

Lead dust accumulation in residential Evaporative Air Conditioning Ducts in Esperance after short lived dust emissions

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Introduction

There were several lead carbonate shiploading events in Esperance during 2005-2006 which caused lead carbonate dust to be blown over parts of the town. The issue of lead dust entering evaporation air-conditioning units and whether they should be included in the cleanup project is one which requires further exploration and explanation.

Discussion

The major issue to be considered is the likelihood of the contamination of evaporation air-conditioning units (EACs) occurring, as contamination of EACs, including the filter pads, duct work and vents from acute, sporadic and short lived dust emission events is believed not to be an issue in this instance. As the dust emissions from the Port were discrete events the opportunity for EACs to be contaminated with lead was dependent on a number of issues.

Evaporative air conditioning systems work by drawing outside air through a set of woven fibrous filter pads which is saturated with water, through a fan unit and out into rooms via flexible ductwork. The warm air loses heat as it passes through the water soaked filter pads by transferring the heat to the colder water.

The effect of the dusty air hitting a water soaked filter pad would remove the majority of dust from the air and be washed out of the unit via the return water overflow to the gutter and/or directly off the roof via a dedicated overflow drain pipe.

To provide an example of when lead contamination in air conditioning ducts could have occurred, the following scenario is explored:

If an EAC along a wing trajectory was operating during the times when lead carbonate was being loaded onto ships at the Port and the wind was blowing across the Port then over the location of the EAC then the EAC may draw this dust air into the unit. If the EAC was operating without water flowing through the filter pads there is a chance that a small amount of lead would have been caught in the EAC system. This would be the case due to the dust not being washed out by the effects of filtration by the water flow over the filters and consequently being blown directly out of the system through the ventilation outlets.

Capture of re-mobilised lead dust by EACs

A review of the airborne dust samples across town by Sinclair Knight Merz for the Esperance Port Authority has shown that airborne lead levels post the event were well below the nationally accepted guideline (Refer to the Appendix) and that long

term lead remobilisation was not occurring. This means that once the initial dust emission events were over, there was no ongoing or long-term dust emissions from the Port and that the opportunity for lead contaminated dust to enter the EACs was extremely low.

Manufacturers' instructions for cleaning EAC Filter Pads

Evaporative Air Conditioner Manufacturer, Seeley International, in their equipment Owner Manuals (<http://www.breezair.com.au/brochures>) recommend that at the end of each warm season the filter pads be removed from the system and that the unit be inspected and cleaned. They also recommend that the system be inspected at the beginning of the warm season and that the filter pads should be inspected to determine if they are suitable for reuse and if so they should be cleaned with low pressure water to remove any dust build up over the cold season before being re-fitted to the system

Following the manufacturers' instructions should remove any lead dust from the filter pads and the cooler body.

Air conditioning duct cleaning

In regards to specific cleaning of air conditioning ducts there have been many studies internationally. To allow for a reasonable appreciation of the findings of these studies I have chosen a US EPA document which draws upon such and provides further guidance on the subject.

The US EPA booklet *Should You Have the Air Ducts in Your Home Cleaned* regarding air conditioning duct cleaning states the following:

Duct cleaning has never been shown to actually prevent health problems. Neither do studies conclusively demonstrate that particle (e.g., dust) levels in homes increase because of dirty air ducts. This is because much of the dirt in air ducts adheres to duct surfaces and does not necessarily enter the living space. It is important to keep in mind that dirty air ducts are only one of many possible sources of particles that are present in homes. Pollutants that enter the home both from outdoors and indoor activities such as cooking, cleaning, smoking, or just moving around can cause greater exposure to contaminants than dirty air ducts. Moreover, there is no evidence that a light amount of household dust or other particulate matter in air ducts poses any risk to your health.

(US EPA, *Should You Have the Air Ducts in Your Home Cleaned*, EPA-402-K-97-002, ISBN 0-16-042730-4, October 1997.
<http://www.epa.gov/iaq/pubs/airduct.html>)

Recommendations

Lead contamination of EACs in Esperance due to the shiploading events at the Port is most likely low. Testing of EACs would show the actual extent of contamination, although the US EPA's statements in their booklet provide guidance that the potential affects to health of low amounts of dust in such systems and associated ductwork is very minimal.

In this instance no adverse health symptoms associated with the operation of EACs which may contain lead contaminated dust have been discovered in Esperance.

As such I do not recommend the cleaning of Evaporative Air Conditioning Systems and ductwork of possible lead contamination on health grounds.

Appendix

The following report was produced by Sinclair Knight Merz for the Esperance Port Authority in relation to annual air quality monitoring around the Port.

Sinclair Knight Merz
Ambient Air Quality Monitoring Report
1 OCTOBER 2007 – 30 SEPTEMBER 2008
Report for Esperance Port Authority
WV03710-MV-RP-0014
9 February 2009

This page from the report shows the locations of the air quality monitoring stations.

Annual Ambient Air Quality Monitoring Report

SKM

6. Monitoring Results

From October 2007 to January 2008 air quality-related activities at the port were monitored under DEC Licence 5099/10. From February 2008 a revised AQMP was implemented (EsPA 2008b). Data collected in accordance with both these requirements is reported in this section and compared to the future requirements of Licence 5099/1974/11.

6.1. PM₁₀ Measured Using a Tapered Element Oscillating Microbalance

6.1.1. October 2007 – January 2008

Three TEOM monitoring sites were in operation during the period October 2007 to January 2008, and are shown in **Figure 6-1**. These continuous monitors provide 30-minute PM₁₀ concentrations.

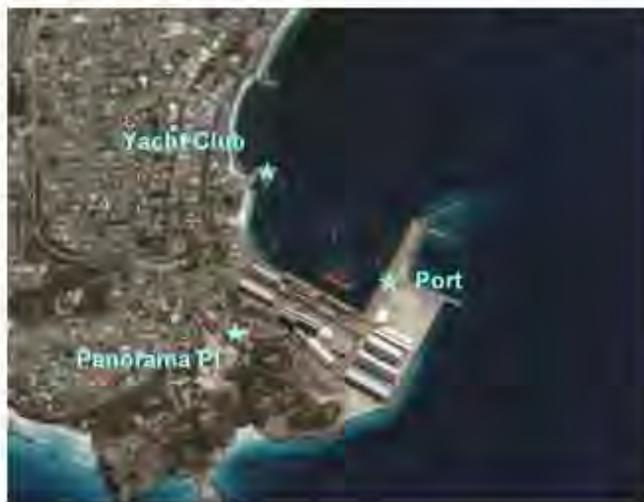


Figure 6-1 Location of TEOM monitoring stations between October 2007 and January 2008

The following paragraph provides details of the air samplers and sample sites.

6.2. TSP High Volume Air Samplers (HVAS)

6.2.1. October 2007 – January 2008

Three HVAS monitors operated alongside the TEOMs at Panorama Place, the Port, and the Yacht Club (see **Figure 6-1**). The results from these monitors were analysed on a daily basis, and the filter paper samples sent to a laboratory for metal speciation analysis (lead, nickel, iron and sulfur). The TSP results for October 2007 to January 2008 are presented in **Figure 6-5** (SKM, 2007b-d, 2008a). The same observations as for the TEOM locations regarding an incomplete dataset and non-compliance with AS/NZ standard siting locations should be taken into account (detailed in **Section 6.1.1**).

This graph shows the airborne lead concentrations in High Volume Air Sample results during Feb to Sept 2008. The graph shows that lead levels were either at or below the levels of detection, $0.01\mu\text{g}/\text{m}^3$, and well below the National Environment Protection Measure Guideline of $0.5\mu\text{g}/\text{m}^3$.

Annual Ambient Air Quality Monitoring Report



Figure 6-8 Lead concentration in HVAS filter paper samples between February and September 2008

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