Rail corridor coal dust monitoring

March 2014

This fact sheet provides background information on dust monitoring by the Department of Science, Information Technology, Innovation and the Arts (DSITIA) on the Western-Metropolitan rail line at Cannon Hill, Fairfield (Brisbane) and Toowoomba. The Queensland Resources Council has commissioned DSITIA to undertake this monitoring.

Why is this dust monitoring taking place?

Approximately 9 million tonnes of export coal is currently transported each year to the Port of Brisbane from coal mines in the Clarence-Moreton and Surat basins in southern Queensland via the Western and Metropolitan rail systems. As part of the industry’s commitment to the community on best practice environmental standards, the South West System coal supply chain members developed a Coal Dust Management Plan (https://www.qrc.org.au/_dbase_upl/AZ023_CoalDustManagementPlan_public.pdf) in November 2013. As part of this plan, DSITIA has been commissioned to undertake dust monitoring to confirm that dust levels, particularly coal dust levels, continue to meet environmental standards.

Is all dust the same?

Dust can be generated in many different ways, particularly in a city where a wide range of domestic, commercial, industrial and transport activities take place. Other sources include bushfires and dust storms. Dust particles can be solid or liquid, or a combination of both; and range in size from less than 0.1 µm (µm = micrometre, or one millionth of a metre; a human hair has a width of about 50 µm) up to about 500 µm (or half a millimetre). Very small particles may remain suspended in the atmosphere for many days and travel many hundreds of kilometres, while large particles tend to settle out quickly near the source of the particles. In general, particles produced by burning fuels (e.g. motor vehicle engines, industrial boilers, wood heaters, bushfire smoke) will be smaller than particles produced by mechanical processes (e.g. earthworks, mining, construction activities) and wind erosion.

Dust may cause health and nuisance effects, depending on the concentration and size of the particles and exposure time. Health effects associated with exposure to elevated dust levels include coughing, sneezing, wheezing and increased breathlessness. Nuisance effects include short-term reduction in visibility, build-up of dust on homes and soiling of washing. In general, particles less than 10 µm in size (PM10) are associated with health impacts, while particles greater than 10 µm in size tend to lead to nuisance impacts.

How do trains cause dust?

As a train approaches and moves past a fixed point it pushes air ahead of it, stirring up dust from the ground. With coal trains, some dust may also be blown from the top of the load or from coal remnants in unloaded wagons. As this type of dust is not generated by coal combustion, it will be larger than 2.5 µm in size (PM2.5), and often larger than PM10.

In line with the industry’s Coal Dust Management Plan, before leaving a mine’s loading facility, the surface of every loaded coal wagon travelling on the Western-Metropolitan rail line is sprayed with a bio-degradable polymer coating to suppress coal dust emissions.

For trains pulled by diesel locomotives, engine exhaust emissions are another source of particles. Most of these particles would be in the PM2.5 size range.

Will coal dust affect my health?

Health risk is greatest for particles less than 10 µm in size (PM10) that are small enough to be breathed deep into a person’s lungs. More and more studies are suggesting that particles less than 2.5 µm in size (PM2.5) are the biggest risk.

In a big coastal city like Brisbane, there are a large number of human and natural sources of these small particles, including motor vehicles, industrial processes, wood fires, lawnmowers, bushfires and even salt in ocean spray.
While some of the particles generated by coal trains could be less than 10 µm in size, most will be bigger than 2.5 µm and are less likely to pose a health risk.

Previous monitoring has found that PM$_{10}$ and PM$_{2.5}$ levels on the Western-Metropolitan rail line are comparable to levels experienced in ‘non-rail’ areas around Brisbane. This indicates that rail transport is only a minor source of PM$_{10}$ and PM$_{2.5}$ particles when compared with other urban sources.

The following levels are used to assess if PM$_{10}$ and PM$_{2.5}$ levels could pose a risk to people’s health.

<table>
<thead>
<tr>
<th>Particle size fraction</th>
<th>Measuring time</th>
<th>Objective*</th>
<th>Allowable exceedances</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM$_{10}$</td>
<td>24 hours</td>
<td>50 µg/m$^3$</td>
<td>5 days per year</td>
</tr>
<tr>
<td>PM$_{2.5}$</td>
<td>24 hours 1 year</td>
<td>25 µg/m$^3$</td>
<td>Nil</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 µg/m$^3$</td>
<td>Nil</td>
</tr>
</tbody>
</table>

*The objectives are expressed in units of micrograms of dust present in a cubic metre of air, µg/m$^3$, as an average over the measuring time.

**When is dust considered a nuisance?**

Dust is considered a nuisance when the amount settling out in a given time (deposited dust), or the amount of dust in the air (total suspended particles, TSP), exceeds a certain level. The following levels are used to assess if dust is likely to be a nuisance.

<table>
<thead>
<tr>
<th>Dust type</th>
<th>Measuring time</th>
<th>Dust nuisance level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposited dust</td>
<td>30 days</td>
<td>4 g per square metre</td>
</tr>
<tr>
<td>TSP</td>
<td>24 hours</td>
<td>80 µg/m$^3$</td>
</tr>
</tbody>
</table>

Some people may consider dust to be a nuisance at lower levels than others, particularly in the case of high-visibility dusts.

**There is black dust on my roof. Is this coal dust?**

While coal is often present in samples of black dust taken from near the rail corridor, it is rarely the major component. Studies have found that, on average, coal makes up about 10 per cent of black dust, which also contains soil, soot, black tyre rubber and often mould.

It has also been found that very little coal dust travels more than about 10 metres away from the rail line.

**What is being monitored?**

The monitoring on the rail corridor at Cannon Hill involves:

- continuous measurement of PM$_{10}$ and PM$_{2.5}$ for direct comparison with guidelines for human health protection
- continuous measurement of total suspended particles (TSP) for direct comparison with recommended dust nuisance avoidance guidelines
- collection of 30-day samples of deposited dust to determine the amount and composition of dust settling out near the rail corridor. Deposited dust sampling is also being carried out at Fairfield and Toowoomba.

It is important to note that the dust levels measured will be the total dust from all sources, including motor vehicles, industry and fires, and not just dust from train movements.

**How is the amount of coal measured?**

The deposited dust sample is examined under a microscope to identify how much of the dust is coal.

**Where can I access the monitoring data?**

The continuous PM$_{10}$, PM$_{2.5}$ and TSP monitoring data is available via the Queensland Government live air data webpage ([http://www.ehp.qld.gov.au/air/data/search.php](http://www.ehp.qld.gov.au/air/data/search.php)). The website data is updated hourly.

The Cannon Hill dust measurements are listed together with measurements from other DSITIA monitoring sites in South East Queensland. This makes it easy to compare levels at Cannon Hill with those in other areas.

The web data is colour-coded to make it easier to see if dust levels are acceptable. Dust levels with a blue, green or purple background meet the human health protection or dust nuisance guidelines. Dust levels with a red or grey background do not comply with the human health protection or dust nuisance guidelines. The most common reasons for high dust levels in South East Queensland are bushfires or dust storms.
Both the continuous and monthly dust deposition data is reported in DSITIA’s South East Queensland monthly air quality bulletins (http://www.qld.gov.au/environment/pollution/monitoring/air-reports/). The bulletins are available from the website two months after the end of the reporting month.

A report summarising the findings of the monitoring will be available in mid-2015.

**Frequently asked questions**

*Is the government paying for this monitoring?*

No. Funding for this monitoring has been provided by South West System coal chain supply members in line with commitments made in their joint coal dust management plan.

*Why are the particle measurements on the website displayed as 24-hour averages?*

Current health and dust nuisance guidelines refer to a minimum exposure period of 24 hours. For this reason, the PM$_{10}$, PM$_{2.5}$ and TSP results are displayed as 24-hour averages to enable direct comparison with the relevant health or nuisance guideline value. However, five minute averaged data is being recorded by the continuous instruments to ensure information on short term spikes in particle levels is captured, and an analysis of this data will be presented in the final report.

*Why is there no information on the proportion of coal dust in the PM$_{10}$, PM$_{2.5}$ and TSP particles?*

The continuous PM$_{10}$, PM$_{2.5}$ and TSP monitoring instruments can only measure the concentration of all particles in these size fractions present in the air sample. They cannot identify the type of particles present. Coal dust is measured by microscope analysis of the deposited dust samples.

*What happens if an air quality guideline is exceeded?*

When an air quality guideline is exceeded, or is expected to be exceeded, for a prolonged period, DSITIA advises the Department of Health who will assess the need for any public health advice.

DSITIA investigates the cause of all air quality guideline exceedances. Where the exceedance appears to be related to emissions from an industry source, the Department of Environment and Heritage Protection is advised.

*Are the coal companies doing anything to minimise the dust?*

Actions being taken by South West System coal chain supply members to reduce the loss of coal during transport include moisture content management, improved loading practices and load profiling, and veneering of loaded wagons. Veneering is the application of a biodegradable polymer onto the surface of the loaded coal to form a crust which significantly reduces coal dust lift-off. More information can be found in the South West System Coal Dust Management Plan.

*Can I trust the monitoring data?*

All monitoring is conducted in accordance with the requirements of the relevant Australian Standard method. DSITIA has an in-house quality system that ensures all data is validated prior to release in bulletins and other publications. Once a month validated data is uploaded to the live air data webpage in place of the original hourly data. (The paragraph underneath the table indicates if the data is fully validated or is still the original hourly data that has only had a preliminary quality check.)