	20
MLA-99	8	81	6	4	20
MLA-98	7	80	6	3	20
MLA-90	8	81	6	4	20
MLA-65	8	81	6	4	20
MLA-57	7	80	6	3	20
MLA-46	8	81	6	4	20
MLA-110	7	73	6	5	19
MLA-93	7	73	6	5	19
MLA-61	7	73	6	5	19
MLA-40	7	73	6	5	19
MLA-491	7	77	6	3	18
MLA-447	7	77	6	3	18
MLA-436	7	77	6	4	18
MLA-422	7	77	6	3	18
MLA-421	7	77	6	3	18
MLA-410	7	77	6	3	18
MLA-409	7	77	6	3	18
MLA-276	7	77	6	4	18
MLA-224	7	77	6	3	18
MLA-221	7	77	6	3	18
MLA-216	7	77	6	4	18

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-209	7	77	6	4	18
MLA-197	7	77	6	4	18
MLA-168	7	56	6	1	18
MLA-126	7	77	6	4	18
MLA-123	7	77	6	4	18
MLA-87	7	77	6	3	18
MLA-73	7	66	6	5	18
MLA-71	7	77	6	3	18
MLA-70	7	77	6	3	18
MLA-59	7	77	6	4	18
MLA-58	7	77	6	4	18
MLA-56	7	77	6	4	18
MLA-33	7	66	6	5	18
MLA-31	7	66	6	5	18
MLA-25	7	66	6	5	18
MLA-23	7	66	6	5	18
MLA-22	7	66	6	5	18
MLA-499	7	74	6	3	17
MLA-493	7	74	6	3	17
MLA-438	7	74	6	3	17
MLA-437	7	74	6	3	17
MLA-246	7	74	6	3	17
MLA-137	7	67	6	2	17
MLA-136	7	67	6	2	17
MLA-132	7	67	6	2	17
MLA-122	7	74	6	3	17

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-120	7	74	6	3	17
MLA-114	7	74	6	3	17
MLA-111	7	74	6	3	17
MLA-75	7	74	6	3	17
MLA-74	7	74	6	3	17
MLA-72	7	67	6	2	17
MLA-30	7	67	6	2	17
MLA-29	7	67	6	2	17
MLA-20	7	74	6	3	17
MLA-6	7	74	6	3	17
MLA-5	7	74	6	3	17
MLA-719	6	64	6	3	14
MLA-716	6	63	6	2	14
MLA-715	6	64	6	3	14
MLA-714	6	64	6	3	14
MLA-701	6	63	6	2	14
MLA-699	6	63	6	2	14
MLA-690	6	63	6	2	14
MLA-665	6	63	6	2	14
MLA-663	6	63	6	2	14
MLA-658	6	63	6	2	14
MLA-597	6	64	6	3	14
MLA-594	6	64	6	3	14
MLA-593	6	63	6	2	14
MLA-589	6	64	6	3	14
MLA-588	6	64	6	3	14

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-559	6	64	6	3	14
MLA-558	6	64	6	3	14
MLA-542	6	62	6	3	14
MLA-462	6	63	6	2	14
MLA-461	6	65	6	2	14
MLA-451	6	52	6	1	14
MLA-419	6	61	6	3	14
MLA-416	6	61	6	3	14
MLA-413	6	61	6	3	14
MLA-408	6	64	6	3	14
MLA-215	6	61	6	3	14
MLA-210	6	61	6	3	14
MLA-200	6	63	6	2	14
MLA-125	6	61	6	3	14
MLA-119	6	63	6	2	14
MLA-118	6	63	6	2	14
MLA-117	6	63	6	2	14
MLA-109	6	65	6	2	14
MLA-95	6	61	6	3	14
MLA-94	6	61	6	3	14
MLA-86	6	63	6	2	14
MLA-80	6	61	6	3	14
MLA-64	6	61	6	3	14
MLA-45	6	61	6	3	14
MLA-44	6	61	6	3	14
MLA-43	6	62	6	3	14

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-42	6	62	6	3	14
MLA-41	6	61	6	3	14
MLA-32	6	65	6	2	14
MLA-24	6	52	6	0	14
MLA-21	6	62	6	3	14
MLA-19	6	52	6	0	14
MLA-18	6	62	6	3	14
MLA-17	6	52	6	0	14
MLA-16	6	52	6	0	14
MLA-14	6	52	6	0	14
MLA-1	6	52	6	0	14
MLA-520	6	86	6	2	13
MLA-97	6	57	6	1	13
MLA-88	6	63	6	2	13
MLA-85	6	63	6	2	13
MLA-83	6	63	6	2	13
MLA-63	6	57	6	1	13
MLA-62	6	57	6	1	13
MLA-39	6	63	6	2	13
MLA-4	6	63	6	2	13
MLA-554	5	67	6	2	12
MLA-553	5	53	6	2	12
MLA-550	5	53	6	2	12
MLA-549	5	53	6	2	12
MLA-548	5	67	6	2	12
MLA-541	5	67	6	2	12

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-531	5	67	6	2	12
MLA-516	5	53	6	2	12
MLA-515	5	53	6	2	12
MLA-514	5	53	6	2	12
MLA-511	5	53	6	2	12
MLA-505	6	52	6	1	12
MLA-106	5	46	6	0	12
MLA-104	5	53	6	2	12
MLA-81	5	46	6	0	12
MLA-79	5	46	6	0	12
MLA-69	6	53	6	1	12
MLA-68	5	53	6	2	12
MLA-67	6	53	6	1	12
MLA-66	6	53	6	1	12
MLA-38	5	53	6	2	12
MLA-28	6	53	6	1	12
MLA-27	5	53	6	2	12
MLA-26	5	53	6	2	12
MLA-15	6	53	6	1	12
MLA-10	6	53	6	1	12
MLA-9	6	53	6	1	12
MLA-8	6	53	6	1	12
MLA-7	6	53	6	1	12
MLA-713	5	53	6	1	11
MLA-710	5	53	6	1	11
MLA-540	5	53	6	1	11

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-537	5	53	6	1	11
MLA-536	5	53	6	1	11
MLA-513	5	51	6	0	11
MLA-512	5	51	6	0	11
MLA-510	5	51	6	0	11
MLA-458	5	51	6	0	11
MLA-457	5	51	6	0	11
MLA-412	5	46	6	0	11
MLA-113	5	46	6	0	11
MLA-108	5	46	6	0	11
MLA-107	5	46	6	0	11
MLA-105	5	46	6	0	11
MLA-92	5	51	6	0	11
MLA-91	5	51	6	0	11
MLA-84	5	51	6	0	11
MLA-78	5	46	6	0	11
MLA-77	5	46	6	0	11
MLA-76	5	46	6	0	11
MLA-36	5	53	6	1	11
MLA-35	5	53	6	1	11
MLA-34	5	53	6	1	11
MLA-13	5	46	6	0	11
MLA-12	5	46	6	0	11
MLA-11	5	46	6	0	11
MLA-3	5	46	6	0	11
MLA-2	5	46	6	0	11

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-355	7	46	6	0	10
MLA-103	5	46	6	0	10
MLA-82	5	46	6	0	10
MLA-616	5	41	6	0	9
MLA-407	5	41	6	0	9
MLA-406	5	41	6	0	9
MLA-300	5	52	6	0	9
MLA-115	5	41	6	0	9
MLA-112	5	41	6	0	9
MLA-679	3	42	6	0	8
MLA-402	3	63	6	1	8
MLA-331	3	44	6	0	8
MLA-603	3	30	6	0	7
MLA-579	3	26	6	0	7
MLA-574	3	22	6	0	7
MLA-494	1	36	6	0	7
MLA-443	4	23	6	0	7
MLA-420	4	22	6	0	7
MLA-404	3	17	6	0	7
MLA-397	3	32	6	0	7
MLA-318	3	28	6	0	7
MLA-310	3	22	6	0	7
MLA-307	2	32	6	0	7
MLA-305	4	21	6	0	7
MLA-297	2	49	6	0	7
MLA-244	3	26	6	0	7

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
Accommodation Facilities	1	9	6	0	6
MLA-742	1	8	6	0	6
MLA-731	1	9	6	0	6
MLA-720	1	6	6	0	6
MLA-708	1	6	6	0	6
MLA-698	0	4	6	0	6
MLA-695	1	6	6	0	6
MLA-694	0	6	6	0	6
MLA-693	2	16	6	0	6
MLA-692	1	8	6	0	6
MLA-687	1	10	6	0	6
MLA-680	1	7	6	0	6
MLA-678	0	5	6	0	6
MLA-672	1	4	6	0	6
MLA-670	1	7	6	0	6
MLA-652	1	20	6	0	6
MLA-639	2	25	6	0	6
MLA-601	2	23	6	0	6
MLA-595	1	13	6	0	6
MLA-592	2	14	6	0	6
MLA-587	1	9	6	0	6
MLA-576	2	13	6	0	6
MLA-567	1	11	6	0	6
MLA-565	1	9	6	0	6
MLA-556	2	13	6	0	6
MLA-547	1	5	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-538	1	6	6	0	6
MLA-533	2	21	6	0	6
MLA-506	1	15	6	0	6
MLA-503	1	21	6	0	6
MLA-452	1	23	6	0	6
MLA-442	2	19	6	0	6
MLA-415	2	18	6	0	6
MLA-388	1	12	6	0	6
MLA-379	1	8	6	0	6
MLA-378	2	15	6	0	6
MLA-375	2	20	6	0	6
MLA-373	1	12	6	0	6
MLA-369	1	18	6	0	6
MLA-368	1	12	6	0	6
MLA-366	1	11	6	0	6
MLA-365	1	16	6	0	6
MLA-364	2	17	6	0	6
MLA-362	1	10	6	0	6
MLA-359	1	9	6	0	6
MLA-356	2	10	6	0	6
MLA-354	1	12	6	0	6
MLA-353	2	21	6	0	6
MLA-352	1	11	6	0	6
MLA-345	1	19	6	0	6
MLA-340	2	19	6	0	6
MLA-339	2	24	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-329	2	30	6	0	6
MLA-321	1	10	6	0	6
MLA-320	2	29	6	0	6
MLA-312	1	6	6	0	6
MLA-308	2	26	6	0	6
MLA-304	0	7	6	0	6
MLA-291	0	6	6	0	6
MLA-284	1	7	6	0	6
MLA-277	3	25	6	0	6
MLA-254	1	9	6	0	6
MLA-247	2	10	6	0	6
MLA-235	2	17	6	0	6
MLA-230	0	5	6	0	6
MLA-229	1	7	6	0	6
MLA-228	1	16	6	0	6
MLA-218	1	7	6	0	6
MLA-213	1	20	6	0	6
MLA-208	0	4	6	0	6
MLA-205	0	4	6	0	6
MLA-201	1	12	6	0	6
MLA-199	1	11	6	0	6
MLA-196	0	3	6	0	6
MLA-190	2	18	6	0	6
MLA-188	2	27	6	0	6
MLA-183	1	11	6	0	6
MLA-178	1	11	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-175	1	15	6	0	6
MLA-162	1	17	6	0	6
MLA-159	2	21	6	0	6
MLA-158	1	11	6	0	6
MLA-150	1	9	6	0	6
MLA-141	1	11	6	0	6
MLA-134	1	11	6	0	6
MLA-116	1	12	6	0	6
MLA-50	2	19	6	0	6
MLA-49	2	15	6	0	6

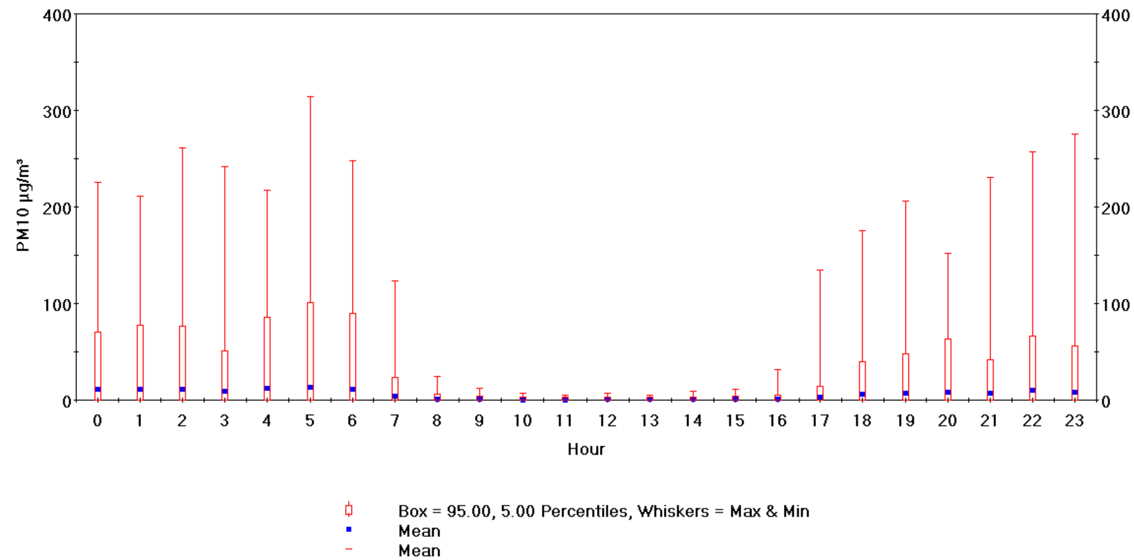


Figure A1 One hour average predicted PM_{10} concentrations

Location: MLA-520	**Data source:** CALPUFF	**Units:** µg/m^3
Type: Box and whisker plot	**Prepared by:** Andrew Wiebe	**Date:** August 2009

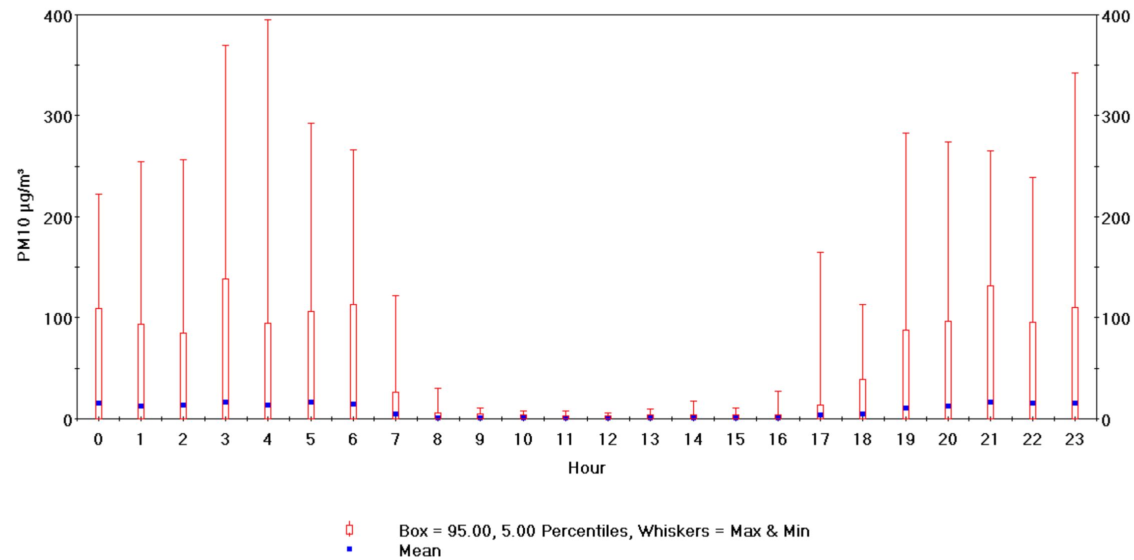


Figure A2 One hour average predicted PM_{10} concentrations

Location:	**Data source:**	**Units:**
MLA-207	CALPUFF	µg/m³
Type:	**Prepared by:**	**Date:**
Box and whisker plot	Andrew Wiebe	August 2009

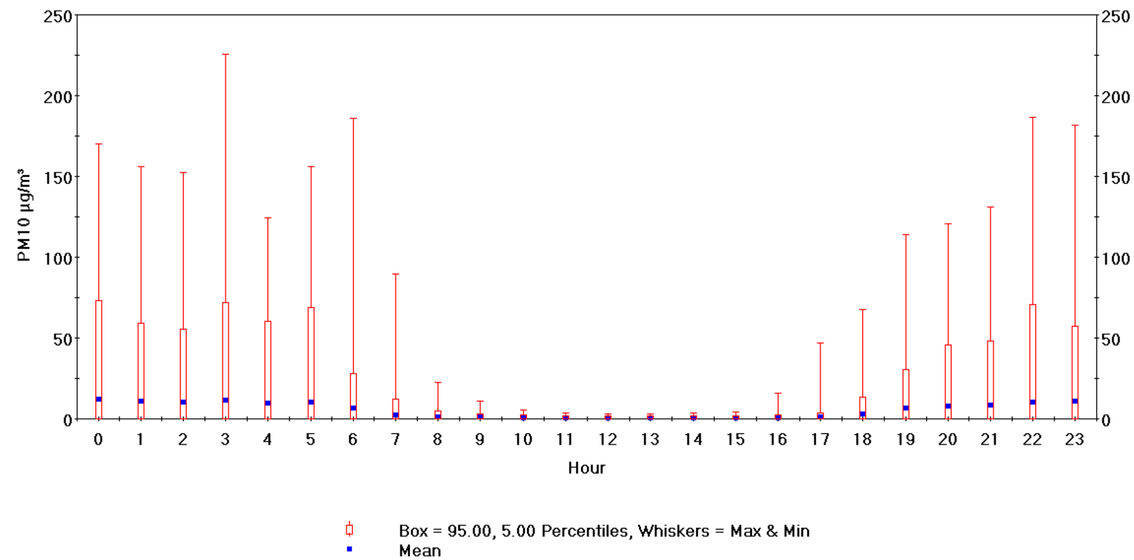


Figure A3 One hour average predicted PM_{10} concentrations

Location: MLA-300	**Data source:** CALPUFF	**Units:** µg/m³
Type: Box and whisker plot	**Prepared by:** Andrew Wiebe	**Date:** August 2009

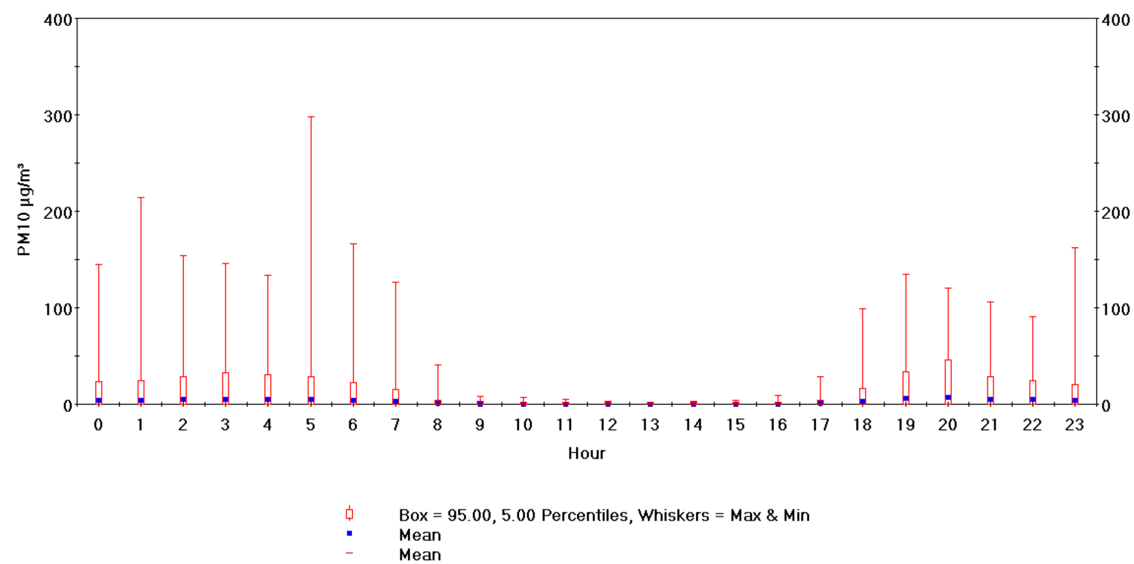


Figure A4 One hour average predicted PM_{10} concentrations

Location: MLA-402	**Data source:** CALPUFF	**Units:** µg/m^3
Type: Box and whisker plot	**Prepared by:** Andrew Wiebe	**Date:** August 2009

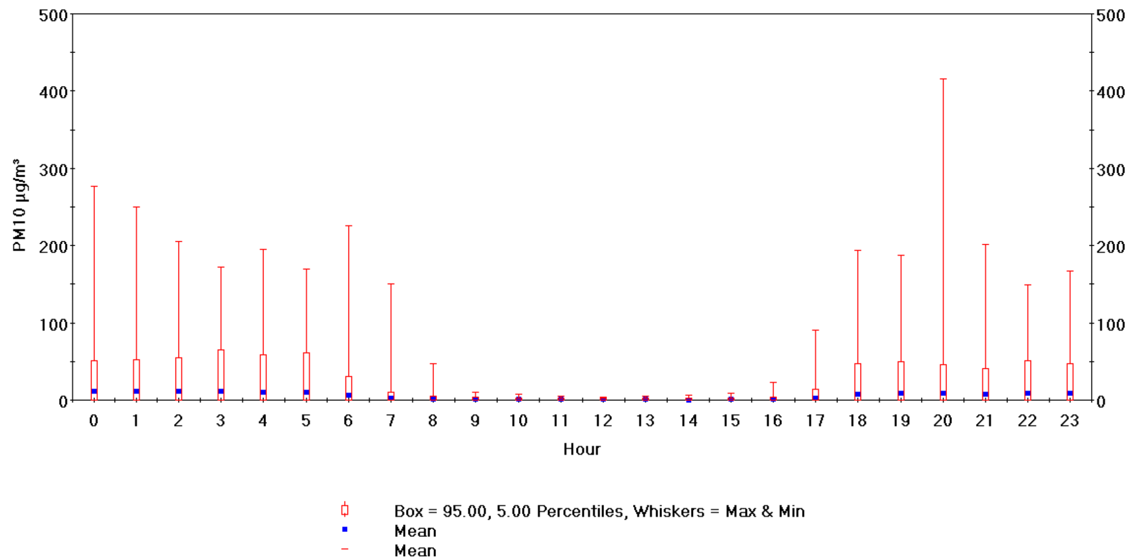


Figure A5 One hour average predicted PM_{10} concentrations

Location: MLA-505	**Data source:** CALPUFF	**Units:** µg/m³
Type: Box and whisker plot	**Prepared by:** Andrew Wiebe	**Date:** August 2009

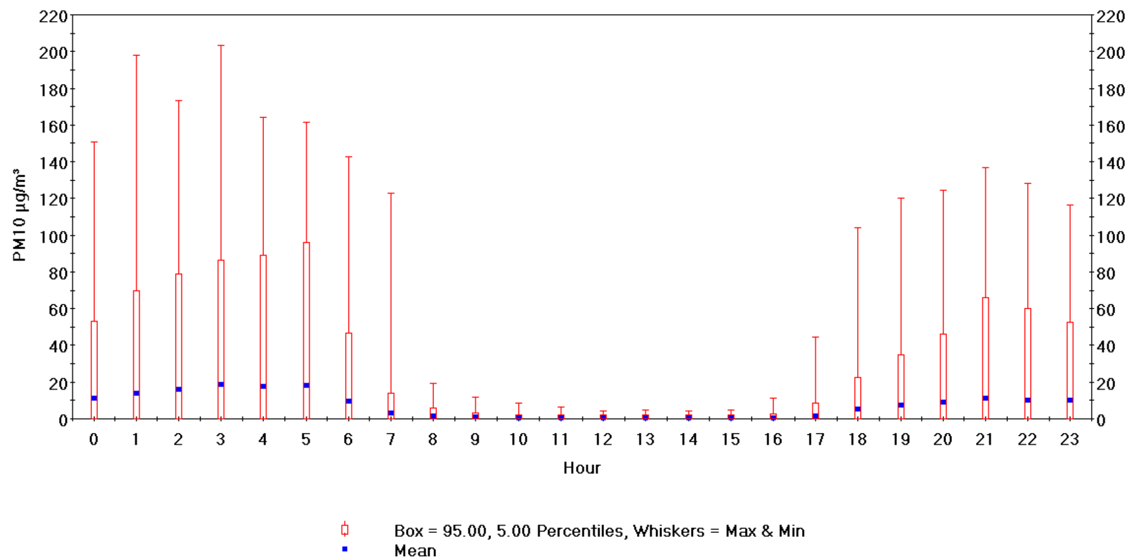


Figure A6 One hour average predicted PM_{10} concentrations

Location:	**Data source:**	**Units:**
MLA-355	CALPUFF	µg/m^3
Type:	**Prepared by:**	**Date:**
Box and whisker plot	Andrew Wiebe	August 2009

Table A3 Year 10 24-hour PM_{10}

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-520	4.4	80	6	5	16
MLA-450	2.7	65	6	2	12
MLA-543	2.5	65	6	1	11
MLA-532	2.5	65	6	1	11
MLA-270	2.5	65	6	1	11
MLA-127	2.5	64	6	1	11
MLA-405	2.3	64	6	1	10
MLA-99	2.3	64	6	1	10
MLA-90	2.3	64	6	1	10
MLA-65	2.3	64	6	1	10
MLA-46	2.3	64	6	1	10
MLA-130	2.5	64	6	1	11
MLA-465	2.5	64	6	1	11
MLA-463	2.5	64	6	1	11
MLA-448	2.5	64	6	1	11
MLA-195	2.5	64	6	1	11
MLA-177	2.5	64	6	1	11
MLA-133	2.5	64	6	1	11
MLA-124	2.5	64	6	1	11
MLA-57	2.5	64	6	1	11
MLA-121	2.5	64	6	1	11
MLA-98	2.5	64	6	1	11
MLA-347	2.2	64	6	1	10
MLA-227	2.2	64	6	1	10

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-219	2.2	64	6	1	10
MLA-276	2.3	63	6	1	11
MLA-436	2.3	63	6	1	11
MLA-216	2.3	63	6	1	11
MLA-209	2.3	63	6	1	11
MLA-197	2.3	63	6	1	11
MLA-126	2.3	63	6	1	11
MLA-123	2.3	63	6	1	11
MLA-59	2.3	63	6	1	11
MLA-58	2.3	63	6	1	11
MLA-56	2.3	63	6	1	11
MLA-73	2.8	63	6	2	11
MLA-33	2.8	63	6	2	11
MLA-31	2.8	63	6	2	11
MLA-25	2.8	63	6	2	11
MLA-23	2.8	63	6	2	11
MLA-22	2.8	63	6	2	11
MLA-447	2.2	63	6	1	10
MLA-410	2.2	63	6	1	10
MLA-409	2.2	63	6	1	10
MLA-491	2.2	63	6	1	10
MLA-422	2.2	63	6	1	10
MLA-421	2.2	63	6	1	10
MLA-224	2.2	63	6	1	10
MLA-221	2.2	63	6	1	10

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-87	2.2	63	6	1	10
MLA-71	2.2	63	6	1	10
MLA-70	2.2	63	6	1	10
MLA-207	2.2	62	6	2	10
MLA-142	2.2	62	6	2	10
MLA-137	2.6	60	6	2	11
MLA-136	2.6	60	6	2	11
MLA-132	2.6	60	6	2	11
MLA-72	2.6	60	6	2	11
MLA-30	2.6	60	6	2	11
MLA-29	2.6	60	6	2	11
MLA-246	2.0	58	6	1	9
MLA-499	2.0	58	6	1	9
MLA-438	2.0	58	6	1	9
MLA-437	2.0	58	6	1	9
MLA-114	2.0	58	6	1	9
MLA-111	2.0	58	6	1	9
MLA-20	2.0	58	6	1	9
MLA-6	2.0	58	6	1	9
MLA-5	2.0	58	6	1	9
MLA-493	2.0	58	6	1	9
MLA-122	2.0	58	6	1	9
MLA-120	2.0	58	6	1	9
MLA-75	2.0	58	6	1	9
MLA-74	2.0	58	6	1	9

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-640	2.1	58	6	2	9
MLA-461	2.4	57	6	1	11
MLA-109	2.4	57	6	1	11
MLA-32	2.4	57	6	1	11
MLA-24	2.7	57	6	2	11
MLA-19	2.7	57	6	2	11
MLA-17	2.7	57	6	2	11
MLA-16	2.7	57	6	2	11
MLA-14	2.7	57	6	2	11
MLA-1	2.7	57	6	2	11
MLA-716	2.3	56	6	1	10
MLA-701	2.3	56	6	1	10
MLA-699	2.3	56	6	1	10
MLA-690	2.3	56	6	1	10
MLA-665	2.3	56	6	1	10
MLA-663	2.3	56	6	1	10
MLA-658	2.3	56	6	1	10
MLA-593	2.3	56	6	1	10
MLA-462	2.3	56	6	1	10
MLA-200	2.3	56	6	1	10
MLA-119	2.3	56	6	1	10
MLA-118	2.3	56	6	1	10
MLA-117	2.3	56	6	1	10
MLA-86	2.3	56	6	1	10
MLA-106	2.6	55	6	1	11

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-81	2.6	55	6	1	11
MLA-79	2.6	55	6	1	11
MLA-110	1.8	55	6	1	8
MLA-61	1.8	55	6	1	8
MLA-93	1.8	55	6	1	8
MLA-40	1.8	55	6	1	8
MLA-616	2.4	54	6	1	9
MLA-115	2.4	54	6	1	9
MLA-112	2.4	54	6	1	9
MLA-407	2.4	54	6	1	9
MLA-542	1.7	54	6	1	8
MLA-43	1.7	54	6	1	8
MLA-42	1.7	54	6	1	8
MLA-21	1.7	54	6	1	8
MLA-18	1.7	54	6	1	8
MLA-719	2.1	53	6	1	10
MLA-715	2.1	53	6	1	10
MLA-714	2.1	53	6	1	10
MLA-597	2.1	53	6	1	10
MLA-594	2.1	53	6	1	10
MLA-589	2.1	53	6	1	10
MLA-588	2.1	53	6	1	10
MLA-559	2.1	53	6	1	10
MLA-558	2.1	53	6	1	10
MLA-408	2.1	53	6	1	10

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-45	1.8	53	6	1	8
MLA-44	1.8	53	6	1	8
MLA-419	1.8	53	6	1	8
MLA-416	1.8	53	6	1	8
MLA-413	1.8	53	6	1	8
MLA-215	1.8	53	6	1	8
MLA-210	1.8	53	6	1	8
MLA-125	1.8	53	6	1	8
MLA-95	1.8	53	6	1	8
MLA-94	1.8	53	6	1	8
MLA-80	1.8	53	6	1	8
MLA-64	1.8	53	6	1	8
MLA-41	1.8	53	6	1	8
MLA-69	2.5	53	6	2	11
MLA-67	2.5	53	6	2	11
MLA-66	2.5	53	6	2	11
MLA-28	2.5	53	6	2	11
MLA-15	2.5	53	6	2	11
MLA-10	2.5	53	6	2	11
MLA-9	2.5	53	6	2	11
MLA-8	2.5	53	6	2	11
MLA-7	2.5	53	6	2	11
MLA-412	2.4	53	6	1	10
MLA-113	2.4	53	6	1	10
MLA-108	2.4	53	6	1	10

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-107	2.4	53	6	1	10
MLA-105	2.4	53	6	1	10
MLA-78	2.4	53	6	1	10
MLA-77	2.4	53	6	1	10
MLA-76	2.4	53	6	1	10
MLA-13	2.4	53	6	1	10
MLA-12	2.4	53	6	1	10
MLA-11	2.4	53	6	1	10
MLA-3	2.4	53	6	1	10
MLA-2	2.4	53	6	1	10
MLA-406	2.2	52	6	1	9
MLA-50	3.5	51	6	1	8
MLA-103	2.3	51	6	0	10
MLA-82	2.3	51	6	0	10
MLA-88	2.0	49	6	0	9
MLA-85	2.0	49	6	0	9
MLA-83	2.0	49	6	0	9
MLA-39	2.0	49	6	0	9
MLA-4	2.0	49	6	0	9
MLA-513	2.2	47	6	0	9
MLA-512	2.2	47	6	0	9
MLA-510	2.2	47	6	0	9
MLA-458	2.2	47	6	0	9
MLA-457	2.2	47	6	0	9
MLA-92	2.2	47	6	0	9

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-91	2.2	47	6	0	9
MLA-84	2.2	47	6	0	9
MLA-713	2.1	45	6	0	9
MLA-710	2.1	45	6	0	9
MLA-540	2.1	45	6	0	9
MLA-537	2.1	45	6	0	9
MLA-536	2.1	45	6	0	9
MLA-36	2.1	45	6	0	9
MLA-35	2.1	45	6	0	9
MLA-34	2.1	45	6	0	9
MLA-553	1.8	45	6	0	8
MLA-550	1.8	45	6	0	8
MLA-549	1.8	45	6	0	8
MLA-516	1.8	45	6	0	8
MLA-515	1.8	45	6	0	8
MLA-514	1.8	45	6	0	8
MLA-511	1.8	45	6	0	8
MLA-104	1.8	45	6	0	8
MLA-68	1.8	45	6	0	8
MLA-38	1.8	45	6	0	8
MLA-27	1.8	45	6	0	8
MLA-26	1.8	45	6	0	8
MLA-595	5.9	44	6	0	12
MLA-97	1.7	44	6	0	8
MLA-63	1.7	44	6	0	8

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-62	1.7	44	6	0	8
MLA-451	1.6	42	6	0	8
MLA-505	4.4	42	6	0	9
MLA-175	2.2	39	6	0	8
MLA-554	3.0	35	6	0	7
MLA-548	3.0	35	6	0	7
MLA-541	3.0	35	6	0	7
MLA-531	3.0	35	6	0	7
MLA-579	2.4	33	6	0	7
MLA-574	0.6	33	6	0	6
MLA-300	3.1	32	6	0	7
MLA-364	2.7	30	6	0	7
MLA-49	3.2	28	6	0	7
MLA-159	2.0	27	6	0	6
MLA-404	3.2	26	6	0	7
MLA-378	2.5	26	6	0	7
MLA-692	2.1	25	6	0	6
MLA-356	2.0	25	6	0	6
MLA-601	1.7	24	6	0	6
MLA-308	0.6	24	6	0	6
MLA-603	1.7	24	6	0	6
MLA-415	1.8	23	6	0	6
MLA-679	1.7	23	6	0	6
MLA-355	3.4	22	6	0	7
MLA-695	1.7	22	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-693	1.5	21	6	0	6
MLA-168	1.5	21	6	0	6
MLA-318	2.1	20	6	0	6
MLA-375	1.3	20	6	0	6
MLA-397	2.0	19	6	0	6
MLA-353	1.3	19	6	0	6
MLA-199	1.3	18	6	0	6
MLA-297	1.5	17	6	0	6
MLA-305	2.2	17	6	0	6
MLA-402	1.6	17	6	0	6
MLA-134	1.9	16	6	0	6
Accommodation facilities	1.6	16	6	0	6
MLA-244	1.3	15	6	0	6
MLA-503	0.4	15	6	0	6
MLA-331	1.5	15	6	0	6
MLA-188	1.7	14	6	0	6
MLA-639	0.9	14	6	0	6
MLA-307	1.3	14	6	0	6
MLA-533	0.7	14	6	0	6
MLA-277	1.2	14	6	0	6
MLA-329	1.0	13	6	0	6
MLA-494	0.4	13	6	0	6
MLA-320	1.1	12	6	0	6
MLA-720	1.6	12	6	0	6
MLA-678	1.3	12	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-576	0.6	12	6	0	7
MLA-556	0.6	12	6	0	7
MLA-442	1.0	12	6	0	6
MLA-443	2.1	12	6	0	6
MLA-235	0.7	12	6	0	6
MLA-196	0.7	11	6	0	6
MLA-420	2.0	11	6	0	6
MLA-592	1.7	11	6	0	6
MLA-228	0.7	11	6	0	6
MLA-190	1.0	11	6	0	6
MLA-339	1.1	11	6	0	6
MLA-205	0.7	11	6	0	6
MLA-310	1.2	10	6	0	6
MLA-162	0.4	10	6	0	6
MLA-694	1.1	9	6	0	6
MLA-183	0.6	9	6	0	6
MLA-708	1.1	9	6	0	6
MLA-547	1.0	9	6	0	6
MLA-213	1.1	9	6	0	6
MLA-742	1.2	9	6	0	6
MLA-158	0.9	8	6	0	6
MLA-340	0.9	8	6	0	6
MLA-687	1.0	8	6	0	6
MLA-506	1.1	8	6	0	6
MLA-345	0.8	7	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-373	0.5	7	6	0	6
MLA-388	0.5	7	6	0	6
MLA-652	0.2	7	6	0	6
MLA-698	0.8	7	6	0	6
MLA-368	0.5	7	6	0	6
MLA-312	0.4	6	6	0	6
MLA-284	0.4	6	6	0	6
MLA-359	0.6	6	6	0	6
MLA-254	0.4	6	6	0	6
MLA-141	0.4	6	6	0	6
MLA-369	0.7	6	6	0	6
MLA-291	0.3	6	6	0	6
MLA-352	0.6	6	6	0	6
MLA-452	0.2	6	6	0	6
MLA-365	0.7	6	6	0	6
MLA-178	0.3	5	6	0	6
MLA-672	0.7	5	6	0	6
MLA-680	0.5	5	6	0	6
MLA-354	0.6	5	6	0	6
MLA-366	0.5	5	6	0	6
MLA-230	0.3	5	6	0	6
MLA-362	0.5	5	6	0	6
MLA-538	0.5	4	6	0	6
MLA-379	0.5	4	6	0	6
MLA-304	0.2	4	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-229	0.3	4	6	0	6
MLA-218	0.3	4	6	0	6
MLA-208	0.2	3	6	0	6

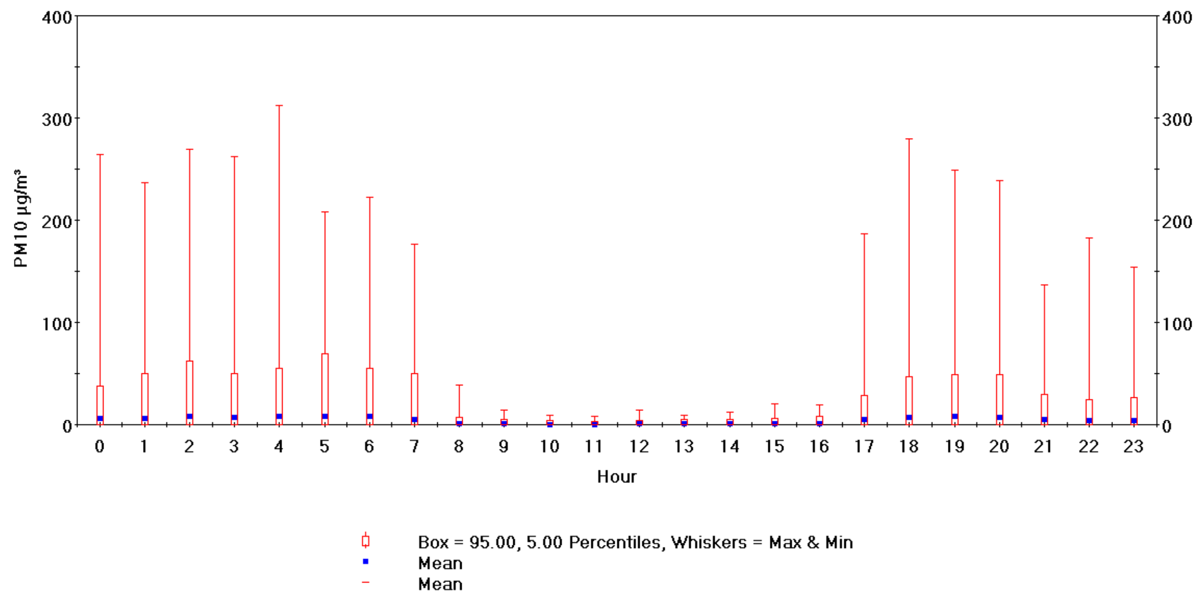


Figure A7 One hour average predicted PM_{10} concentrations

Location: MLA-520	**Data source:** CALPUFF	**Units:** µg/m³
Type: Box and whisker plot	**Prepared by:** Andrew Wiebe	**Date:** August 2009

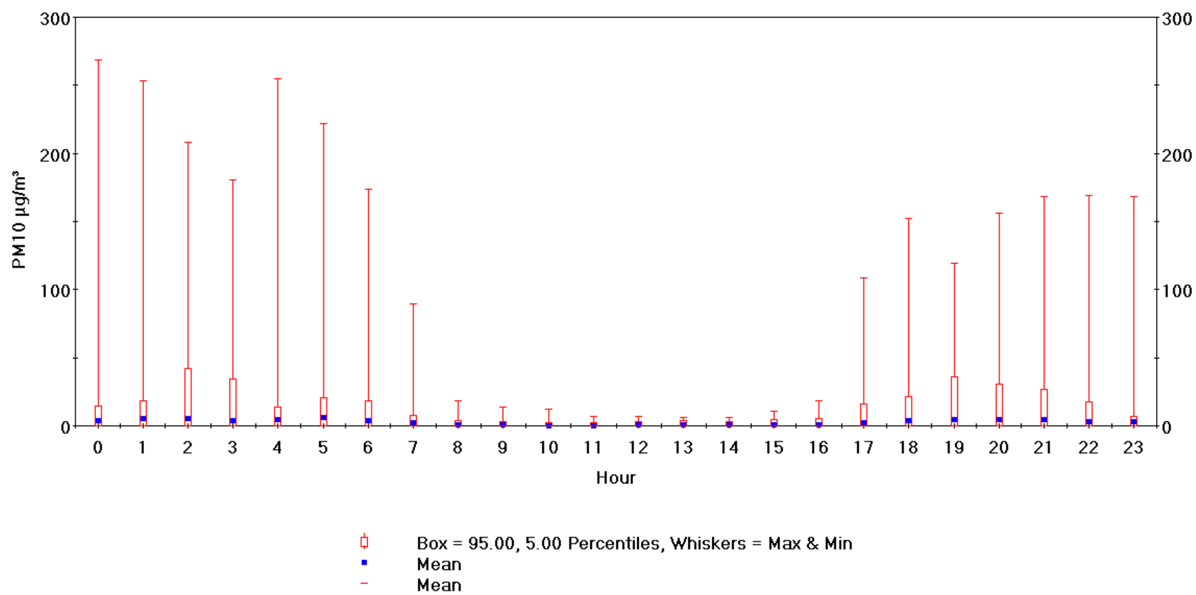


Figure A8 One hour average predicted PM_{10} concentrations

Location: MLA-450	**Data source:** CALPUFF	**Units:** µg/m³
Type: Box and whisker plot	**Prepared by:** Andrew Wiebe	**Date:** August 2009

Table A4 Year 20 24-hour PM_{10}

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-116	6.7	67	6	1	15
MLA-595	6.0	64	6	2	14
MLA-300	5.9	58	6	1	12
MLA-355	6.9	45	6	0	10
MLA-50	5.3	48	6	0	9
MLA-554	3.0	56	6	1	8
MLA-548	3.0	56	6	1	8
MLA-541	3.0	56	6	1	8
MLA-531	3.0	56	6	1	8
MLA-404	4.9	36	6	0	8
MLA-505	1.9	38	6	0	7
MLA-443	3.5	26	6	0	7
MLA-420	3.2	23	6	0	7
MLA-321	2.9	21	6	0	7
MLA-305	3.9	23	6	0	7
MLA-247	3.4	25	6	0	7
MLA-201	3.3	22	6	0	7
MLA-49	4.1	34	6	0	7
Accommodation Facilities	1.3	8	6	0	6
MLA-742	1.3	10	6	0	6
MLA-731	2.1	19	6	0	6
MLA-720	1.5	9	6	0	6
MLA-719	0.7	15	6	0	6
MLA-716	0.7	16	6	0	6
MLA-715	0.7	15	6	0	6
MLA-714	0.7	15	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-713	0.7	16	6	0	6
MLA-710	0.7	16	6	0	6
MLA-708	1.4	14	6	0	6
MLA-701	0.7	16	6	0	6
MLA-699	0.7	16	6	0	6
MLA-698	0.6	7	6	0	6
MLA-695	1.2	9	6	0	6
MLA-694	0.9	7	6	0	6
MLA-693	1.6	15	6	0	6
MLA-692	1.4	9	6	0	6
MLA-690	0.7	16	6	0	6
MLA-687	1.2	8	6	0	6
MLA-680	0.6	7	6	0	6
MLA-679	1.5	24	6	0	6
MLA-678	0.8	9	6	0	6
MLA-672	0.9	6	6	0	6
MLA-670	1.3	10	6	0	6
MLA-665	0.7	16	6	0	6
MLA-663	0.7	16	6	0	6
MLA-658	0.7	16	6	0	6
MLA-652	0.2	10	6	0	6
MLA-640	0.6	16	6	0	6
MLA-639	1.0	15	6	0	6
MLA-616	0.7	18	6	0	6
MLA-603	1.4	34	6	0	6
MLA-601	1.1	32	6	0	6
MLA-597	0.7	15	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-594	0.7	15	6	0	6
MLA-593	0.7	16	6	0	6
MLA-592	1.7	20	6	0	6
MLA-589	0.7	15	6	0	6
MLA-588	0.7	15	6	0	6
MLA-587	1.6	9	6	0	6
MLA-579	1.2	34	6	0	6
MLA-576	2.0	11	6	0	6
MLA-574	0.3	8	6	0	6
MLA-567	1.8	12	6	0	6
MLA-565	1.8	11	6	0	6
MLA-559	0.7	15	6	0	6
MLA-558	0.7	15	6	0	6
MLA-556	2.0	11	6	0	6
MLA-553	0.6	14	6	0	6
MLA-550	0.6	14	6	0	6
MLA-549	0.6	14	6	0	6
MLA-547	1.3	10	6	0	6
MLA-543	0.7	18	6	0	6
MLA-542	0.6	14	6	0	6
MLA-540	0.7	16	6	0	6
MLA-538	0.5	6	6	0	6
MLA-537	0.7	16	6	0	6
MLA-536	0.7	16	6	0	6
MLA-533	0.4	9	6	0	6
MLA-532	0.7	18	6	0	6
MLA-520	1.2	33	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-516	0.6	14	6	0	6
MLA-515	0.6	14	6	0	6
MLA-514	0.6	14	6	0	6
MLA-513	0.7	16	6	0	6
MLA-512	0.7	16	6	0	6
MLA-511	0.6	14	6	0	6
MLA-510	0.7	16	6	0	6
MLA-506	1.2	11	6	0	6
MLA-503	0.2	8	6	0	6
MLA-499	0.6	15	6	0	6
MLA-494	0.2	5	6	0	6
MLA-493	0.6	15	6	0	6
MLA-491	0.7	17	6	0	6
MLA-465	0.8	19	6	0	6
MLA-463	0.8	19	6	0	6
MLA-462	0.7	16	6	0	6
MLA-461	0.8	18	6	0	6
MLA-458	0.7	16	6	0	6
MLA-457	0.7	16	6	0	6
MLA-452	0.2	10	6	0	6
MLA-451	0.5	14	6	0	6
MLA-450	0.8	20	6	0	6
MLA-448	0.8	19	6	0	6
MLA-447	0.7	16	6	0	6
MLA-442	1.5	25	6	0	6
MLA-438	0.6	15	6	0	6
MLA-437	0.6	15	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-436	0.7	18	6	0	6
MLA-422	0.7	17	6	0	6
MLA-421	0.7	17	6	0	6
MLA-419	0.6	13	6	0	6
MLA-416	0.6	13	6	0	6
MLA-415	2.4	16	6	0	6
MLA-413	0.6	13	6	0	6
MLA-412	0.8	17	6	0	6
MLA-410	0.7	16	6	0	6
MLA-409	0.7	16	6	0	6
MLA-408	0.7	15	6	0	6
MLA-407	0.7	18	6	0	6
MLA-406	0.7	18	6	0	6
MLA-405	0.7	18	6	0	6
MLA-402	1.5	20	6	0	6
MLA-397	1.4	12	6	0	6
MLA-388	0.5	5	6	0	6
MLA-379	0.7	7	6	0	6
MLA-378	1.7	16	6	0	6
MLA-375	1.3	24	6	0	6
MLA-373	0.5	4	6	0	6
MLA-369	0.8	10	6	0	6
MLA-368	0.5	5	6	0	6
MLA-366	0.7	6	6	0	6
MLA-365	0.7	9	6	0	6
MLA-364	2.0	22	6	0	6
MLA-362	0.6	6	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-359	0.7	5	6	0	6
MLA-356	1.2	14	6	0	6
MLA-354	0.6	7	6	0	6
MLA-353	1.3	20	6	0	6
MLA-352	0.7	5	6	0	6
MLA-347	0.7	17	6	0	6
MLA-345	0.8	11	6	0	6
MLA-340	0.9	13	6	0	6
MLA-339	1.2	21	6	0	6
MLA-331	1.4	16	6	0	6
MLA-329	0.8	12	6	0	6
MLA-320	1.1	16	6	0	6
MLA-318	1.6	19	6	0	6
MLA-312	0.4	8	6	0	6
MLA-310	1.1	10	6	0	6
MLA-308	0.5	27	6	0	6
MLA-307	1.5	25	6	0	6
MLA-304	0.2	5	6	0	6
MLA-297	1.3	19	6	0	6
MLA-291	0.3	5	6	0	6
MLA-284	0.3	6	6	0	6
MLA-277	1.3	11	6	0	6
MLA-276	0.7	18	6	0	6
MLA-270	0.7	18	6	0	6
MLA-254	0.3	5	6	0	6
MLA-246	0.6	15	6	0	6
MLA-244	1.8	12	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-235	0.6	12	6	0	6
MLA-230	0.3	6	6	0	6
MLA-229	0.3	5	6	0	6
MLA-228	0.6	11	6	0	6
MLA-227	0.7	17	6	0	6
MLA-224	0.7	17	6	0	6
MLA-221	0.7	17	6	0	6
MLA-219	0.7	17	6	0	6
MLA-218	0.3	5	6	0	6
MLA-216	0.7	18	6	0	6
MLA-215	0.6	13	6	0	6
MLA-213	1.2	11	6	0	6
MLA-210	0.6	13	6	0	6
MLA-209	0.7	18	6	0	6
MLA-208	0.2	3	6	0	6
MLA-207	0.7	17	6	0	6
MLA-205	0.4	7	6	0	6
MLA-200	0.7	16	6	0	6
MLA-199	1.1	8	6	0	6
MLA-197	0.7	18	6	0	6
MLA-196	0.4	5	6	0	6
MLA-195	0.8	19	6	0	6
MLA-190	1.1	9	6	0	6
MLA-188	1.8	15	6	0	6
MLA-183	0.5	6	6	0	6
MLA-178	0.3	9	6	0	6
MLA-177	0.8	19	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-175	1.8	24	6	0	6
MLA-168	0.9	22	6	0	6
MLA-162	0.4	13	6	0	6
MLA-159	1.8	17	6	0	6
MLA-158	1.2	8	6	0	6
MLA-150	1.8	12	6	0	6
MLA-142	0.7	17	6	0	6
MLA-141	0.4	8	6	0	6
MLA-137	0.8	19	6	0	6
MLA-136	0.8	19	6	0	6
MLA-134	2.7	18	6	0	6
MLA-133	0.8	19	6	0	6
MLA-132	0.8	19	6	0	6
MLA-130	0.8	19	6	0	6
MLA-127	0.7	18	6	0	6
MLA-126	0.7	18	6	0	6
MLA-125	0.6	13	6	0	6
MLA-124	0.8	19	6	0	6
MLA-123	0.7	18	6	0	6
MLA-122	0.6	15	6	0	6
MLA-121	0.8	19	6	0	6
MLA-120	0.6	15	6	0	6
MLA-119	0.7	16	6	0	6
MLA-118	0.7	16	6	0	6
MLA-117	0.7	16	6	0	6
MLA-115	0.7	18	6	0	6
MLA-114	0.6	15	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-113	0.8	17	6	0	6
MLA-112	0.7	18	6	0	6
MLA-111	0.6	15	6	0	6
MLA-110	0.6	13	6	0	6
MLA-109	0.8	18	6	0	6
MLA-108	0.8	17	6	0	6
MLA-107	0.8	17	6	0	6
MLA-106	0.8	17	6	0	6
MLA-105	0.8	17	6	0	6
MLA-104	0.6	14	6	0	6
MLA-103	0.7	17	6	0	6
MLA-99	0.7	18	6	0	6
MLA-98	0.8	19	6	0	6
MLA-97	0.6	14	6	0	6
MLA-95	0.6	13	6	0	6
MLA-94	0.6	13	6	0	6
MLA-93	0.6	13	6	0	6
MLA-92	0.7	16	6	0	6
MLA-91	0.7	16	6	0	6
MLA-90	0.7	18	6	0	6
MLA-88	0.6	14	6	0	6
MLA-87	0.7	17	6	0	6
MLA-86	0.7	16	6	0	6
MLA-85	0.6	14	6	0	6
MLA-84	0.7	16	6	0	6
MLA-83	0.6	14	6	0	6
MLA-82	0.7	17	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-81	0.8	17	6	0	6
MLA-80	0.6	13	6	0	6
MLA-79	0.8	17	6	0	6
MLA-78	0.8	17	6	0	6
MLA-77	0.8	17	6	0	6
MLA-76	0.8	17	6	0	6
MLA-75	0.6	15	6	0	6
MLA-74	0.6	15	6	0	6
MLA-73	0.8	20	6	0	6
MLA-72	0.8	19	6	0	6
MLA-71	0.7	17	6	0	6
MLA-70	0.7	17	6	0	6
MLA-69	0.8	18	6	0	6
MLA-68	0.6	14	6	0	6
MLA-67	0.8	18	6	0	6
MLA-66	0.8	18	6	0	6
MLA-65	0.7	18	6	0	6
MLA-64	0.6	13	6	0	6
MLA-63	0.6	14	6	0	6
MLA-62	0.6	14	6	0	6
MLA-61	0.6	13	6	0	6
MLA-59	0.7	18	6	0	6
MLA-58	0.7	18	6	0	6
MLA-57	0.8	19	6	0	6
MLA-56	0.7	18	6	0	6
MLA-46	0.7	18	6	0	6
MLA-45	0.6	13	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-44	0.6	13	6	0	6
MLA-43	0.6	14	6	0	6
MLA-42	0.6	14	6	0	6
MLA-41	0.6	13	6	0	6
MLA-40	0.6	13	6	0	6
MLA-39	0.6	14	6	0	6
MLA-38	0.6	14	6	0	6
MLA-36	0.7	16	6	0	6
MLA-35	0.7	16	6	0	6
MLA-34	0.7	16	6	0	6
MLA-33	0.8	20	6	0	6
MLA-32	0.8	18	6	0	6
MLA-31	0.8	20	6	0	6
MLA-30	0.8	19	6	0	6
MLA-29	0.8	19	6	0	6
MLA-28	0.8	18	6	0	6
MLA-27	0.6	14	6	0	6
MLA-26	0.6	14	6	0	6
MLA-25	0.8	20	6	0	6
MLA-24	0.8	19	6	0	6
MLA-23	0.8	20	6	0	6
MLA-22	0.8	20	6	0	6
MLA-21	0.6	14	6	0	6
MLA-20	0.6	15	6	0	6
MLA-19	0.8	19	6	0	6
MLA-18	0.6	14	6	0	6
MLA-17	0.8	19	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-16	0.8	19	6	0	6
MLA-15	0.8	18	6	0	6
MLA-14	0.8	19	6	0	6
MLA-13	0.8	17	6	0	6
MLA-12	0.8	17	6	0	6
MLA-11	0.8	17	6	0	6
MLA-10	0.8	18	6	0	6
MLA-9	0.8	18	6	0	6
MLA-8	0.8	18	6	0	6
MLA-7	0.8	18	6	0	6
MLA-6	0.6	15	6	0	6
MLA-5	0.6	15	6	0	6
MLA-4	0.6	14	6	0	6
MLA-3	0.8	17	6	0	6
MLA-2	0.8	17	6	0	6
MLA-1	0.8	19	6	0	6

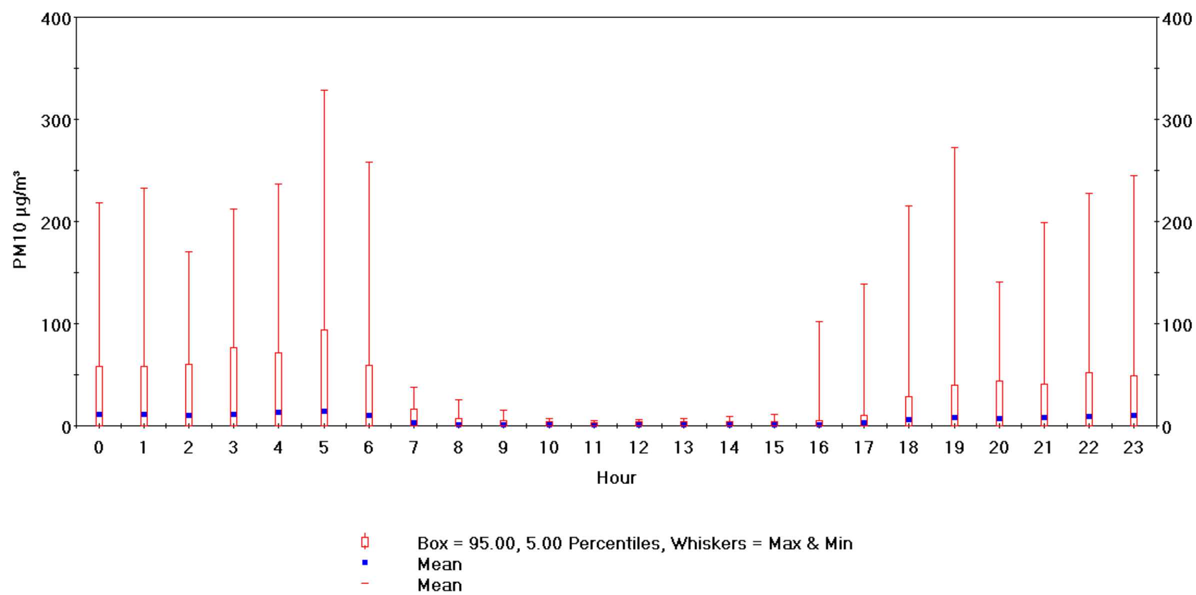


Figure A9 One hour average predicted PM_{10} concentrations

Location: MLA-595	**Data source:** CALPUFF	**Units:** µg/m^3
Type: Box and whisker plot	**Prepared by:** Andrew Wiebe	**Date:** August 2009

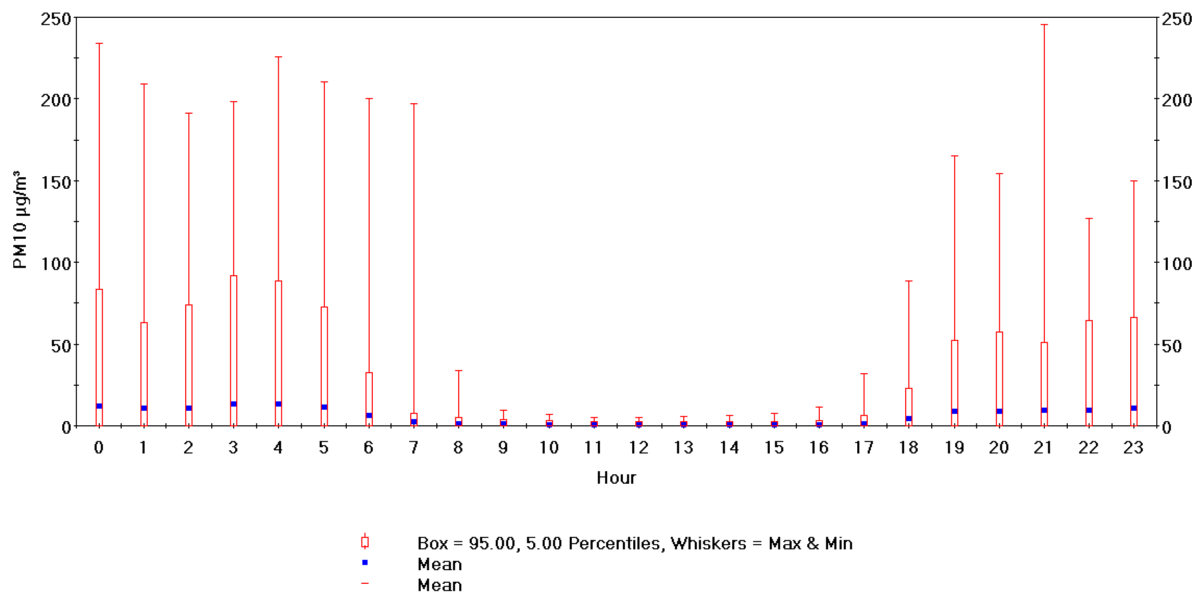


Figure A10 One hour average predicted PM_{10} concentrations

Location:	**Data source:**	**Units:**
MLA-300	CALPUFF	µg/m³
Type:	**Prepared by:**	**Date:**
Box and whisker plot	Andrew Wiebe	August 2009

Table A5 Year 30 24-hour PM_{10}

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-300	7.4	61	6	4	16
MLA-355	6.6	43	6	0	9
MLA-595	3.6	31	6	0	7
MLA-554	2.5	34	6	0	7
MLA-548	2.5	34	6	0	7
MLA-541	2.5	34	6	0	7
MLA-531	2.5	34	6	0	7
MLA-505	2.0	39	6	0	7
MLA-443	3.7	27	6	0	7
MLA-420	3.2	24	6	0	7
MLA-404	3.0	20	6	0	7
MLA-305	3.1	18	6	0	7
MLA-175	2.0	35	6	0	7
MLA-159	2.0	34	6	0	7
MLA-116	3.9	33	6	0	7
Accommodation Facilities	1.6	9	6	0	6
MLA-742	1.2	8	6	0	6
MLA-731	1.3	12	6	0	6
MLA-720	1.0	9	6	0	6
MLA-719	1.5	16	6	0	6
MLA-716	1.5	16	6	0	6
MLA-715	1.5	16	6	0	6
MLA-714	1.5	16	6	0	6
MLA-713	1.5	16	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-710	1.5	16	6	0	6
MLA-708	1.0	7	6	0	6
MLA-701	1.5	16	6	0	6
MLA-699	1.5	16	6	0	6
MLA-698	0.4	5	6	0	6
MLA-695	1.1	9	6	0	6
MLA-694	0.6	7	6	0	6
MLA-693	1.4	10	6	0	6
MLA-692	1.4	10	6	0	6
MLA-690	1.5	16	6	0	6
MLA-687	0.9	6	6	0	6
MLA-680	0.5	4	6	0	6
MLA-679	1.3	16	6	0	6
MLA-678	0.7	6	6	0	6
MLA-672	0.6	4	6	0	6
MLA-670	1.0	6	6	0	6
MLA-665	1.5	16	6	0	6
MLA-663	1.5	16	6	0	6
MLA-658	1.5	16	6	0	6
MLA-652	0.2	9	6	0	6
MLA-640	1.7	18	6	0	6
MLA-639	0.8	12	6	0	6
MLA-616	1.6	23	6	0	6
MLA-603	0.8	14	6	0	6
MLA-601	0.8	11	6	0	6
MLA-597	1.5	16	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-594	1.5	16	6	0	6
MLA-593	1.5	16	6	0	6
MLA-592	1.6	28	6	0	6
MLA-589	1.5	16	6	0	6
MLA-588	1.5	16	6	0	6
MLA-587	1.2	9	6	0	6
MLA-579	1.6	26	6	0	6
MLA-576	0.7	7	6	0	6
MLA-574	1.0	11	6	0	6
MLA-567	1.5	9	6	0	6
MLA-565	1.3	7	6	0	6
MLA-559	1.5	16	6	0	6
MLA-558	1.5	16	6	0	6
MLA-556	0.7	7	6	0	6
MLA-553	1.4	15	6	0	6
MLA-550	1.4	15	6	0	6
MLA-549	1.4	15	6	0	6
MLA-547	0.9	6	6	0	6
MLA-543	1.7	18	6	0	6
MLA-542	1.4	15	6	0	6
MLA-540	1.5	16	6	0	6
MLA-538	0.5	3	6	0	6
MLA-537	1.5	16	6	0	6
MLA-536	1.5	16	6	0	6
MLA-533	0.9	15	6	0	6
MLA-532	1.7	18	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-520	1.4	16	6	0	6
MLA-516	1.4	15	6	0	6
MLA-515	1.4	15	6	0	6
MLA-514	1.4	15	6	0	6
MLA-513	1.5	16	6	0	6
MLA-512	1.5	16	6	0	6
MLA-511	1.4	15	6	0	6
MLA-510	1.5	16	6	0	6
MLA-506	1.1	8	6	0	6
MLA-503	0.3	9	6	0	6
MLA-499	1.5	16	6	0	6
MLA-494	0.4	15	6	0	6
MLA-493	1.7	18	6	0	6
MLA-491	1.7	18	6	0	6
MLA-465	1.7	18	6	0	6
MLA-463	1.7	18	6	0	6
MLA-462	1.5	16	6	0	6
MLA-461	1.5	16	6	0	6
MLA-458	1.5	16	6	0	6
MLA-457	1.5	16	6	0	6
MLA-452	0.3	12	6	0	6
MLA-451	1.4	15	6	0	6
MLA-450	1.7	26	6	0	6
MLA-448	1.7	18	6	0	6
MLA-447	1.5	16	6	0	6
MLA-442	1.8	26	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-438	1.5	16	6	0	6
MLA-437	1.5	16	6	0	6
MLA-436	1.7	18	6	0	6
MLA-422	1.7	18	6	0	6
MLA-421	1.7	18	6	0	6
MLA-419	1.4	15	6	0	6
MLA-416	1.4	15	6	0	6
MLA-415	2.0	17	6	0	6
MLA-413	1.4	15	6	0	6
MLA-412	1.6	23	6	0	6
MLA-410	1.5	16	6	0	6
MLA-409	1.5	16	6	0	6
MLA-408	1.5	16	6	0	6
MLA-407	1.3	18	6	0	6
MLA-406	1.6	23	6	0	6
MLA-405	1.7	18	6	0	6
MLA-402	0.9	17	6	0	6
MLA-397	0.9	8	6	0	6
MLA-388	0.3	5	6	0	6
MLA-379	0.5	5	6	0	6
MLA-378	0.6	8	6	0	6
MLA-375	0.6	9	6	0	6
MLA-373	0.3	4	6	0	6
MLA-369	0.6	8	6	0	6
MLA-368	0.3	5	6	0	6
MLA-366	0.5	5	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-365	0.5	8	6	0	6
MLA-364	0.6	8	6	0	6
MLA-362	0.5	5	6	0	6
MLA-359	0.6	5	6	0	6
MLA-356	0.8	11	6	0	6
MLA-354	0.4	6	6	0	6
MLA-353	0.6	12	6	0	6
MLA-352	0.6	4	6	0	6
MLA-347	1.7	18	6	0	6
MLA-345	0.5	9	6	0	6
MLA-340	0.7	13	6	0	6
MLA-339	0.9	18	6	0	6
MLA-331	0.9	12	6	0	6
MLA-329	0.5	8	6	0	6
MLA-321	1.8	11	6	0	6
MLA-320	0.7	11	6	0	6
MLA-318	0.9	10	6	0	6
MLA-312	0.2	5	6	0	6
MLA-310	0.9	7	6	0	6
MLA-308	0.4	13	6	0	6
MLA-307	0.9	16	6	0	6
MLA-304	0.2	6	6	0	6
MLA-297	0.7	14	6	0	6
MLA-291	0.2	4	6	0	6
MLA-284	0.2	4	6	0	6
MLA-277	1.1	7	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-276	1.5	16	6	0	6
MLA-270	1.7	18	6	0	6
MLA-254	0.3	5	6	0	6
MLA-247	1.9	15	6	0	6
MLA-246	1.4	15	6	0	6
MLA-244	1.5	9	6	0	6
MLA-235	0.5	9	6	0	6
MLA-230	0.2	4	6	0	6
MLA-229	0.2	5	6	0	6
MLA-228	0.5	10	6	0	6
MLA-227	1.7	18	6	0	6
MLA-224	1.7	18	6	0	6
MLA-221	1.7	18	6	0	6
MLA-219	1.7	18	6	0	6
MLA-218	0.2	5	6	0	6
MLA-216	1.7	18	6	0	6
MLA-215	1.4	15	6	0	6
MLA-213	1.0	8	6	0	6
MLA-210	1.4	15	6	0	6
MLA-209	1.7	18	6	0	6
MLA-208	0.1	3	6	0	6
MLA-207	1.7	18	6	0	6
MLA-205	0.3	6	6	0	6
MLA-201	1.9	15	6	0	6
MLA-200	1.5	16	6	0	6
MLA-199	1.1	9	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-197	1.7	18	6	0	6
MLA-196	0.4	6	6	0	6
MLA-195	1.7	18	6	0	6
MLA-190	0.9	10	6	0	6
MLA-188	1.5	18	6	0	6
MLA-183	0.4	8	6	0	6
MLA-178	0.3	9	6	0	6
MLA-177	1.7	18	6	0	6
MLA-168	1.7	21	6	0	6
MLA-162	0.4	6	6	0	6
MLA-158	0.9	6	6	0	6
MLA-150	1.1	7	6	0	6
MLA-142	1.7	18	6	0	6
MLA-141	0.4	7	6	0	6
MLA-137	1.6	23	6	0	6
MLA-136	1.6	23	6	0	6
MLA-134	1.7	11	6	0	6
MLA-133	1.7	18	6	0	6
MLA-132	1.6	23	6	0	6
MLA-130	1.6	23	6	0	6
MLA-127	1.7	26	6	0	6
MLA-126	1.7	18	6	0	6
MLA-125	1.4	15	6	0	6
MLA-124	1.7	18	6	0	6
MLA-123	1.7	18	6	0	6
MLA-122	1.7	18	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-121	1.7	26	6	0	6
MLA-120	1.7	18	6	0	6
MLA-119	1.5	16	6	0	6
MLA-118	1.5	16	6	0	6
MLA-117	1.5	16	6	0	6
MLA-115	1.6	23	6	0	6
MLA-114	1.4	15	6	0	6
MLA-113	1.6	23	6	0	6
MLA-112	1.6	23	6	0	6
MLA-111	1.4	15	6	0	6
MLA-110	1.4	15	6	0	6
MLA-109	1.5	16	6	0	6
MLA-108	1.6	23	6	0	6
MLA-107	1.6	23	6	0	6
MLA-106	1.6	23	6	0	6
MLA-105	1.6	23	6	0	6
MLA-104	1.4	15	6	0	6
MLA-103	1.6	23	6	0	6
MLA-99	1.7	18	6	0	6
MLA-98	1.7	26	6	0	6
MLA-97	1.4	15	6	0	6
MLA-95	1.4	15	6	0	6
MLA-94	1.4	15	6	0	6
MLA-93	1.4	15	6	0	6
MLA-92	1.5	16	6	0	6
MLA-91	1.5	16	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-90	1.7	18	6	0	6
MLA-88	1.4	15	6	0	6
MLA-87	1.7	18	6	0	6
MLA-86	1.5	16	6	0	6
MLA-85	1.4	15	6	0	6
MLA-84	1.5	16	6	0	6
MLA-83	1.4	15	6	0	6
MLA-82	1.6	23	6	0	6
MLA-81	1.6	23	6	0	6
MLA-80	1.4	15	6	0	6
MLA-79	1.6	23	6	0	6
MLA-78	1.6	23	6	0	6
MLA-77	1.6	23	6	0	6
MLA-76	1.6	23	6	0	6
MLA-75	1.7	18	6	0	6
MLA-74	1.7	18	6	0	6
MLA-73	1.6	23	6	0	6
MLA-72	1.6	23	6	0	6
MLA-71	1.7	18	6	0	6
MLA-70	1.7	18	6	0	6
MLA-69	1.6	23	6	0	6
MLA-68	1.4	15	6	0	6
MLA-67	1.6	23	6	0	6
MLA-66	1.6	23	6	0	6
MLA-65	1.7	18	6	0	6
MLA-64	1.4	15	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-63	1.4	15	6	0	6
MLA-62	1.4	15	6	0	6
MLA-61	1.4	15	6	0	6
MLA-59	1.7	18	6	0	6
MLA-58	1.7	18	6	0	6
MLA-57	1.7	18	6	0	6
MLA-56	1.7	18	6	0	6
MLA-50	2.8	16	6	0	6
MLA-49	2.6	18	6	0	6
MLA-46	1.7	18	6	0	6
MLA-45	1.4	15	6	0	6
MLA-44	1.4	15	6	0	6
MLA-43	1.4	15	6	0	6
MLA-42	1.4	15	6	0	6
MLA-41	1.4	15	6	0	6
MLA-40	1.4	15	6	0	6
MLA-39	1.4	15	6	0	6
MLA-38	1.4	15	6	0	6
MLA-36	1.5	16	6	0	6
MLA-35	1.5	16	6	0	6
MLA-34	1.5	16	6	0	6
MLA-33	1.6	23	6	0	6
MLA-32	1.5	16	6	0	6
MLA-31	1.6	23	6	0	6
MLA-30	1.6	23	6	0	6
MLA-29	1.6	23	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-28	1.6	23	6	0	6
MLA-27	1.4	15	6	0	6
MLA-26	1.4	15	6	0	6
MLA-25	1.6	23	6	0	6
MLA-24	1.6	23	6	0	6
MLA-23	1.6	23	6	0	6
MLA-22	1.6	23	6	0	6
MLA-21	1.4	15	6	0	6
MLA-20	1.4	15	6	0	6
MLA-19	1.6	23	6	0	6
MLA-18	1.4	15	6	0	6
MLA-17	1.6	23	6	0	6
MLA-16	1.6	23	6	0	6
MLA-15	1.6	23	6	0	6
MLA-14	1.6	23	6	0	6
MLA-13	1.6	23	6	0	6
MLA-12	1.6	23	6	0	6
MLA-11	1.6	23	6	0	6
MLA-10	1.6	23	6	0	6
MLA-9	1.6	23	6	0	6
MLA-8	1.6	23	6	0	6
MLA-7	1.6	23	6	0	6
MLA-6	1.4	15	6	0	6
MLA-5	1.4	15	6	0	6
MLA-4	1.4	15	6	0	6
MLA-3	1.6	23	6	0	6

Sensitive Receptor	Average	Maximum	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to natural events	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project	Number of days 24-hour PM_{10} exceeds 50 µg/m³ due to the Project + 24-hour varying background
MLA-2	1.6	23	6	0	6
MLA-1	1.6	23	6	0	6

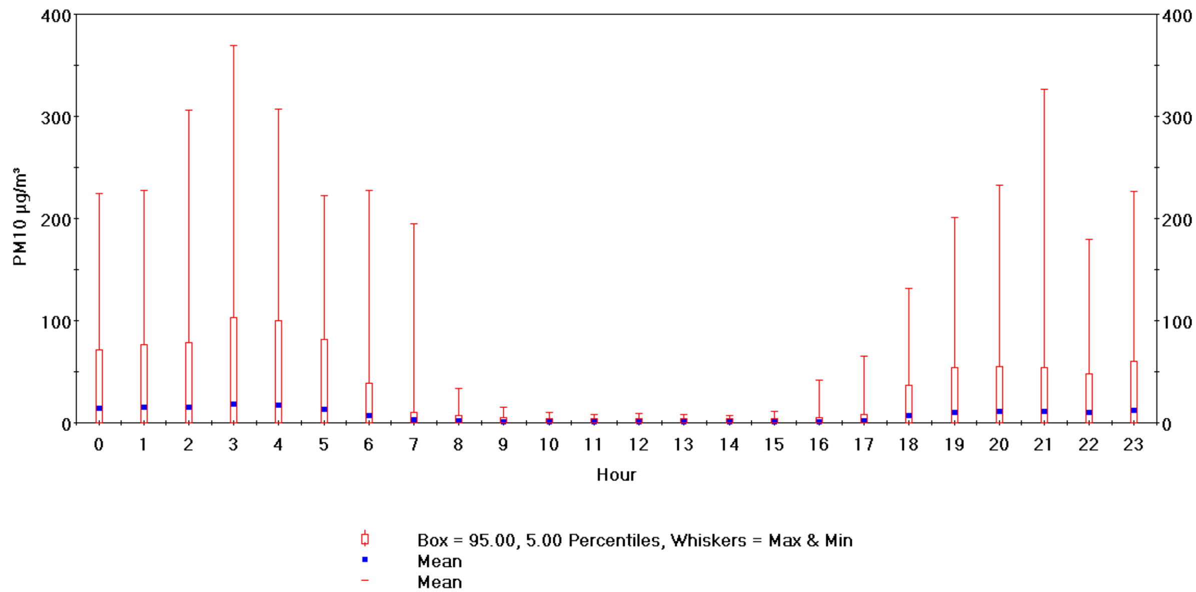


Figure A11 One hour average predicted PM_{10} concentrations

Location: MLA-300	**Data source:** CALPUFF	**Units:** µg/m³
Type: Box and whisker plot	**Prepared by:** Andrew Wiebe	**Date:** August 2009

Appendix B Emission estimation and pit activity

B1.1 Year 1

The following tables detail the model input data for modelling Year 1 of the Project.

Table B1 Year 1 Emissions for Wandoan – All Pits

Source	Austinvale North Construction			Austinvale		
	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	TSP (g/s)	$PM_{2.5}$ (g/s)	$PM_{2.5}$ (g/s)
Dragline (overburden)	-	-	-	11.66	2.90	0.20
Truck & Shovel (Overburden)	7.14	1.78	0.12	-	-	-
Truck Loading Coal (HE&FEL)	-	-	-	11.60	1.78	0.22
Bulldozing (overburden)	0.95	0.19	0.10	0.95	0.19	0.10
Truck Dumping (overburden)	0.40	0.10	0.04	0.32	0.08	0.03
Erosion Area	0.08	0.04	0.002	-	-	-
Blasting (coal and overburden)	4.05	2.11	0.12	4.05	2.11	0.12
Drilling (overburden)	0.10	0.05	0.003	0.10	0.05	0.003
Haul Truck	0.44	0.12	0.01	1.29	0.35	0.04

Table B2 Year 1 Emissions for Wandoan – Mine Infrastructure

Source	Infrastructure		
	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)
ROM 1	3.2	1.4	0.06
ROM 2	-	-	-
ROM 3	-	-	-
Grader	0.07	0.02	0.004
CHPP area	0.1	0.05	0.01
Conveyor 1	0.06	0.03	0.002
Conveyor 2	-	-	-
Conveyor 3	-	-	-

Table B3 Year 1 Daily Pit Activity

Coal	**Austinvale**
Equipment	Truck & Shovel
Haul Truck Speed (km/hr)	40
Roundtrip (min)	24
t/hour	3,317
ROM tons	14,900,000
Total Hours	4,492
Days of Operations	187
Overburden	
Equipment	Dragline
t/hour	8,564
Overburden tons	47,951,955
Total Hours	5,600
Days of Operations	233
Total Days in Pit	420

B1.2 Year 5

The following tables detail the model input data for modelling Year 5 of Wandoan Coal Mine.

Table B4 Year 5 Emissions for Wandoan – Eastern Pits

Source	Woleebee Creek			Frank Creek		
	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)
Dragline (overburden)	11.89	2.94	0.20	-	-	-
Truck & Shovel (Overburden)	-	-	-	10.36	2.59	0.18
Truck Loading Coal (HE&FEL)	10.34	1.59	0.20	5.75	0.88	0.11
Bulldozing (overburden)	0.95	0.19	0.10	0.95	0.19	0.10
Truck Dumping (overburden)	0.29	0.07	0.18	0.58	0.14	0.06
Erosion Area	0.12	0.06	0.004	-	-	-
Blasting (coal and overburden)	4.05	2.11	0.12	4.05	2.11	0.12
Drilling (overburden)	0.10	0.05	0.003	0.10	0.05	0.003
Haul Truck	2.42	0.66	0.07	2.52	0.69	0.07

Table B5 Year 5 Emissions for Wandoan – Western Pits

Source	Austinvale			Mud Creek			Wubagul		
	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)
Dragline (overburden)	14.55	3.61	0.25	-	-	-	11.58	2.88	0.20
Truck & Shovel (Overburden)	28.19	5.77	0.60	7.65	1.91	0.13			
Truck Loading Coal (HE&FEL)	12.54	1.93	0.24	3.96	0.61	0.08	9.75	1.50	0.19
Bulldozing (overburden)	0.95	0.19	0.10	0.95	0.19	0.10	0.95	0.19	0.10
Truck Dumping (overburden)	0.15	0.04	0.02	0.43	0.11	0.04	0.05	0.02	0.02
Erosion Area	0.12	0.06	0.004	-	-	-	1.88	0.98	0.057
Blasting (coal and overburden)	4.05	2.11	0.12	4.05	2.11	0.12	4.05	2.11	0.12
Drilling (overburden)	0.10	0.05	0.003	0.10	0.05	0.003	0.10	0.05	0.003
Haul Truck	2.15	0.59	0.06	2.55	0.70	0.07	2.19	0.60	0.06

Table B6 Year 5 Emissions for Wandoan – Mine Infrastructure

Source	Infrastructure		
	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)
Austinvale North	0.08	0.04	0.002
ROM 1	9.57	4.02	0.18
ROM 2	3.13	1.32	0.06
ROM 3	-	-	-
Grader	0.17	0.04	0.005
CHPP area	0.32	0.15	0.02
Conveyor 1	0.06	0.03	0.002
Conveyor 2	0.03	0.02	0.001
Conveyor 3	-	-	-

Table B7 Year 5 Daily Pit Activity

Coal	Frank Creek	Woleebee	Austinvale	Mud Creek	Wubagul
Equipment	*Truck and Shovel*	*Truck and Shovel*	*Truck and Shovel*	*Truck and Shovel*	*Truck and Shovel*
Haul Truck Speed (km/hr)	40	40	40	40	40
Roundtrip (min)	24	24	21	17	47
t/hour	1,597	1,597	1,597	1,762	1,077
ROM tons	2,833,448	13,185,677	15,993,271	394,435	12,437,170
Total Hours	1,774	8,255	10,013	224	11,545
Days of Operations	74	344	417	9	481
Overburden					
Equipment	*Truck and Shovel*	*Dragline*	*Dragline*	*Dragline*	*Dragline*
t/hour	3,208	8,564	8,564	2,495	2,495
Overburden tons	10,381,750	57,721,211	59,804,250	1,970,146	5,704,008
Total Hours	3,237	6,740	6,984	790	2,286
Days of Operations	135	281	291	33	95
Total Days in Pit	209	625	708	42	576

B1.3 Year 10

The following tables detail the model input data for modelling Year 10 of Wandoan Coal Mine.

Table B8 Year 10 Emissions for Wandoan – Eastern Pits

Source	Turkey Hill			Summer Hill			Mud Creek		
	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)
Dragline (overburden)	12.4	3.1	0.2	13.2	3.3	0.2	9.2	2.3	0.2
Truck & Shovel (Overburden)	-	-	-	-	-	-	-	-	-
Truck Loading Coal (HE&FEL)	12.5	1.9	0.2	20.4	3.1	0.4	11.5	1.8	0.2
Bulldozing (overburden)	1.0	0.2	0.1	1.0	0.2	0.1	1.0	0.2	0.1
Truck Dumping (overburden)	0.4	0.1	0.04	0.4	0.1	0.04	0.1	0.03	0.01
Erosion Area	-	-	-	-	-	-	-	-	-
Blasting (coal and overburden)	4.05	2.11	0.12	4.05	2.11	0.12	4.05	2.11	0.12
Drilling (overburden)	0.10	0.05	0.003	0.1	0.05	0.003	0.1	0.05	0.003
Haul Truck	0.96	0.26	0.03	1.56	0.43	0.04	0.88	0.24	0.02

Table B9 Year 10 Emissions for Wandoan – Western Pits

Source	Woleebee			Frank Creek		
	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)
Dragline (overburden)	9.1	2.3	0.2	-	-	-
Truck & Shovel (Overburden)	-	-	-	18.2	4.6	0.3
Truck Loading Coal (HE&FEL)	10.8	1.7	0.2	14.0	2.2	0.3
Bulldozing (overburden)	1.0	0.2	0.1	1.0	0.2	0.1
Truck Dumping (overburden)	0.1	0.03	0.01	0.3	0.1	0.03
Erosion Area	0.2	0.1	0.01	-	-	-
Blasting (coal and overburden)	1.00	0.52	0.03	1.00	0.52	0.03
Drilling (overburden)	0.10	0.05	0.003	0.10	0.05	0.003
Haul Truck	0.82	0.22	0.02	1.07	0.29	0.03

Table B10 Year 10 Emissions for Wandoan – Mine Infrastructure

Source	Infrastructure		
	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)
Austinvale North	3.8	2	0.1
Austinvale	2	1.1	0.1
ROM 1	2.3	1	0.04
ROM 2	7.4	3.1	0.1
ROM 3	3.5	1.5	0.1
Grader	0.1	0.03	0.004
CHPP area	0.3	0.1	0.02
Conveyor 1	0.06	0.03	0.002
Conveyor 2	0.06	0.03	0.002
Conveyor 3	0.14	0.07	0.004

Table B11 Year 10 Daily Pit Activitiy

Coal	Turkey Hill	Summer Hill	Mud Creek	Woleebee	Frank Creek
Equipment	*Truck and Shovel*	*Truck and Shovel*	*Truck and Shovel*	*Truck and Shovel*	*Truck and Shovel*
Haul Truck Speed (km/hr)	40	40	40	40	40
Roundtrip (min)	24	24	21	17	47
Tons per hour	1,597	1,597	1,597	1,762	1,077
ROM tons	2,833,448	13,185,677	15,993,271	394,435	12,437,170
Total hours	1,774	8,255	10,013	224	11,545
Days of Operations	74	344	417	9	481
Overburden					
Equipment	*Truck and Shovel*	*Dragline*	*Dragline*	*Truck and shovel*	*Truck and Shovel*
Tons per hour	3,208	8,564	8,564	2,495	2,495
Overburden tons	10,381,750	57,721,211	59,804,250	1,970,146	5,704,008
Total hours	3,237	6,740	6,984	790	2,286
Days of Operations	135	281	291	33	95
Total days in pit	209	625	708	42	576

B1.4 Year 20

The following tables detail the model input data for modelling Year 20 of Wandoan Coal Mine.

Table B12 Year 20 Emissions for Wandoan – Western Pits

Source	Turkey Hill			Summer Hill			Mud Creek		
	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)
Dragline (overburden)	12.9	3.2	0.2	14.3	3.6	0.2	12.0	3.0	0.2
Truck & Shovel (Overburden)	-	-	-	-	-	-	-	-	-
Truck Loading Coal (HE&FEL)	12.0	1.8	0.2	6.7	1.0	0.1	13.1	2.0	0.2
Bulldozing (overburden)	1.0	0.2	0.1	1.0	0.2	0.1	1.0	0.2	0.1
Truck Dumping (overburden)	0.2	0.05	0.02	0.2	0.1	0.02	0.1	0.04	0.02
Erosion Area	0.3	0.2	0.0	0.3	0.1	0.0	0.1	0.0	0.0
Blasting (coal and overburden)	4.0	2.1	0.1	4.0	2.1	0.1	4.0	2.1	0.1
Drilling (overburden)	0.1	0.1	0.003	0.1	0.1	0.003	0.1	0.1	0.003
Haul Truck	1.8	0.5	0.0	1.0	0.3	0.0	1.1	0.3	0.03

Table B13 Year 20 Emissions for Wandoan – Eastern Pits 1

Source	Woleebee Creek			Woleebee North		
	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)
Dragline (overburden)	12.0	3.0	0.2	9.1	2.3	0.2
Truck & Shovel (Overburden)	-	-	-	-	-	-
Truck Loading Coal (HE&FEL)	13.1	2.0	0.2	10.0	1.5	0.2
Bulldozing (overburden)	1.0	0.2	0.1	1.0	0.2	0.1
Truck Dumping (overburden)	0.1	0.04	0.02	0.1	0.0	0.0
Erosion Area	0.1	0.04	0.002	-	-	-
Blasting (coal and overburden)	4.0	2.1	0.1	4.0	2.1	0.1
Drilling (overburden)	0.1	0.1	0.003	0.1	0.1	0.003
Haul Truck	2.0	0.5	0.1	1.5	0.4	0.0

Table B14 Year 20 Emissions for Wandoan – Eastern Pits 2

Source	Leichhardt			Frank Creek West		
	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)
Dragline (overburden)	13.2	3.3	0.2	-	-	-
Truck & Shovel (Overburden)	-	-	-	9.9	2.5	0.2
Truck Loading Coal (HE&FEL)	6.5	1.0	0.1	7.5	1.2	0.1
Bulldozing (overburden)	1.0	0.2	0.1	1.0	0.2	0.1
Truck Dumping (overburden)	0.3	0.1	0.0	1.2	0.3	0.1
Erosion Area	-	-	-	0.01	0.008	0.0004
Blasting (coal and overburden)	4.0	2.1	0.1	4.0	2.1	0.1
Drilling (overburden)	0.1	0.1	0.003	0.1	0.1	0.003
Haul Truck	1.5	0.4	0.04	1.7	0.46	0.05

Table B15 Year 20 Emissions for Wandoan – Mine Infrastructure

Source	Infrastructure		
	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)
Austinvale North	3.8	2.0	0.1
Austinvale	2.0	1.1	0.1
ROM 1	5.2	2.2	0.1
ROM 2	1.1	0.5	0.02
ROM 3	3.5	1.5	0.1
Grader	0.1	0.03	0.004
CHPP area	0.3	0.1	0.02
Conveyor 1	0.3	0.1	0.02
Conveyor 2	0.1	0.03	0.002
Conveyor 3	0.1	0.1	0.004

Table B16 Year 20 Daily Pit Activity

Coal	Turkey Hill	Summer Hill	Woleebee Creek	Woleebee North	Leichhardt	Mud Creek	Frank Creek West
Equipment	*Truck & Shovel*	*Truck & Shovel*	*Truck & Shovel*	*Truck & Shovel*	*Truck & Shovel*	*Truck & Shovel*	*Truck & Shovel*
Haul Truck Speed (km/hr)	40	40	40	40	40	40	40
Roundtrip (min)	22	30	21	17	23	18	17
Tons per Hour	2,381	1,511	3,791	1,965	1,603	3,477	1,965
ROM tons	10,289,788	5,706,994	9,724,870	4,167,802	6,119,423	5,161,344	4,167,802
Total Hours	4,322	3,777	2,566	2,122	3,817	1,485	2,122
Days of Operations	180	157	107	88	159	62	88
Overburden							
Equipment	*Dragline*	*Dragline*	*Dragline*	*Dragline*	*Dragline*	*Dragline*	*Truck & Shovel*
Tons per Hour	8,564	8,565	8,566	8,569	8,567	8,568	8,569
Overburden (tons)	52,560,442	58,479,538	42,490,867	18,210,372	39,964,958	49,504,398	18,210,372
Total Hours	6,138	6,828	4,961	2,125	4,665	5,778	2,125
Days of Operations	256	285	207	89	194	241	89
Total Days in Pit	436	442	314	177	353	303	177

B1.5 Year 30

The following tables detail the model input data for modelling Year 30 of Wandoan Coal Mine.

Table B17 Year 30 Emissions for Wandoan – Western Pits

Source	Turkey Hill			Summer Hill			Mud Creek		
	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)
Dragline (overburden)	-	-	-	10.67	2.65	0.18	11.27	2.80	0.19
Truck & Shovel (Overburden)	3.72	0.93	0.06	-	-	-	-	-	-
Truck Loading Coal (HE&FEL)	4.17	0.64	0.08	7.75	0.77	0.09	6.85	1.05	0.13
Bulldozing (overburden)	0.95	0.19	0.10	0.95	0.19	0.10	0.95	0.19	0.10
Truck Dumping (overburden)	0.07	0.02	0.01	0.19	0.05	0.02	0.18	0.05	0.02
Erosion Area	0.30	0.15	0.01	0.04	0.02	0.001	0.35	0.18	0.01
Blasting (coal and overburden)	4.05	2.11	0.12	4.05	2.11	0.12	4.05	2.11	0.12
Drilling (overburden)	0.10	0.05	0.003	0.10	0.05	0.003	0.10	0.05	0.003
Haul Truck	0.64	0.17	0.02	1.80	0.49	0.05	1.04	0.29	0.03

Table B18 Year 30 Emissions for Wandoan – Eastern Pits

Source	Woleebee Creek			Wubagul			Woleebee North		
	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)
Dragline (overburden)	11.49	2.85	0.20	8.94	2.22	0.15	7.89	1.96	0.13
Truck & Shovel (Overburden)	-	-	-	-	-	-	-	-	-
Truck Loading Coal (HE&FEL)	15.87	2.44	0.30	10.75	1.65	0.20	10.90	1.68	0.21
Bulldozing (overburden)	0.95	0.19	0.10	0.95	0.19	0.10	0.95	0.19	0.10
Truck Dumping (overburden)	0.24	0.06	0.03	0.15	0.04	0.02	0.16	0.04	0.02
Erosion Area	0.10	0.05	0.003	0.02	0.01	0.001	0.05	0.03	0.002
Blasting (coal and overburden)	4.05	2.11	0.12	4.05	2.11	0.12	4.05	2.11	0.12
Drilling (overburden)	0.10	0.05	0.003	0.10	0.05	0.003	0.10	0.05	0.003
Haul Truck	2.40	0.66	0.07	1.62	0.44	0.04	1.66	0.45	0.05

Table B19 Year 30 Emissions for Wandoan – Mine Infrastructure

Source	Infrastructure		
	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)
Austinevale North	7.52	3.91	0.23
Austinevale	4.05	2.10	0.12
ROM 1	5.17	2.17	0.10
ROM 2	2.86	1.20	0.05
ROM 3	1.61	0.68	0.03
Grader	0.17	0.04	0.005
CHPP area	0.30	0.14	0.02
Conveyor 1	0.06	0.03	0.002
Conveyor 2	0.14	0.07	0.004
Conveyor 3	-	-	-

Table B20 Year 30 Daily Pit Activity

Coal	Turkey Hill	Summer Hill	Woleebee Creek	Wubagul	Mud Creek	Woleebee North
Equipment	*Truck & Shovel*	*Truck & Shovel*	*Truck & Shovel*	*Truck & Shovel*	*Truck & Shovel*	*Truck & Shovel*
Haul Truck Speed (km/hr)	40	40	40	40	40	40
Roundtrip (min)	19	22.6	20.8	23.5	46.9	19.9
Tons per Hour	507	1,836	4,217	1,825	1,059	1,889
ROM tons	921,397	6,404,044	10,390,841	9,213,507	5,866,993	4,453,217
Total Hours	1,818	3,488	2,464	5,047	5,540	2,357
Days of Operations	76	145	103	210	231	98
Overburden						
Equipment	*Dragline*	*Dragline*	*Dragline*	*Dragline*	*Dragline*	*Dragline*
Tons per Hour	8,564	8,565	8,566	8,567	8,568	8,569
Overburden (tons)	3,673,219	42,089,331	35,888,868	36,536,359	46,081,803	15,380,944
Total Hours	429	4,914	4,190	4,265	5,379	1,795
Days of Operations	18	205	175	178	224	75
Total Days in Pit	94	350	277	388	455	173