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Stage 1: Kilburn/Gepps Cross Area Study

Review of the Environmental Issues and Ambient Air Quality

July 2006

A Review of the Environmental Issues and Ambient Air Quality in the Kilburn/Gepps Cross Area:
July 2006

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SUMMARY

In response to community concerns, the Environment Protection Authority undertook a compliance audit program of licensed sites in the Kilburn/Gepps Cross area. The compliance audit identified a range of compliance issues in relation to potential air quality impacts and other non-air related issues. The compliance of a licensed site with the Environment Protection Act and related legislation is reflective of a combination of the age of the site and its equipment, the level of interaction between the sites management and the EPA and the mindset of the site managers.

The monitoring of the ambient air quality in the Kilburn/Gepps Cross area surmised that the quality of and impacts to the local air shed is comparable to that of Adelaide areas containing similar types of local industry and vehicle traffic routes. Impacts to the local air shed were identified to arise as a result of localised sources, such as local industry activity and vehicle traffic and to a lesser extent from regional sources.

Short term continuous monitoring in the Kilburn/Gepps Cross area identified a high risk for the exceedence of the National Environment Protection (Ambient Air Quality) Measure PM_{10} Goal. If continuous monitoring was carried out for a 12-month period and this trend were to continue it is highly likely that PM_{10} recordings will exceed the NEPM Goal of not more than 5 events above the NEPM Standard for PM_{10} per annum.

The benzene levels recorded during monitoring at the Kilburn and Gepps Cross sites were below and at the Air Toxics NEPM Investigation Limit, respectively. Benzene levels at various other monitoring sites in the past have been detected at a similar order of magnitude to those measured at Kilburn. There is a risk however that the annual average Air Toxics NEPM Investigation Limit of 0.003ppm will be reached if monitoring is undertaken at the Gepps Cross site for a period of 12 months.

Metal analysis of High Volume Sampler (HVS) filters resulted in elevated levels of zinc and iron in filters removed from HVS located at both the Kilburn and Gepps Cross sites when compared to a site located in Northfield. The levels for particulate zinc were very similar in both the TSP and PM_{10} filters suggesting that most zinc particulate was fine in nature and possibly a component of smoke or fume. Heavy metals measured were minor and did not exceed criteria from the WHO or USEPA. Monitoring identified predominantly vehicle emission type sources of pollutants to the south of the Gepps Cross site (i.e. Grand Junction Road) as a major source of pollutants including moderate levels of formaldehyde, carbon monoxide and oxides of nitrogen.

The Odour Survey revealed that the 11 surveyed EPA licensed sites in the Kilburn area are not entirely odour free. Variances in odour intensity and hedonic tone represent a potential for odour issues to exist in the Kilburn and Gepps Cross areas under a variety of meteorological conditions.

The Kilburn/Gepps Cross area review provides an opportunity for the identification of areas where improved performance by local industry can potentially reduce pollutant loads into the local air shed. Once identified, programs and opportunities for improvement can be developed in conjunction with the licensee to work towards addressing the areas of non-compliance.

Further monitoring of the local air shed is required to support the ambient air quality monitoring findings, conduct particle speciation of the zinc and iron to determine the source and conclude where NEPM standards and investigation levels are exceeded. Local community awareness programs will be developed to raise awareness and provide a greater appreciation by industry in regard to the quality of the local environment and the pressures this creates on the adjacent community.

INTRODUCTION

Air quality and odour have been a long standing issue in the Kilburn/Gepps Cross area and are primarily associated with the close proximity between residential housing and industry. The Kilburn and Gepps Cross area contain a number of major arterial roads and include a mix of industrial, commercial and residential functions all in close proximity to each other. There are a large number of EPA licensed premises in the area, including foundries, a medical waste incinerator, a galvaniser, a rendering plant and many other unlicensed industries undertaking a range of activities. A risk exists for the air quality in the Kilburn/Gepps Cross area to be impacted by a combination of emissions from the local industry and diffuse sources such as motor vehicles, owing to the major transport corridors in the area. Impacts to the air quality can result from emissions of dust, odorous compounds and other chemicals into the ambient air from a variety of diffuse and point sources.

The EPA has received numerous complaints from local residents regarding disturbances they have experienced whilst living in the area. The bulk of the complaints focus on the foundries operating in the area, but complaints have also been received in response to activities of other premises in the area. Of these complaints, referring to both EPA licensed and non-licensed premises, the majority depicted noise, odour, smoke and dust pollution.

The SA EPA had not previously undertaken ambient air monitoring of the Kilburn/Gepps Cross area, thus a baseline of information was unavailable to compare the ambient air quality of the Kilburn/Gepps area with other similar areas within the Adelaide air shed. The SA EPA resolved to develop a better understanding of the local emission levels and their potential impact on local residents by undertaking a detailed review of in the Kilburn/Gepps Cross area. The aims of the review were to gain an improved understanding of the ambient air quality in the local area, focussing on particulates, chemicals and odour; and to identify key areas of non-compliance and poor performance of licensed premises in regard to the management of processes used to control emissions to the environment.

EPA COMPLIANCE AUDIT

In response to community concerns, the Environment Protection Authority undertook a compliance audit program of licensed sites in the Kilburn/Gepps Cross area. A desktop survey of the industrial activities within the Kilburn/Gepps Cross area was undertaken. A 2km radius circle was drawn using the intersection of Grand Junction and Churchill Road as its centre, the area within the circle was allocated as the survey area (Figure 1). A large number of SA EPA licensed and unlicensed Industries were found to be operating within the survey area. To ensure a consistent approach only the premises that hold a current SA EPA licence were included in the survey. A number of EPA licensed sites were designated as possible contributors to the air quality of the local area.

Of the licensed sites identified in the desktop survey, all were sent a letter informing them of the possibility that the EPA may audit them in the near future. The letter included the audit format and emphasised the opportunity for the licensee to undertake a voluntary audit prior to the EPA Audit. Of these notified sites, 15 were seen to be most likely to impact on the local ambient air quality and were incorporated into the EPA Audit (Table 1). The licensees were contacted and notification letters were sent detailing the time and date of the Audit, re-emphasising the opportunity for a voluntary audit and again included the audit format. All sites were given sufficient notice of the Authority's intention to carry out an audit to ensure the appropriate people and paperwork was made available during the audit.

Audit teams were assembled, comprising of three Auditors and the site licence coordinator (optional). The audit process typically involved an entry interview to explain the Audit process and provide background information (0.5 hrs); followed by a site inspection, photographs, completion of the audit checklist and licence condition checklist (1-2 hrs); and a debrief interview providing feedback on the site inspection findings (0.5 hrs). A post-audit letter was forwarded to the site management detailing the audit findings and thanking them for their participation. A debrief of the audit findings was provided to the sites EPA Licence Coordinator to inform them of non-compliance issues identified during the audit and to ensure follow-up is carried out, if necessary

Whilst the audits were focussed on emissions to air, the audit did assess the sites compliance with the Environment Protection Act 1993 and included assessment for compliance against:

a) the General Environmental Duty as outlined in Section 25 of the Act,
b) any relevant Environmental Protection Policies under the Act,
c) the requirements of their Environmental Authorisation and/or Exemptions under the Act,
d) the applicability of the environmental authorisation to the sites activities, and
e) the adequacy of licence conditions imposed on the licensed premises.

Figure 1: Map of Kilburn/Gepps Cross Area & Compliance Audit Area of Interest (500m increments).

Table 1: Compliance Audit Schedule of EPA Licensed Sites

Audited Site	Audit Date
Barbaro Galvanising Pty Ltd	5th September 2005
McKechnie Iron Foundry Pty Ltd	8th September 2005
Fletcher & Sons	9th September 2005
Intercast & Forge	15th September 2005
Master Butchers Cooperative Limited	19th September 2005
T&R Pastoral Pty Ltd	20th September 2005
Adelaide Galvanising Industries Pty Ltd	26th September 2005
Korvest Ltd	27th October 2005
Plastics Granulating Services	1st November 2005
L.F. Jeffries Nominees Pty Ltd	4th November 2005
Collex Pty Ltd	21st November 2005
Asphalt SA[1]	23rd November 2005
W P Crowhurst Pty Ltd	5th December 2005
Bradken Resources Pty Ltd	12th December 2005
IJF Australia Pty Ltd	19th January 2006

[1] The Boral asphalt site in Wingfield was not audited as the plant was being rebuilt during the program

AIR MONITORING OF LOCAL AIR SHED

Air quality monitoring of the Kilburn/Gepps Cross area was undertaken to measure and provide information on the levels of air pollutants that may be affecting the amenity of the local area and have potential impacts on the local residents. Two locations were selected to carry out the air monitoring based upon the suitability of the site for the collection of data. The sites chosen were the Canine Association of South Australia's grounds and the Gepps Cross Girls High School grounds (Figure 2).

Local air shed monitoring of the Kilburn/Gepps cross area was divided into two periods based upon the monitoring method. High Volume Samplers was carried out between 17th Dec 2004 – 18th Nov 2005 and 5th Jan 2006 – 5th May 2006 at the SA Canine Association and Gepps Cross Girls High School sites, respectively. Continuous monitoring was undertaken between 16th July 2005 – 6th Oct 2005 and 22nd Nov 2005 – 7th May 2006 at the SA Canine Association and Gepps Cross Girls High School sites, respectively.

The Hot Spot Caravan was used to carry out the Air Quality monitoring in the Kilburn/Gepps Cross area. The Hot Spot Caravan is able to provide an understanding of the levels of a range of pollutants either emitted or transported into the area of interest for a specified timeframe as it houses a number of instruments including a Tapered Element Oscillating Microbalance (TEOM), the OPSIS Ambient Air Monitoring System (OPSIS), High Volume Samplers (HVS), and meteorological data recording instruments (Table 2).

Continuous PM_{10} data was collected from air monitoring sites located at Kensington and Netley in parallel with continuous PM_{10} data collected from the Kilburn and Gepps Cross sites.

Metal analysis was carried out on HVS filters used to monitor TSP and PM_{10} concentrations from the Kilburn, Gepps Cross and Northfield monitoring sites. Analysis for a range of Volatile Organic Compounds and Aldehydes and Ketones was performed via USEPA TO-17 and USEPA TO-11A methods, respectively.

Table 2: Ambient Air Monitoring Parameters, Equipment & Type

Monitored Parameter	Monitoring Equipment	Type of Monitoring
Particles less than 10µm in diameter (PM_{10})	TEOM	Continuous
Particles less than 10µm in diameter (PM_{10})	HVS	Compositional
Carbon monoxide	Direct reading method	Continuous, AS 3580.7.1-1992
Nitric oxide	OPSIS	Continuous
Nitrogen dioxide	OPSIS	Continuous
Sulfur dioxide	OPSIS	Continuous
Benzene	OPSIS	Continuous, USEPA method TO-17
Toluene	OPSIS	Continuous, USEPA method TO-17
Formaldehyde	OPSIS	Continuous, USEPA method TO-11A
Wind speed, wind direction, temperature and pressure	Vaisala equipment	

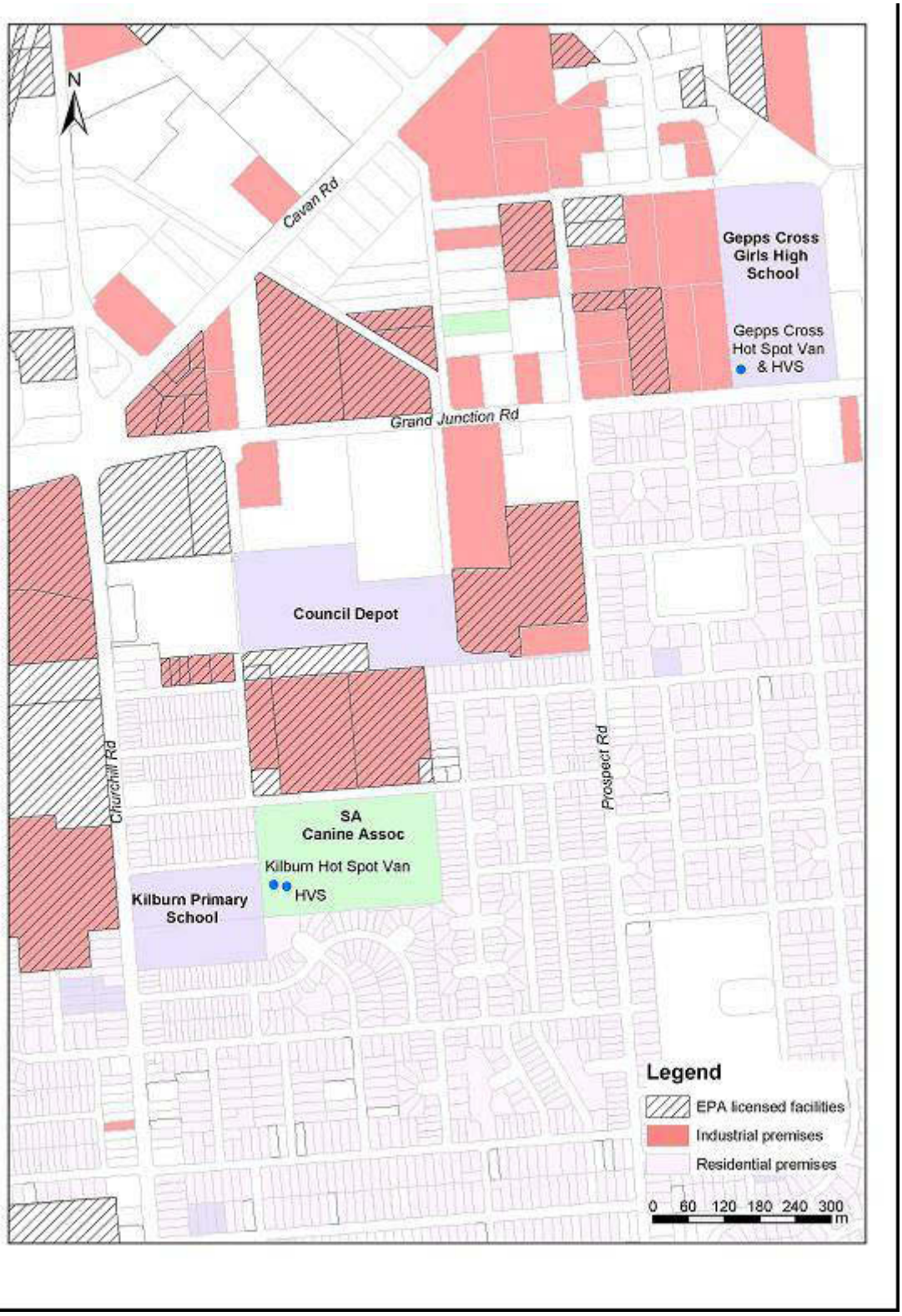

Figure 2: Map Detailing the location of Ambient Air Monitoring Site Locations

ODOUR SURVEY

An odour survey was undertaken of industries residing within a 3 km radius of the Kilburn particle and meteorological monitoring station located at the South Australian Canine Association (Appendix 3). The Odour Survey of 11 EPA licensed sites was carried out on 4 nonconsecutive days (12, 20 and 26 of May and 24 June 2005) when wind speeds were low and there was no rain (Table 3). All meteorological data used for the Odour Survey was sourced from the meteorological station located at the SA Canine Association site, Kilburn. In consultation with the EPA Licence coordinators, the survey was performed on 11 EPA licensed sites operating within the Kilburn/Gepps Cross area. The industries were chosen on the basis that the EPA had received odour complaints from the public naming the site and also due to the type of odorous emissions expected as a result of the site's activities. The surveyed Industry groups included foundries, renderers, incinerators, surface coaters and recycling depots (Table 3).

EPA volunteers were selected to participate in the odour study based upon test results of their ability to distinguish odours. Although the human nose is able to detect and distinguish odours, the intensity of the odours cannot be quantified via the nose alone. The Nasal Ranger® field olfactometer provides a method for the quantitative measurement of odour and was used by the volunteers to enable them to determine odour intensity. The survey of odour was taken upwind and down wind of each site and the volunteers were asked to describe the odour using a list of descriptors of hedonic tone and quantify the odour intensity using the Nasal Ranger® (Appendix 3).

Table 3: Industries included in the Odour Survey

Company name	Activities
Bitumax Pty Ltd	Hot mix asphalt preparation
Bradken Resources Pty Ltd	Ferrous and non-ferrous metal melting
Fletcher & Sons	Ferrous and non-ferrous metal melting
Collex Pty Ltd	Incineration: chemical wastes
Distinctive Diecasters Pty Ltd	Ferrous and non-ferrous metal melting
Korvest Ltd	Surface coating: hot dip galvanising
LF Jeffries Nominees Pty Ltd	Recycling depot (garden waste)
Master Butchers Co-Operative Ltd	Rendering and/or fat extraction works
McKechnie Iron Foundry Pty Ltd	Abrasive blasting
Plastics Granulating Services (Scherer Trading Pty Ltd)	Recycling depot (plastic containers)
Solver Paints (WP Crowhurst Pty Ltd)	Chemical storage and warehousing facilities

FINDINGS

Compliance Audit

The compliance audit results (Appendix 1) were divided into 4 groups; Galvanisers, Foundries, Agricultural Products and Other, based upon the type of activities undertaken at the site. The individual audit results were assessed against the requirements of the Environment Protection Act, 1993 and associated Regulations and Policies. This identified areas of non-compliance; in relation to potential air quality impacts and other non-air related potential environmental impacts, for further investigation. The compliance audit program identified 2 sites that have potential regional air quality impacts, 9 sites with potential local air quality impacts (<100m), 10 sites with bunding and liquid storage issues, 4 sites requiring an update to licence conditions and 1 site with potential site contamination issues (Table 4).

The compliance audit of the Galvanising group revealed that emission to air and other non-air related compliance issues were observed at Barbaro Galvanising Pty Ltd, Adelaide Galvanising Industries Pty Ltd and Korvest Ltd. At all three sites emissions of fume to air from the molten zinc baths were observed. Visible fume arising from the zinc bath at Adelaide Galvanising appears to be mostly retained within the galvanising building whilst the doors are closed. A significant evolution of fume from the molten zinc bath was observed during the audit of Korvest. The compliance of this fume emission with the Environment Protection (Air Quality) Policy, 1994 requires further follow up. Non-air related compliance issues observed during the Galvanisers group audit involve the storage of liquids, the integrity, adequacy and use of bunded areas and the general management including housekeeping of the site. A lack of suitable bunding for the containment of the cooling tower used to reduce the temperature of the sodium chromate solution and storage of oily tetrachloroethylene (TCE) outside of a bunded area was observed at Barbaro Galvanising. The integrity and capacity of a bunded area at Korvest was compromised by the storage of containers in addition to the tanks within the bunded area, the placement of pipes over the bund wall, and cracks within the bund wall surface. These observed issues potentially reduce the integrity of the bund to retain the liquids stored within it in the event of a spill or leak. General housekeeping and site management issues observed at Korvest included the presence of what appeared to be zinc fume powder at the base of the ID fan used to exhaust the molten zinc bath in plant 102, drag out of chromium (VI) from the bath in plant 103 and localised diesel contamination on the ground adjacent a diesel refuelling tank.

The compliance audit of the Foundries group revealed potential sources of emissions to air and other non-air related compliance issues at Fletcher & Sons, Bradken Resources Pty Ltd and McKechnie Iron Foundry. No issues of non-compliance were observed at the Intercast & Forge Foundry. At the three remaining sites issues relating to the effectiveness of emission capture systems and fugitive emissions of odorous compounds from the cooling of moulds were observed. A potential also exists for nuisance dust to arise as a result of entrainment of sand particles stored outside exposed to the elements and from loose sand located on surfaces around the site as a result of spills from material handling. Further investigation is required to determine whether these potential air emissions are in fact areas of non-compliance. Non-air related compliance issues observed during the compliance audit relate to the integrity of the bunded areas to retain liquids held within the bund in the event of a

spill or leak. Cracks and other damage, that appeared to be a result of general site activity, were observed at Bradken and McKechnie.

The compliance audit of the Agricultural Products group observed compliance issues that may impact on air quality and other non-air related compliance issues at Master Butchers Cooperative Ltd and L.F. Jeffries Nominees Pty Ltd whilst only non-air related issues were identified at T&R Pastoral Pty Ltd. No emissions to air were identified from Master Butchers during the compliance audit due to the rendering plant not being operational at the time of the audit; hence assessment of the odour capture and destruction strategies implemented was not possible. Authorised officers on another compliance audit at an alternate date and time did detect a strong offensive odour downwind of the Master Butchers site. Master Butchers were notified of this event within the post audit follow-up letter and the details were documented within their audit file. No emissions to air were noted during the audit of Jeffries, however a highly offensive odour of rotting vegetation was noted downwind of the site immediately after the completion of the audit. Jeffries were notified of this event within the post audit follow-up letter and the details were documented within their audit file. Non-air related compliance issues relating to bunded areas and noise levels were observed during the compliance audit of the Agricultural Products group. At Master Butchers the functionality of the tallow storage area bund was identified as a possible non-compliance issue due to the fact that the tanks were not entirely contained within the bund perimeter. Issues relating to the integrity and capacity of bunded areas and noise emissions were identified at T&R Pastoral. Elevated noise levels were experienced and originated from a compressor located at the rear of the T&R Pastoral facility. The integrity and capacity of the chromate storage bund was noted as compromised due to the presence of tank interconnection pipes running along the exterior of the bund, a drain pipe breaching the bund wall and the use of the bund to process waste water. A lack of spill control equipment in the form of spill kits was observed at liquid transfer points, the information provided to the audit team indicated that the premise relied upon the waste cartage contractor to provide the spill kits and manage spills if and when they occurred.

The compliance audit of the industry group designated as Other identified a combination of air and non-air related compliance issues for Collex Pty Ltd, W P Crowhurst Pty Ltd, Asphalt SA and Plastic Granulating Services. No non-compliance issues were identified during the audit of IJF Australia. The compliance audit of the pollution control equipment at the Collex Incinerator could not be assessed because the incinerator was not operational at the time of audit. The audit team did note that instrumentation necessary for the management of combustion did not appear to be in working order and the ability of the facility to cope with sudden changes in feed composition was also queried. The storage of liquids adjacent a low bund wall was noted as a potential issue in regard to the bund's ability to contain liquids in the event of a container rupture. Completion of the WP Crowhurst audit identified a number of non-air related compliance issues relating to bunding and potential stormwater pollution. The bunding issues related to the integrity of the rollover bund seal and the possible breach of a bund as a result of an observed earthing system. A filling point at the bulk liquids store was observed to be unbunded and thus represents a risk to the stormwater system. The wastewater treatment plant was located in very close proximity to a stormwater drain and no management system appeared to be in place to ensure pollutants do not enter or are discharged into the stormwater system when the site's isolation valve is opened. The compliance audit of Plastics Granulating Services identified fugitive offensive odours arising from

containers that previously contained dairy products. Non-air related issues identified were the capacity and adequacy of the bund housing the plastic washing plant and the storage of liquids outside of bunded areas. The compliance audit of Asphalt SA identified a potential for fugitive odour from truck exhausts during loading and the non-compliance of non-bitumen storage tanks in regards to bunding and spill management equipment.

The majority of sites that comprised the industry groups were observed to have similar compliance issues arising from practices and/or procedures for pollution control as others within the group (Table 4). The exception to this was the observation of no non-compliance issues at the Intercast & Forge foundry. This level of compliance is a result of the relatively new status of the site, the flow of information between the foundry and the EPA during the construction of the site and good management in regard to environmental impacts.

Table 4: Compliance Audit Observation Summary

SITE	Licence number	Potential regional AQ issue	Potential Local[2] AQ issue	Problems with bunding	Observed site contam'n	Licence not current
Galvanisers						
Barbaro Galvanising	91		Yes	Yes		
Adelaide Galvanising	598		Yes			
Korvest	611		Yes	Yes	Yes	
Foundries						
Intercast & Forge	12692					Yes
Fletcher & Sons	1164		Yes			
Bradkens Resources	13845		Yes	Yes		Yes
McKechnie Iron Foundry	1116		Yes	Yes		
Agricultural Products						
Master Butchers Cooperative	1147	Yes		Yes		Yes
LF Jeffries Nominees	1728	Yes				
T&R Pastoral	14372			Yes		Yes
Other						
Collex	2672		Yes	Yes		
Asphalt SA	14452		Yes	Yes		
W P Crowhurst Paints	1088			Yes		
Plastic Granulating Services	2367		Yes	Yes		
IJF Australia	13897					
TOTALS		2	9	10	1	4

[2] Local impacts are those that occur within approx 100 metres of the source

Ambient Air Monitoring

Particulates

PM_{10} monitoring using HVS was conducted on a 24hr average, 1 in 6 day sampling regime for 11 months at both the Kilburn and Gepps Cross monitoring sites. HVS monitoring resulted in a maximum PM_{10} concentration of 62.6µgm^{-3} and 31.9µgm^{-3} for the Kilburn and Gepps Cross sites, respectively. At the Kilburn site 1 exceedence of the National Environment Protection (Ambient Air Quality) Measure standard of 50µgm^{-3} was recorded and none at the Gepps Cross site. Continuous monitoring utilising the TEOM, conducted for 3 and 5-month periods, recorded a maximum PM_{10} concentration of 57.8µgm^{-3} and 79.2µgm^{-3} at the Kilburn and Gepps Cross sites, respectively (Figure 3 & 4). At both the Kilburn and Gepps Cross sites 4 exceedences of the Air Quality NEPM standard were recorded during continuous monitoring (Table 5). During the entire monitoring program (HVS and TEOM) a total of 5 unique events exceeding the Air Quality NEPM Standard were observed at the Kilburn site, 4 of these events occurring in 3 months of continuous monitoring (Figure 4,).

The collection of continuous data utilising the TEOM allows for the analysis of highly time resolved data (10 minute and 1 hour averages). To indicate whether a 'dust event' was localised or regional, PM_{10} data collected at the Netley and Kensington monitoring sites were compared with the parallel data collected at the Kilburn and Gepps Cross sites (Figure 3 & 4). The Netley background site was located in a light industrial and residential area whilst the Kensington site was located in a predominantly residential area. The 1-hour averaged PM_{10} measurements were analysed to identify whether there was a difference of more than 30µgm^{-3} between the site of interest and the background site for the same period. Regional dust events, affecting the entire Adelaide air shed, were designated as dust events whereby elevated PM_{10} concentrations were experienced at the each of the Kilburn, Gepps Cross, Netley and Kensington sites during parallel monitoring. Regional dust events were present at all sites however the average PM_{10} dust concentration measured at the Kilburn site was still 35% and 101% greater than the Netley and Kensington sites, respectively (Figure 3).

Comparison of parallel PM_{10} Kilburn and Netley site monitoring showed 124 local dust events were recorded exclusively at the Kilburn site while only 8 were recorded exclusively at the Netley site. During parallel monitoring of Gepps Cross and Netley monitoring sites, 85 and 123 unique PM_{10} dust events occurred exclusively at Gepps Cross and Netley monitoring sites, respectively. These findings suggest that PM_{10} levels experienced in the Kilburn, Gepps Cross and Netley areas are a result of contributions from localised emission sources and from local traffic sources. Of the 124 local dust events that were recorded at the Kilburn site approximately 26 occurred between 7:30 – 9:00am. For example the 3 sharp spikes occurred at approximately 8:00am on consecutive days and indicate a local or nearby dust source was responsible, as the same peaks were not observed during parallel monitoring at the Netley site (Figure 7). Comparison of wind current direction and PM_{10} concentration recorded at the Kilburn and Gepps Cross monitoring sites show the larger recorded PM_{10} values (> 40µgm^{-3}) occurred during periods when wind currents were from the NW-NE and to a lesser degree from wind currents from the S-SW (Figure 5 & 6). Hence it would be expected that the source/s of PM_{10} arise from a site/s residing in this direction from the monitoring sites.

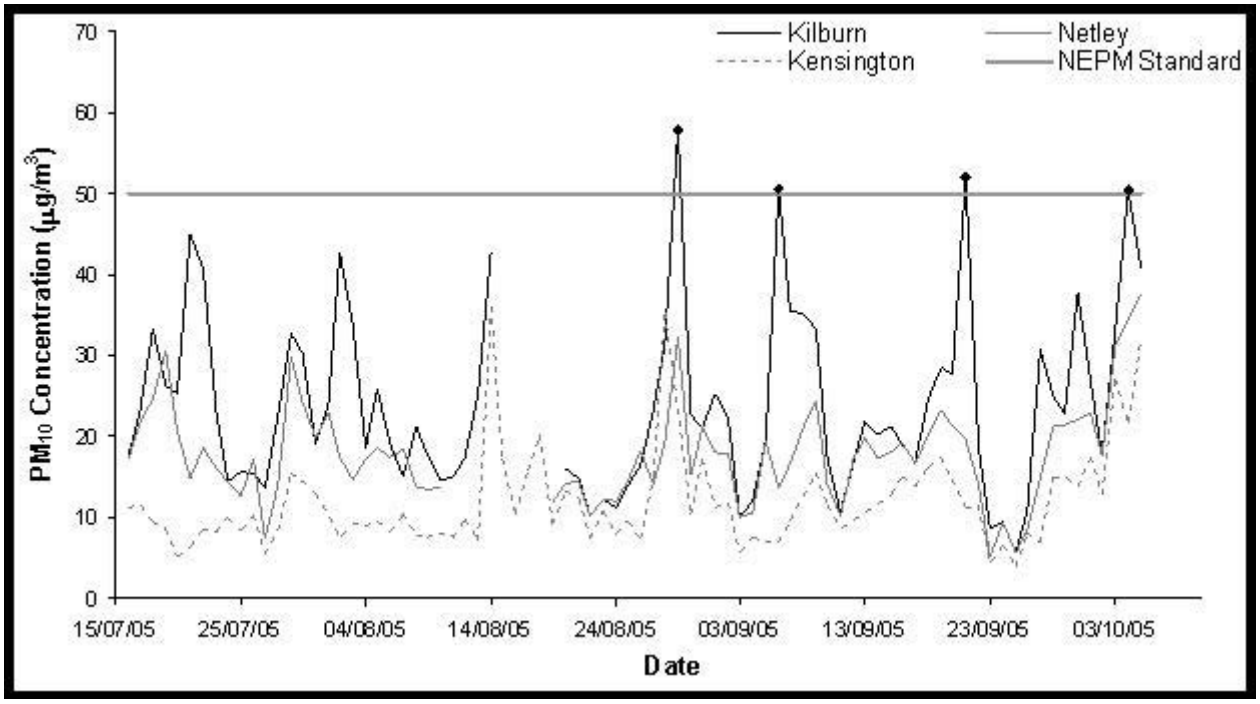

Figure 3: Kilburn, Netley & Kensington TEOM Data & the NEPM Standard (50µgm^{-3})

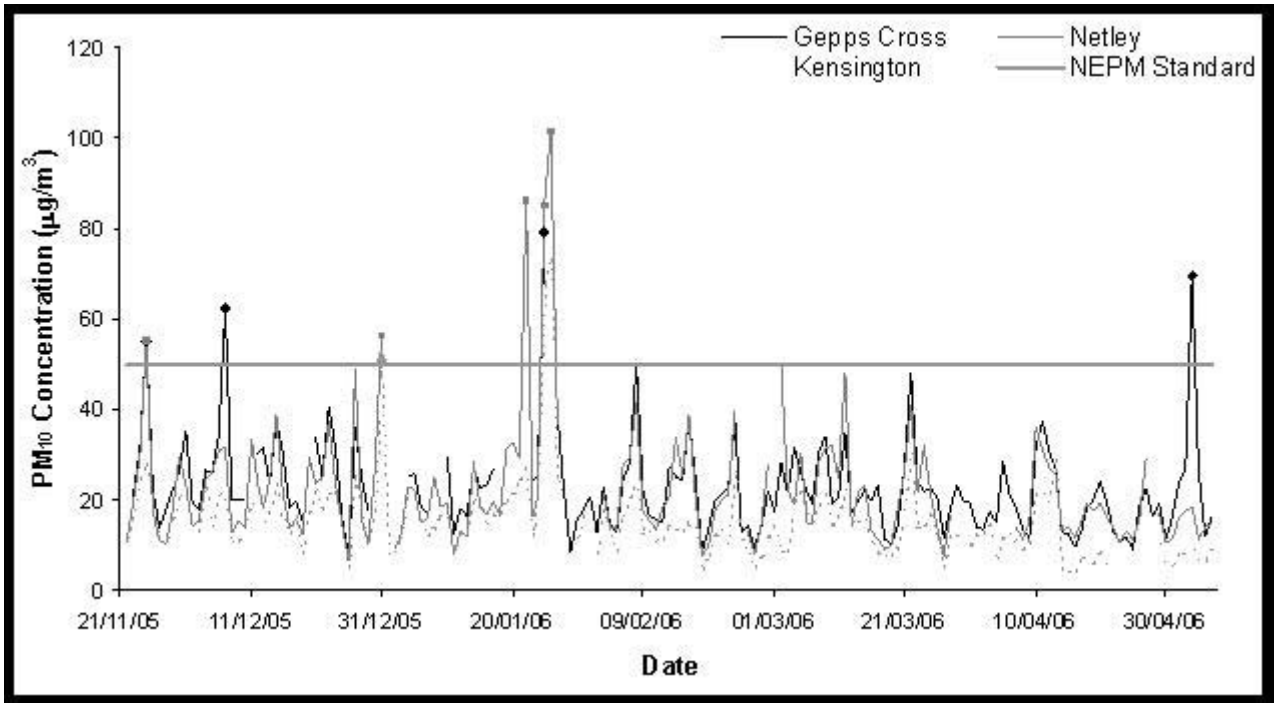

Figure 4: Gepps Cross, Netley & Kensington TEOM Data & the NEPM Standard (50µgm^{-3})

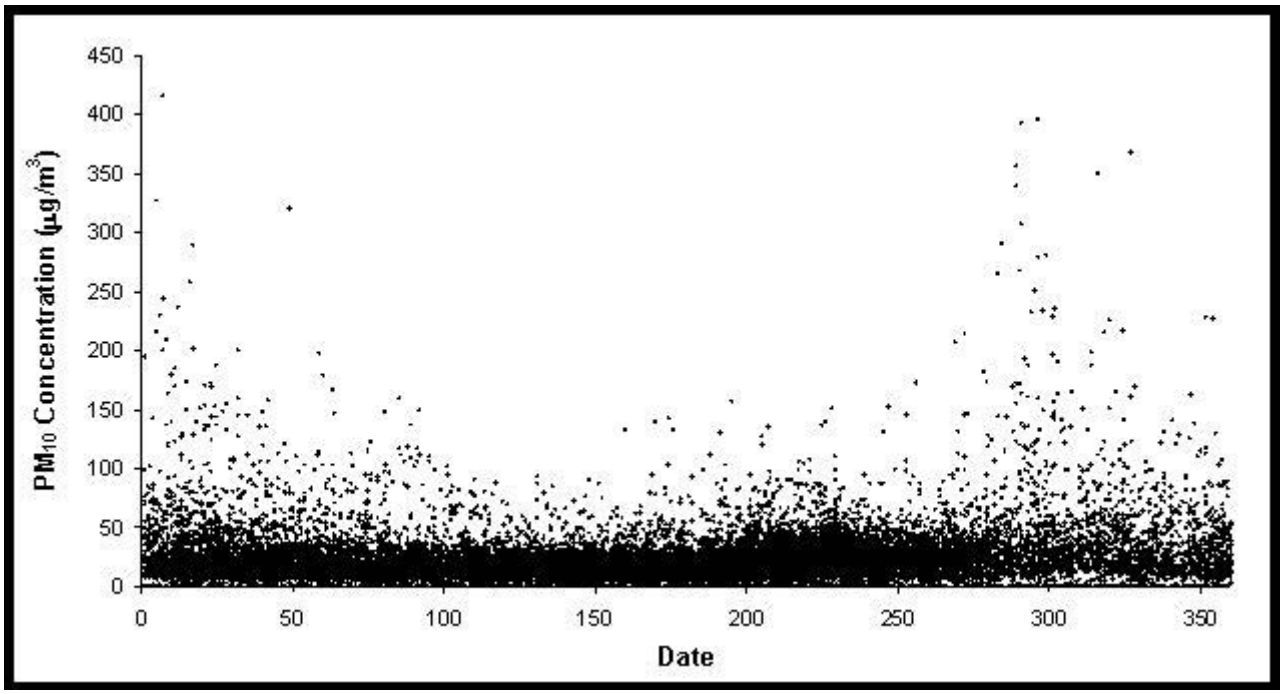

Figure 5: PM_{10} versus Wind Direction for 10-minute averages at Kilburn

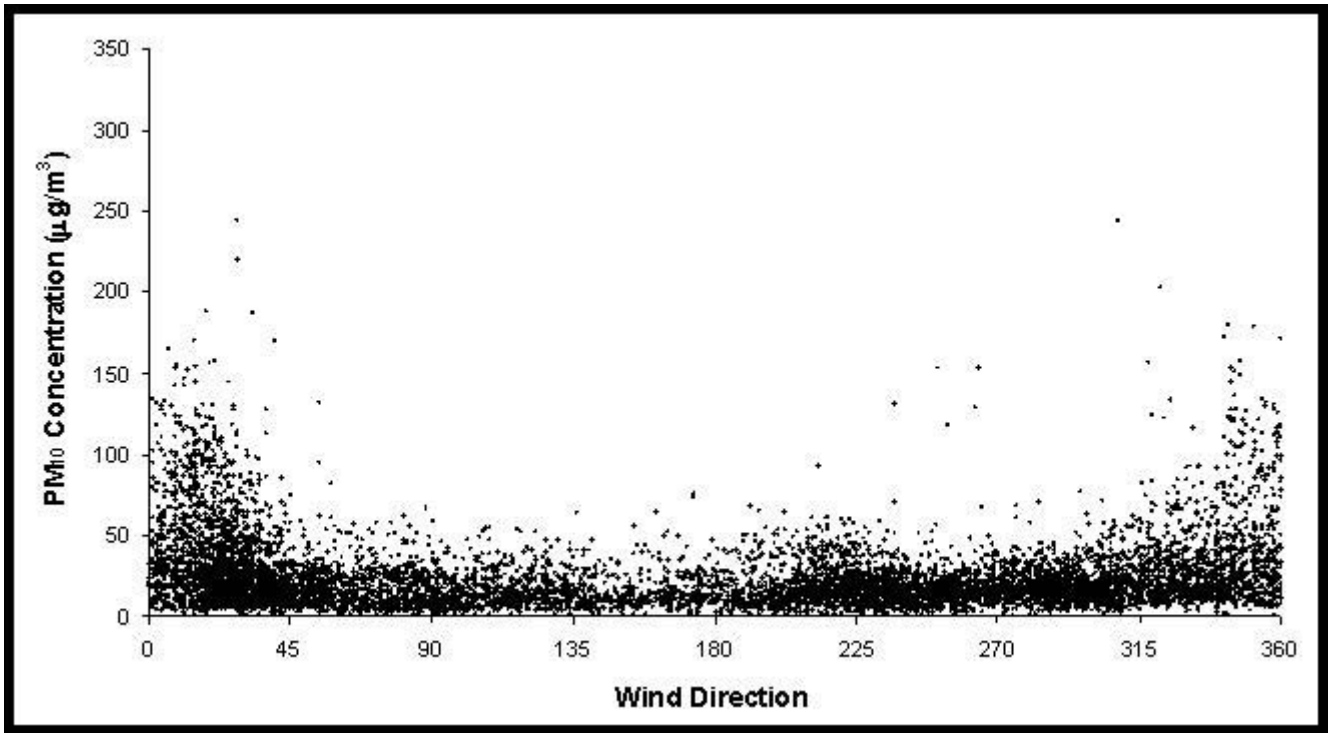

Figure 6: PM_{10} versus Wind Direction for 10-minute averages at Gepps Cross

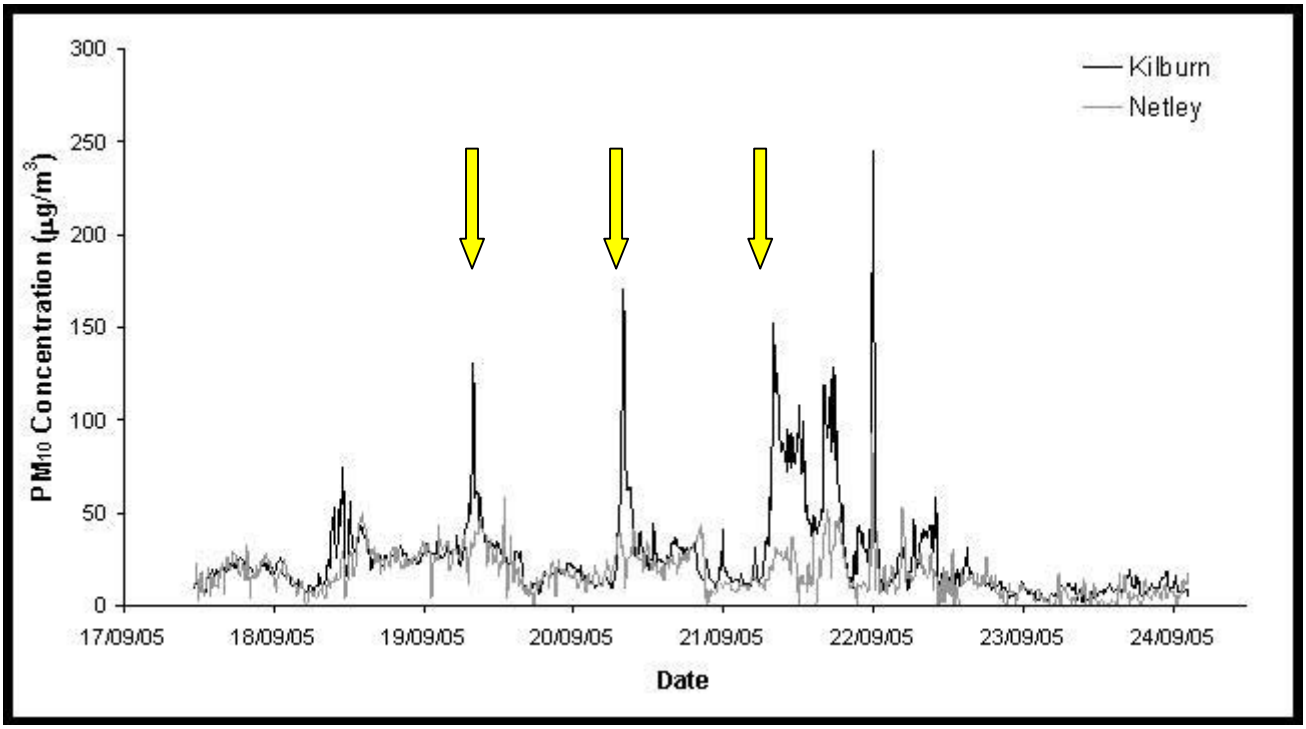

Figure 7: Continuous PM_{10} Data Recorded at the Kilburn & Netley sites (19/9-21/9, PM_{10} spikes occurred at 8am)

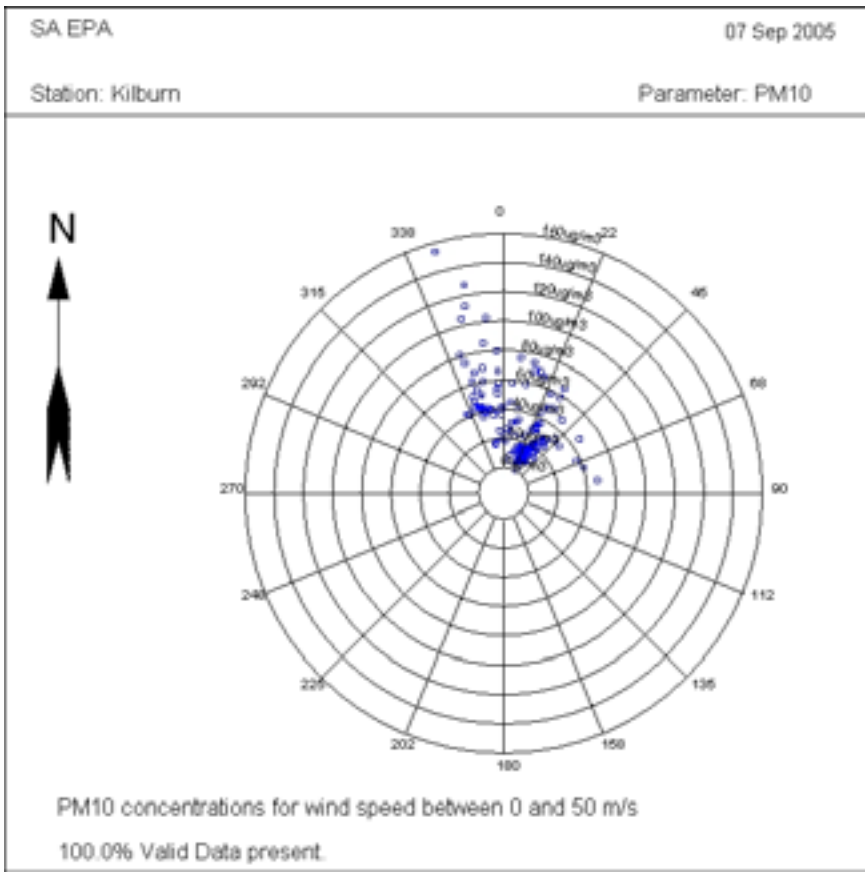

Figure 8: Wind Rose for PM_{10} at Kilburn on the Day Elevated Zinc Levels Were Recorded

Metal Analysis

Metal Analysis was carried out on a number of TSP and PM_{10} filters used for HVS monitoring at the Kilburn and Gepps Cross sites. The results show slightly elevated levels of iron and zinc in the samples when compared to results from the background site at Northfield. The highest readings found at the Kilburn monitoring site were 4.0 µg/m^3 for TSP iron and 2.6 µg/m^3 for PM_{10} zinc. The highest readings found at the Gepps Cross monitoring site were 2.2 µgm^{-3} for TSP iron and 1.6 µgm^{-3} for PM_{10} zinc. The levels for particulate zinc were very similar in both TSP and PM_{10} filters on all days of collection (Table 7) suggesting that most zinc particulate was fine in nature and is present within smoke or fume. Figure 8 shows that the wind direction and particulate loading on 7th Sept 2005 were predominantly from the North; this coincided with the day of the highest zinc loading for the Kilburn area.

Benzene

Benzene levels recorded at the Gepps Cross monitoring site were found to be at the Air Toxics NEPM Investigation Limit of 0.003ppm and were found to be 0.001ppm higher than that at the Kilburn monitoring site (Table 5). Benzene results recorded using the US EPA TO-17 tube sampling method, at the Gepps Cross site, confirmed the levels measured with the OPSIS analyser and recorded no elevated levels of the other monitored hydrocarbons. The average benzene concentration at the Kilburn site during the 3-month monitoring period was 0.002 ppm. A benzene sample was taken manually using USEPA method TO-17 on the 12th April 2006. This sample found a level of 0.022 ppm averaged across the hour with the wind direction being predominantly from the West. Another 4 samples were also taken at the same location and found levels of benzene to be 0.002 ppm, the same level as that determined via OPSIS. The 0.022 ppm reading appears to be a one off as no visible emissions were observed at the time the sample was taken, the source could not be determined and there were no other similar occasions during the 3 months of monitoring. Generally benzene was found to impact the Kilburn and Gepps Cross sites from all wind directions, however the largest benzene concentration recorded at the Gepps Cross site was during wind currents from the south.

Other pollutants and Volatile Organic Compounds

Other pollutants and Volatile Organic Compounds (VOC) recorded concentrations at the Kilburn and Gepps Cross sites were found to be low and below the relevant standards available at the World Health Organisation or United States Environment Protection Agency used for ambient air quality assessment. Sampling via USEPA TO-17 and USEPA TO-11A methodologies revealed low levels of VOC pollutants measured (Table 6). Moderate levels of pollutants were measured at the Gepps Cross site, these coincided with wind currents from the south and had carbon monoxide and oxides of nitrogen peaks as well as small increases in background levels of formaldehyde. These carbon monoxide and oxides of nitrogen peaks and increased formaldehyde represent the profile of traffic related sources typically found at other monitored Adelaide metropolitan sites.

Table 5: Kilburn & Gepps Cross Areas Monitoring Results & Comparison with National Environment Protection (Ambient Air Quality) Measure Standards or National Environment Protection (Air Toxics) Measure Investigation Levels

Pollutant	Maximum Measured		Air Toxics or Ambient Air Quality NEPM		
	Kilburn	Gepps Cross	Ambient Air Quality Standard or Air Toxics Investigation Level	Kilburn Exceedences	Gepps Cross Exceedences
PM_{10} – TEOM	57.8 µg/m^3 (24 hr ave)	79.2 µg/m^3 (24 hr ave)	50µg/m^3 (24hr ave) not greater than 5 events per year	4	4
PM_{10} - HVS	62.6 µg/m^3 (24 hr ave)	31.9 µg/m^3 (24 hr ave)		1	0
Carbon Monoxide	2.47 ppm (8 hr ave)	1.8 ppm (8 hr ave)	9 ppm	0	0
Nitrogen Dioxide	0.044 ppm (1 hr ave)	0.037 ppm (1 hr ave)	0.12 ppm (1 hr ave)	0	0
Sulfur Dioxide	0.017 ppm (1 hr ave)	0.004 ppm (1 hr ave)	0. 20 ppm (1 hr ave)	0	0
Benzene[3]	0.002 ppm (study ave)	0.003 ppm (study ave)	0.003 ppm (annual ave)	0	0
Toluene	0.007 ppm (24 hr ave)	0.020 ppm (24 hr ave)	1.0 ppm (24 hr ave)	0	0
Formaldehyde	0.013 ppm (24 hr ave)	0.019 ppm (24 hr ave)	0.04 ppm (24 hr ave)	0	0

[3] Due to Benzene monitoring being undertaken for less than a year the study average was used for comparison with the National Environment Protection (Air Toxics) Measure Investigation Level.

Table 6: Volatile Organic Compounds & Acetaldehyde Concentrations Recorded at the Kilburn and Gepps Cross Monitoring Sites

Volatile Organic Compounds	Kilburn Monitoring Site (μgm^{-3})					Gepps Cross Monitoring Site (μgm^{-3})				
Date	11/4/06	12/4/06	13/4/06	19/4/06	27/4/06	12/4/06	19/4/06	26/4/06	27/4/06	27/4/06
Trichlorofluoromethane (Freon 11)	8.36	11.1	#	12.1	6.69	2.4	#	7.19	#	6.53
Dichloromethane	#	#	#	3.7	#	#	#	#	3.72	#
Benzene	3.48	8.83	#	75	10	5.38	#	7.93	#	5.76
Trichloroethylene	#	#	#	#	#	#	3.21	#	#	#
Toluene	#	#	21.1	3.12	#	20.7	#	#	16.1	#
Ethyl benzene	#	#	#	#	#	#	#	#	3.34	#
1,2,4-Trimethylbenzene	#	#	2.72	2.39	#	#	#	#	#	#
1,4-Dichlorobenzene	#	#	#	#	2.25	#	#	#	#	#
Total Xylenes	#	#	3.19	#	#	3.19	#	#	8.5	#
Aldehyde / Ketone										
Date	-	-	-	-	27/4/06	-	26/4/06	27/4/06	27/4/06	27/4/06
Acetaldehyde[4]	-	-	-	-	87	-	14	45	#	#

Results were below the reportable limit of the applicable USEPA TO-17 or USEPA TO-11A method.

[4] Laboratory errors resulted in 1 out of 5 and 4 out of 5 samples being analysed from the Kilburn and Gepps Cross monitoring sites, respectively

Table 7: Metal Analysis of HVS Filters collected from the Kilburn and Gepps Cross Monitoring Sites

Parameter	Kilburn Site Metal Analysis (µgm^{-3})						Gepps Cross Site Metal Analysis (µgm^{-3})					
	Date	**Iron**	**Lead**	**Zinc**	**Nickel**	**Chromium**	**Date**	**Iron**	**Lead**	**Zinc**	**Nickel**	**Chromium**
TSP	09/06/2005	4.0	0.0	0.6	0.0	0.1	23/01/2006	1.5	0.0	0.4	0.0	0.0
	02/08/2005	3.4	0.1	1.1	0.0	0.0	17/01/2006	1.2	0.0	1.5	0.0	0.0
	07/09/2005	3.1	0.0	2.5	0.0	0.0	05/04/2006	2.2	0.0	1.2	0.0	0.0
PM_{10}	09/06/2005	2.7	0.0	0.5	0.0	0.0	23/01/2006	0.5	0.0	0.2	0.0	0.0
	02/08/2005	2.3	0.1	0.9	0.0	0.0	17/01/2006	0.6	0.0	1.6	0.0	0.0
	07/09/2005	1.5	0.0	2.6	0.0	0.0	05/04/2006	0.6	0.0	0.7	0.0	0.0
Northfield site (PM_{10})	02/08/2005	0.3	0.0	0.0	0.0	0.0	02/08/2005	0.3	0.0	0.0	0.0	0.0
Netley site – (PM_{10})	02/08/2005	0.3	0.0	0.1	0.0	0.0	02/08/2005	0.3	0.0	0.1	0.0	0.0

Odour Survey

Surveyed industries are ranked according to the highest Dilution-to-threshold (D/T) value detected downwind of the industry by the volunteer using the Nasal Ranger® on the day of sampling (Table 8). Of the 11 industries the most odorous were Bradken Resources and the Master Butchers Co-Operative D/T readings ranging from 30 - 60 for both sites. Bitumax and McKechnie Iron Foundry followed with D/T readings ranging from 2 - 15. This high odour intensity combined with the hedonic tone of the odours being described as 'unpleasant' and 'foul' indicates these industries present an odour concern in the Kilburn area. Due to the close proximity of industries in the area, some of the odours detected upwind of sites (Table 8) were not reflective of the industrial site being surveyed. For example the asphalt odour upwind of Fletcher & Sons was not reflective of the expected odours from a foundry. The odours were most likely from Bitumax, which was upwind of the foundry during the survey and was described as having an asphalt odour when surveyed downwind of the site.

Table 8: Results of Odour Survey

Industry	Nasal Ranger readings		Descriptors		Comments	
	Downwind	Upwind	Downwind	Upwind	Downwind	Upwind
Bradken	60, 30, 30	no reading	burnt metallic	smoky	constant very strong unpleasant	
Master Butchers Co-operative	30, <60, 30	no odour	sharp pungent cooked meat putrid foul meat		very unpleasant foul	
McKechnie Iron Foundry	2, no reading, 15	no odour	metallic camphor burnt		Intermittent noticeable	
Bitumax	4, 2, 2	faint	asphalt	solvent petrol	unpleasant	
Collex	no reading	no odour	burnt sharp pungent smoky rubbish stale		intermittent comes in burst every 1-2 minutes	
Fletcher & Sons	no reading	negligible	metallic burnt burnt rubber	asphalt	intermittent	slight asphalt odour
Plastics Granulating Services	no reading	no odour	plastic	burnt rubber	weak intermittent	very faint odour
Solver Paints	no reading	no odour	paint solvent ether aromatic sweet		very slight not strong smell intermittent	
Distinctive Diecasters	no reading, just detectable	no odour	burnt hot metal			
Korvest	no odour	no reading		weak burnt plastic		very weak
L F Jeffries Nominees	no reading	no odour	musty earthy			

CONCLUSIONS

The compliance audit identified a range of compliance issues in relation to potential air quality impacts and other non-air related issues. Of the air related compliance issues 2 sites were deemed to have potential regional air quality impacts and 9 were observed to have potential local air quality impacts (within 100m). Of the non-air related issues identified during the compliance audit, most related to the bunding and storage of liquids. This type of non-compliance was predominantly a result of poor site management including housekeeping, storage of liquids and maintenance of the integrity of the bunding system.

Most individual sites within the industry groups were observed to have similar practices and/or procedures for pollution control as the others within the group. The exception to this was the observation of no non-compliance issues at the Intercast & Forge foundry. The observation of no non-compliance issues is a result of the relatively recent construction of the site (in discussion with the EPA) and good management in regard to environmental impacts. Thus the compliance of a site with the Environment Protection Act and related legislation is reflective of a combination of the age of the site and its equipment, the sites involvement with the EPA and the mindset of the site managers.

The review of the ambient air quality in the Kilburn/Gepps Cross area surmised that the quality of and impacts to the local air shed is comparable to that of Adelaide areas containing similar levels of local industry and vehicle traffic routes. Impacts to the local air shed were identified to arise as a result of localised sources, such as local industry activity and vehicle traffic and to a lesser extent from regional sources. A comparison of the localised PM_{10} dust events recorded in the Kilburn, Gepps Cross and Netley areas signified that these areas with a similar range of industrial activity and transport routes have similar dust levels. The sources and scale of the localised dust events impact on the Kilburn and Gepps area requires further investigation.

A high risk exists for the National Environment Protection (Ambient Air Quality) Measure PM_{10} Goal to be exceeded in the Kilburn/Gepps Cross area. During the continuous monitoring periods of the Kilburn and Gepps Cross sites 4 and 5 exceedences of $50\mu gm^{-3}$ were recorded, respectively. Continuous monitoring was conducted for 3 months at the Kilburn site and 5 months at the Gepps Cross site. If continuous monitoring was carried out for a 12-month period and this trend were to continue it is highly likely that PM_{10} recordings will exceed the NEPM Goal of not more than 5 events above the NEPM Standard for PM_{10} per annum.

Comparison of the highly time resolved PM_{10} monitoring data of the Kilburn and Gepps Cross sites with parallel PM_{10} data collected at the Netley and Kensington sites identified unique localised events at all sites. These unique events point to local sources of PM_{10} in the Kilburn, Gepps Cross and Netley areas. The unique PM_{10} dust event findings suggest that PM_{10} levels experienced in the Kilburn, Gepps Cross and Netley areas are a result of contributions from localised emission sources and from local traffic sources. The results further show that PM_{10} levels recorded in the Kilburn area are greater than those of the Netley and Kensington sites. This is reflective of the density and type of local industry operating in the area and additionally the type and amount of vehicle traffic travelling through the area.

The benzene levels recorded during monitoring at the Kilburn and Gepps Cross sites were below and at the Air Toxics NEPM Investigation Limit, respectively. If benzene

levels remain unchanged, the trend over a 12-month period for the Kilburn site is not expected to reach the annual average Air Toxics NEPM Investigation Limit of 0.003ppm. Benzene levels at various other monitoring sites in the past have been detected at a similar order of magnitude to those measured at Kilburn. There is a risk however that the annual average Air Toxics NEPM Investigation Limit of 0.003ppm will be reached if monitoring is undertaken at the Gepps Cross site for a period of 12 months. Results for benzene recorded at the Gepps Cross site signifies that further monitoring is required to support the findings and determine the source of the benzene.

Metal Analysis of HVS filters resulted in elevated levels of zinc and iron in filters removed from HVS located at both the Kilburn and Gepps Cross sites when compared to the Northfield site. The levels for particulate zinc were very similar in both the TSP and PM_{10} filters suggesting that most zinc particulate was fine in nature and possibly a component of smoke or fume. Due to the type of filters used the chemical structure of the zinc could not be determined. Further particulate collection at the Kilburn and Gepps Cross sites is required to determine the chemical structure and speciations of the zinc compounds and subsequently determine the source of the fume/smoke. Heavy metals measured were minor and did not exceed criteria from the WHO or USEPA. Monitoring identified predominantly vehicle emission type sources of pollutants to the south of the Gepps Cross site (ie Grand Junction Road) as a major source of pollutants including moderate levels of formaldehyde, carbon monoxide and oxides of nitrogen.

The Odour survey has shown that industries in the Kilburn area are not entirely odour free and variance in odour intensity and hedonic tone indicates the potential for odour issues to exist in the Kilburn and Gepps Cross areas.

The Kilburn/Gepps Cross area review enables the identification of areas where improved performance by local industry can reduce pollutant loads into the local air shed. This managed environmental improvement can be implemented with the assistance of the EPA through the use of modified licence conditions and eco-efficiency training. The findings of this review, opportunities for improvement and further monitoring programs will be made available to the Kilburn/Gepps Cross community via information sessions and awareness programs. These programs will have regard to the quality of ambient air, raise awareness of impact sources to the local air quality and provide a greater appreciation by industry in regard to their impacts upon the local environment.

REFERENCES

APPENDIX 1

Site Audit Results

Barbaro Galvanising Pty Ltd

Barbaro Galvanising Pty Ltd operates a facility for galvanising small black iron parts such as scaffolding brackets and reinforcing bars.

Observed emissions to air

- Zinc oxide fume from the molten zinc bath.

Other issues identified during the audit

- The lack of adequate bunding for the sodium dichromate solution cooler
- The storage of oily TCE outside a bunded area

Adelaide Galvanising Industries Pty Ltd

Adelaide Galvanising Industries Pty Ltd operates a facility for galvanising black iron parts such as fabricated structural beams and platforms.

Observed emissions to air

- Zinc oxide fume from the molten zinc bath however the bulk of this stays within the galvanising building.

In discussions with site management, it would appear that successful management of zinc oxide fume is a problem across the galvanising industry.

Other issues identified during the audit

- Nil

Korvest Ltd

Korvest Ltd operates two plants for galvanising black iron parts. Plant 102 is capable of galvanising large fabrications while plant 103 handles smaller objects such as clips and brackets.

Observed emissions to air

- A significant evolution of zinc oxide fume from the molten zinc bath in plant 102 was highly visible during the audit

Other issues identified during the audit

- Zinc oxide fume powder was observed on the ground around the ID fan on the molten zinc bath in plant 102
- The integrity and functionality of bunded areas on site and their conformance to the EPA Guideline 080/04 *Bunding and Spill Management* http://www.epa.sa.gov.au/pdfs/guide_bunding.pdf
- Drag out of chromium (VI) from the bath in plant 103
- Localised diesel contamination in the ground adjacent the diesel tank near plant 103

Intercast & Forge

Intercast & Forge operates a foundry capable of mass-producing cast and ductile iron components of up to 35 kg. The foundry uses green sand technology for its moulds.

No issues were identified during the audit however the licence requires updating.

Fletcher & Sons

Fletcher & Sons operates a jobbing foundry capable of producing up 100 kg iron and steel castings. The foundry uses resin bonded sand technology for its moulds.

Observed emissions to air

- Fugitive loss of odorous products of resin pyrolysis during mould cooling
- The potential for nuisance dust from the sand lying around the site and the large inventory at the back of the site

No other issues were identified during the audit.

Bradken Resources Pty Ltd

Bradken Resources Pty Ltd operates a jobbing foundry capable of producing up 10 tonne steel castings. The foundry uses resin bonded sand technology for its moulds.

Observed emissions to air

- Escape of fume from the furnace during crucible filling
- Fugitive loss of odorous products of resin pyrolysis during mould cooling
- The potential for nuisance dust from the sand on the ground and building roof

Other issues identified during the audit

- A cracked bund wall at the chemical store
- The need for splash guards in some bunded areas where the inventory was too close to the bund wall
- The licence needed to be updated to reflect plant operation

McKechnie Iron Foundry

McKechnie Iron Foundry operates a jobbing foundry capable of producing up 20 tonne iron and steel castings. The foundry uses resin bonded sand technology for its moulds.

Observed emissions to air

- Fugitive loss of pyrolysed resin chemicals evolved during mould cooling
- Potential for wind whipping of sand lying around the site

Other issues identified during the audit

- The cracked roll over bund at the entrance to the chemical store

Master Butchers Cooperative Limited

Master Butchers Cooperative Limited operates a rendering plant fed by material from members of the co-operative. The operation produces protein meal and tallow.

No emissions to air were identified from this site, however the rendering plant was not operating for most of the time the audit team were on site so no assessment of the odour destruction strategies was possible. Authorised Officers on other audits detected a strong offensive odour downwind of the site.

Observed emissions to air

- A strong offensive rendering odour was present in Rosberg Road downwind of the site

Other issues identified during the audit

- The adequacy of the tallow storage bunding on the southern boundary of the site
- The need to update the licence to make it more accurately reflect your business activities

L.F. Jeffries Nominees Pty Ltd

L.F. Jeffries Nominees operates a retail outlet for bulk landscaping material such as mulching materials and soils. The rear half of the site is used to receive green organics from kerb side collection and blend with wood waste to produce a feed for the composting operation at Buckland Park.

The blended material was obviously composting and while no emissions to air were observed on site, the audit team noted a highly offensive odour of rotting vegetation in Schumacher Road immediately after the audit.

Observed emissions to air

- A highly offensive odour of rotting vegetation downwind in Schumacher Road immediately after the audit.

No other issues were identified during the audit.

T&R Pastoral Pty Ltd

T&R Pastoral Pty Ltd operates a facility for processing sheepskins. Most skins are tanned however some are salted for export.

No emissions to air were identified from this site.

Other issues identified during the audit

- The high compressor noise level;
- The integrity of the chromate bund, specifically with regard to pipes exterior to the bund, a drain pipe breaching the bund wall and the use of the bund as a process tank;
- The need for future bunds to be constructed to EPA Guideline 080/04 *Bunding and Spill Management*;
- The need for the company to have spill kits at the waste loading points and not rely on the waste cartage contractor to provide spill kits;
- The need to update the licence to make it more accurately reflects the business activities.

Collex Pty Ltd

Collex Pty Ltd operates a facility to incinerate various wastes including medical, quarantine and spent solvents.

The incinerator was off work during the audit for internal refractory repair however audit team noted that instrumentation necessary for combustion management was not operational. The ability of the facility to cope with sudden changes in feed composition was also questioned.

Other issues identified were:

- The large inventory of solvents stored in the bunded area and whether it was stored to close to the (low) bund wall.

Asphalt SA

Compliance Audit not per formed as the plant was being rebuilt during the audit program

W P Crowhurst Pty Ltd

W P Crowhurst Pty Ltd operates a facility for manufacturing, packing and warehousing water based paints.

While no emissions to air were noted a number of other issues were observed:

- The need to extend the roll-over bund to accommodate an unbunded filling point at the bulk liquids store;
- The need to reseal section of the roll-over bund at the bulk liquid store;
- Possible penetration of the ammonia/glycol bund by the earthing system;
- Compliance of the stormwater discharge with the *Environment Protection (Water Quality) Policy 2003* (SA);
- Possible passing of the stormwater isolation valve;
- The installation of a high level alarm in the stormwater system;
- The proximity of the waste treatment plant to the stormwater system.

Plastic Granulating Services

Plastic Granulating Services recycle various waste plastics (such as film, poly pipe, crates etc) to form fresh moulding granules

The major emission to air from this site was:

- Fugitive offensive odours from raw materials that previously contained dairy products

Other issues identified were:

- The adequacy of the bunding in the shredded plastic washing plant.
- Storage of 205 litre drums of oils (including waste) outside bunded areas.
- Storage of cooling water outside bunded are

IJF Australia

IJF Australia manufactures furniture from veneered chipboard. No issues were observed during the audit.

APPENDIX 2

Glossary of Terms

TEOM: Tapered Element Oscillating Microbalance – An instrument capable of measuring continuously the mass of particles collected on a filter.

HVS: High volume sampler – An instrument used to collect large samples of particles for compositional analysis. One sample collected per 24-hour period.

OPSIS: A brand of instrument that uses the differential optical absorption spectroscopy (DOAS) method. Uses light to measure the levels of gaseous pollutants in air.

USEPA TO-17: A sampling and analysis method for volatile organic compounds present in air. The standard method for determining a limited number of VOC concentrations in air in Australia.
The following compounds were analysed: Trichlorofluoromethane (Freon 11), 1,1-Dichloroethene, Dichloromethane, Dichloroethene, 1,1-Dichloroethane, 1,2-Dichloroethene, Bromochloromethane, 2,2-Dichloropropane, 1,2-Dichloroethane, 1,1,1-Trichloroethane, Dichloropropene, Benzene, Carbon tetrachloride, Dibromomethane, 1,2-Dichloropropane, Bromodichloromethane, Trichloroethylene, cis-1,3-Dichloropropene, trans-1,3-Dichloropropene, 1,1,2-Trichloroethane (Mr 132), Toluene, 1,3-Dichloropropane, Dibromochloromethane, 1,2-Dibromoethane, Tetrachloroethylene, 1,1,1,2-Tetrachloroethane, Chlorobenzene, Ethyl benzene, Bromoform, Styrene, 1,1,2,2-Tetrachloroethane, Trichloropropane, Isopropylbenzene, Bromobenzene, 2-Chlorotoluene, n-Propylbenzene, 4-Chlorotoluene, 1,3,5-Trimethyl benzene, t-Butylbenzene (Mr 134), 1,2,4-Trimethylbenzene (Mr 120), 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, sec-Butylbenzene, 4-Isopropyltoluene, 1,2-Dichlorobenzene, n-Butylbenzene, 1,2-Dibromo-3-chloropropane, 1,2,4-Trichlorobenzene, Naphthalene, 1,2,3-Trichlorobenzene, Hexachlorobutadiene,Total Xylenes

USEPA TO-11A: A sampling and analysis method for aldehydes and ketones present in ambient air. The standard method for determining a limited number aldehyde and ketone concentration in air in Australia.
The following compounds were analysed: Formaldehyde, Acetaldehyde, Acrolein, Acetone, Propionaldehyde, Crotonaldehyde, Methacrolein, 2-Butanone, Butyraldehyde, Benzaldehyde, Valeraldehyde, p-Tolualdehyde, Hexaldehyde.

Carbon monoxide Direct Reading Method: As specified in AS 3580.7.1-1992

APPENDIX 3

Kilburn Odour Study Report