Guidance Note – Lead
(Supplementary information to Schedule B7 section 5.4)

This note provides additional information on the determination of the lead Health Investigation Levels (HILs) in the *National Environment Protection (Assessment of Site Contamination) Measure 1999* (NEPM) and the use of the United States Environmental Protection Agency (US EPA) Integrated Exposure Uptake Biokinetic Model (IEUBK Model) in site-specific risk assessments.

NHMRC Blood Lead Goal for Australia

The determination of the HILs in the NEPM has used the blood lead goal set for all Australians by the National Health and Medical Research Council (NHMRC). The NHMRC position on lead is documented at http://www.nhmrc.gov.au/your-health/lead-exposure-and-health-effects.

The position statement notes that:

> ***All Australians should have a blood lead level below 10 μg/dL.***
>
> **and**
>
> ***This should not be interpreted as suggesting that 10 μg/dL is a safe level of exposure or a level of concern. Rather it is the level at which sources of exposure to lead should be investigated.***

The HILs have been derived using this blood lead goal with the goal being applied to 95% of the population evaluated (i.e. the HIL derived is based on a soil concentration (and intake from other sources such as air, diet and drinking water) where 95% of those exposed will have blood lead levels below 10 μg/dL).

It is not appropriate to use this goal as an average blood lead concentration when assessing exposure to lead at a specific site given the NHMRC statement that all Australians should have blood lead concentrations less than 10 μg/dL. A site-specific assessment is required to consider the 95% level.

The NHMRC has also established a new working committee to review the current Australian blood lead goal as noted in the position statement at http://www.nhmrc.gov.au/your-health/lead-exposure-and-health-effects. The committee is considering the information used by the US Centres for Disease Control (US CDC) when they recently changed their blood lead goal to 5 μg/dL as well as other recent literature. The committee is made up of representatives of various Health Departments as well as academics working in this field as is scheduled to report in mid-2014.

Both the NHMRC and the US CDC note that it is important to limit exposure to lead in the community.

IEUBK Model

The IEUBK Model was developed by the US EPA to facilitate calculations such as those undertaken in determining the HILs and uses the detailed understanding of uptake and excretion that is available for lead in people. A summary description of each of the input parameters is provided in a paper

developed to support the HIL calculations at http://www.enrisks.com.au/resources-view/ieubk-modelling-for-establishing-hil-a-and-conducting-site-specific-adjustments-to-the-model/. More detailed information is available in the technical support document for the model at http://www.epa.gov/superfund/health/contaminants/lead/products.htm.

As noted in the NEPM all other toxicity reference values for lead have been withdrawn by the World Health Organization (WHO) and other relevant agencies.

Most of the input parameter defaults chosen by the US EPA are relevant for most contaminated sites and are based on evidence collected during site remediation in the USA. The main parameter that can be adjusted for a site-specific risk assessment is the bioaccessibility of the lead at a site. The bioaccessibility of lead in soil depends on the source of the lead. If the lead is sourced from the breakdown of car batteries for example then the lead is likely to be readily bioaccessible and the default input parameter value would be relevant. If the lead is sourced from an ore body then the bioaccessibility can be quite different and a site-specific value may be used in the site-specific risk assessment. Bioaccessibility needs to be measured in samples from the site as discussed in Schedule B4 of the NEPM before any changes to the modelling can be made.

For most contaminated sites in Australia, there will be limited changes that can be made to the model input parameters and so it is not recommended that site-specific remediation criteria be generated unless there is strong evidence available that supports changes to the defaults.

When using the IEUBK model it is important to make sure to enter the right statistic for the calculation. When using the Find button to determine a soil concentration that will keep blood lead levels below a certain level, the probability of exceeding the cutoff should be 5%. The default value is 50% and this is protective of the average of the population which does not meet the NHMRC goal. The default value needs to be changed to ensure that 95% of the population assessed is below the blood lead goal.

It should also be noted that the NHMRC goal is a population-wide goal that is being adapted to a site-specific goal for a limited population size. This makes it even more important to not estimate the soil remediation criteria using the wrong statistical basis.

In summary, risk management of elevated lead levels at contaminated sites will become increasingly the focus of site investigation and remediation where lead levels are above HILs. It is not appropriate to undertake a site-specific risk assessment using the IEUBK model at most sites where bioaccessibility is not known or not expected to be much different from 80-100%. For a limited number of sites it is possible that bioaccessibility will be different from that assumed in the development of the HILs. In these cases measurement of bioaccessibility must be undertaken and the modelling should be undertaken by experienced users of IEUBK.