Consultation Regulation Impact Statement

Managing risks associated with lead in the workplace: blood lead levels and exposure standards

December 2015

Contents

Executive Summary

Lead has a wide range of biological effects on people, including on the developing foetus, which are directly related to the concentration of lead in the affected organ systems.

This Consultation Regulation Impact Statement (Consultation RIS) has been prepared by Safe Work Australia to assist Ministers responsible for Work Health and Safety (WHS) in their decision regarding the best way to reduce the potential for adverse health outcomes caused by exposure to lead in the workplace.

Safe Work Australia is seeking information on a range of questions in relation to the options presented for blood lead levels and airborne lead concentrations. Information from submissions will be used to carry out further cost impact analysis and prepare a Decision Regulation Impact Statement (Decision RIS). The preferred option in the Decision RIS will be determined after considering information provided from the public consultation. In particular Safe Work Australia seeks views are sought on:

1. setting levels of lead in workers' blood (blood lead levels) to identify:

- trigger points to commence mandatory health monitoring of workers undertaking lead risk work
- workers who need to be removed from lead risk work, and
- when those workers may be returned to lead risk work.

2. setting a maximum concentration of lead in air for workplaces.

Blood lead levels

In Australia, WHS laws in all jurisdictions except the ACT prescribe blood lead levels. The ACT has little if any industry involving lead.

WHS requirements for managing lead exposure in the workplace are the same in all jurisdictions which have adopted the 'model' WHS laws developed by Safe Work Australia—that is, the Commonwealth, New South Wales, Queensland, South Australia, Tasmania and the Northern Territory.

Under model WHS laws, at risk workers must be immediately removed from carrying out lead risk work if their blood lead levels are at or greater than:

- 50 micrograms of lead per 100 mL (µg/dL) of blood for females not of reproductive capacity and males
- 20 µg/dL for females of reproductive capacity, and
- 15 µg/dL for females who are pregnant or breastfeeding.

While Victoria and Western Australia have not adopted the 'model' requirements for managing lead are generally the same, subject to the differences explained in section 3.4.

This Consultation RIS discusses whether the current mandated blood lead levels for removal of workers' from lead risk work are adequate to protect workers' health and that of their unborn children.

Epidemiological and toxicological evidence suggests current removal levels are not adequate to protect most workers. Studies demonstrate potential adverse health effects start at blood lead levels as low as 5 µg/dL with more serious effects starting at approximately 25 - 30 µg/dL. Occupational epidemiological investigations indicate effects, including cancer, are mostly associated with blood lead levels greater than 30 µg/dL.

For the developing foetus, risks of spontaneous abortion and detrimental intellectual development are associated with blood lead levels below the currently mandated removal level for females of reproductive capacity—20 µg/dL.

This Consultation RIS considers three options to amend Australian requirements to reflect these findings:

- Option 1: Status quo (no changes to mandated blood lead removal levels)
- Option 2: Amending mandated blood lead removal levels and related requirements to reflect epidemiological and toxicological evidence:
  - a 20 µg/dL (target level) and 30 µg/dL (removal level) for females of non-reproductive capacity and males with a 10 µg/dL removal level for females of reproductive capacity.
- Option 3: Gender neutral blood lead removal level:
  - a 10 µg/dL blood lead removal level for all workers.

Airborne lead contaminant levels

WHS laws in all jurisdictions currently set maximum lead concentrations in air which must not be exceeded in the workplace i.e. workplace exposure standards (WES). The WES for lead is 0.15 milligrams per cubic metre of air (mg/m^3).

Additionally, duty holders must eliminate or minimise concentrations so far as is reasonably practicable.

Toxicological evidence suggests the current Australian WES for lead is not adequate to protect workers' health and that of their unborn children.

Toxicological models demonstrate concentrations of lead in air can be used to estimate blood lead levels in workers. This Consultation RIS draws on these studies to suggest new WES for lead—to ensure mandated maximum blood lead levels are not exceeded.

The options are:

- Option 1: Status quo (workplace exposure standard of 0.15 mg/m^3)
- Option 2: Workplace exposure standard of 0.05 mg/m^3
- Option 3: Workplace exposure standard set to protect the most vulnerable group (0.01 mg/m^3)
- Option 4: Non-regulatory approach (non-mandatory) work airborne level of 0.15 mg/m^3, 0.05 mg/m^3 or 0.01 mg/m^3 dependant on the adopted blood lead level option).

Glossary

Acronyms

Acronym	Description
ACGIH	American Conference of Governmental Industrial Hygienists
BLRL	Blood lead removal level
COAG	Council of Australian Governments
FRC	Females of Reproductive Capacity
FNRC/M	Females Not of Reproductive Capacity and Males
mg/m^3	Milligrams per metre cubed
NHMRC	National Health and Medical Research Council
NOHSC	National Occupational Health and Safety Commission
OBPR	Office of Best Practice Regulation
P/BF	Pregnant and or Breast Feeding
RIS	Regulation Impact Statement
TWA	Time Weighted Average
µg/dL	Micrograms per decilitre
$µg/m^3$	Micrograms per metre cubed
µmol/L	Micromoles per litre
WES	Workplace Exposure Standard
WHS	Work Health and Safety

Definitions

8-hour Time-weighted average (TWA) means the maximum average airborne concentration of a substance when calculated over an eight-hour working day, for a five-day working week.

Biological monitoring - means:

(a) the measurement and evaluation of a substance, or its metabolites, in the body tissue, fluids or exhaled air of a person exposed to the substance; or

(b) blood lead level monitoring.

Blood lead level means the concentration of lead in whole blood expressed in micromoles per litre (µmol/L) or micrograms per decilitre (µg/dL).

Blood lead level monitoring means the testing of the venous or capillary blood of a person by a laboratory accredited by the National Association of Testing Authorities (NATA), under the supervision of a registered medical practitioner, to determine the blood lead level.

Blood lead removal level means a confirmed blood lead level at which a worker must immediately be removed from carrying out lead risk work.

Female of reproductive capacity - means a female other than a female who provides information stating that she is not of reproductive capacity.

Health monitoring (in reference to lead) - means monitoring the person to identify changes in the person's health status because of exposure to lead. Health monitoring includes: demographic, medical and occupational history, physical examination, and biological monitoring.

Lead means lead metal, lead alloys, inorganic lead compounds and lead salts of organic acids.

Lead process – see Appendix A

Lead process area means a workplace or part of a workplace where a lead process is carried out.

Lead risk work - means work carried out in a lead process that is likely to cause the blood lead level of a worker carrying out the work to exceed:

(a) for a female of reproductive capacity — 10µg/dL (0.48µmol/L); or
(b) in any other case — 30µg/dL (1.45µmol/L).

Workplace exposure standard means an exposure standard in Safe Work Australia's Workplace Exposure Standard for Airborne Contaminants. An exposure standard represents the airborne concentration of a particular substance or mixture that must not be exceeded. The exposure standard for lead is in the form of an 8-hour time-weighted average.

Conversions

1 µg/m^3 = 0.001 mg/m^3 (ie. there are 1000 micrograms in one milligram)

1 µg/dL = ~0.05 µmol/L (ie. µg/dL x 0.0483 (conversion factor for lead))

1 µmol/L = ~21 µg/dL (ie. µg/dL x (20.72 (molecular weight of lead per decilitre))

Interpretation

This Proposal should be read with:

- Part 7.2 of the model Work Health and Safety (WHS) Regulations, published on the Safe Work Australia website
- the Safe Work Australia publication *Workplace Exposure Standards for Airborne Contaminants*, 18 April 2013, and
- the ToxConsult Pty Ltd report *Review of hazards and health effects of inorganic lead – implications for WHS regulatory policy*, July 2014, published on the Safe Work Australia website.*

** This independent report was commissioned by Safe Work Australia to inform this Consultation RIS. It includes an extensive literature review and references over 350 individual reports and documents in support of its findings.*

1. Key issues for consultation

This Consultation RIS seeks public comment and feedback on the regulatory options being considered to manage the adverse health effects of lead exposure in response to updated evidence. Key issues for consideration are the lack of available information on the current magnitude of lead exposure in workplaces, and the likely impact of the proposed options on Australian businesses.

Responses received during the consultation process will help to fill the information gaps, as well as help shape and inform the proposed policy options. Specifically, the issues for consultation and the questions will assist in developing a complete understanding of the costs and likely impacts that may occur if the requirements for lead exposure are changed under the model Work Health and Safety Regulations. This includes how feasible it is for businesses to meet any new standards, what effects any changes might have on workforce participation, and the cost of any changes to control methods, or worker testing processes currently in place.

This information will also be used to develop a Decision RIS which will include a cost benefit analysis to assess the impacts associated with the final proposed regulatory model. The Decision RIS will Ministers in deciding which proposal is the best option.

The Decision RIS will be published on the Office of Best Practice Regulation (OBPR) website.

The problem

Evidence suggests that the current regulatory controls for lead exposure in the workplace are not adequate to protect the health and safety of lead process workers.

The proposed solutions

Changes to the biological monitoring for lead through the limits set in the model WHS Regulations for blood lead levels, and changes to the limits for lead in the workplace exposure standard for airborne contaminants are the options considered to address this issue.

Issues for consultation and feedback

The focus of this consultation process is to gather information from industry and interested parties on the nature and extent of the impact of the proposed options. In the process, Safe Work Australia is also interested in respondents' views on whether any changes are needed to regulation and, if so, what form such changes should take.

The key issues to be addressed through consultation are:

- the cost and impact to businesses of the current regulation
- any changes to the cost and impacts under the proposed options
- the nature and scope of the industry sector to which the regulatory change applies e.g. employment and business numbers, safety performance, particular characteristics of the industry in relation to the proposed changes
- any technical barriers which may preclude adoption of each of the proposed options, and
- the degree to which businesses have already implemented voluntary control measures beyond those prescribed in the regulations and WES, and how effective those measures are in reducing adverse health effects in workers.

Filling the gaps

The data presented in this Consultation RIS is incomplete because the majority of publicly available Australian blood lead level reports do not identify the individual's employer, making it difficult to determine if the exposure source is occupational and, if so, which industry the individual works in.

An accurate assessment of the number of workplaces in which lead processes occur could not be made because there is no register available which lists workplaces using lead processes and no single agency currently compiles information on the number of workplaces where lead processes occur.

Publicly available statistical data on industry size is insufficient to accurately determine the number of lead risk workers as lead risk work is a subset of industry determined on repeated/ ongoing exposure and not on business sector.

Although a requirement exists under the model WHS Regulations for a business to notify the regulator that the work is lead risk, this information is likely to underestimate the size of the lead risk workforce in Australia due to under reporting, non-compliance and difficulties in accessing or locating information previously submitted.

1.1 Providing your feedback

Safe Work Australia welcomes submissions from businesses undertaking lead risk work, unions, workers, regulators, interested parties, government departments and members of the public.

This Consultation RIS includes questions which are designed to elicit information on the proposed options.

Respondents may answer some or all of the questions posed in this paper, or can raise a matter not explicitly addressed, as long as it is pertinent to the regulation of lead risk work.

For ease of reference, the questions appearing throughout this Consultation RIS are listed in Appendix D. Wherever possible include evidence and examples to justify a position.

Making a submission

Submissions are sought by **5.30 pm on 26 February 2016**. Submissions can be made either online at https://submissions.swa.gov.au/lead, by email to lead@swa.gov.au or by post to:

The Director
Occupational Hygiene Section
Safe Work Australia
GPO Box 641
Canberra ACT 2601

Respondents may elect to have their submissions published online.

Safe Work Australia's policy on acknowledging receipt of and publishing submissions is provided on its website.

2. Introduction

2.1 About Safe Work Australia

Safe Work Australia is an independent Australian Government statutory agency which is jointly funded by the Commonwealth, state and territory governments through an Intergovernmental Agreement.

Safe Work Australia was established by the *Safe Work Australia Act 2008* (Cth) with primary responsibility to lead the development of policy to improve WHS and workers' compensation arrangements across Australia. It performs its functions in accordance with strategic and operational plans agreed annually by WHS Ministers.

Safe Work Australia does not regulate WHS laws. The Commonwealth, states and territories retain responsibility for regulating and enforcing WHS laws in their jurisdiction.

Safe Work Australia is governed by a tripartite body comprising 15 Members, including:

- an independent Chair
- nine Members representing the Commonwealth and each state and territory
- two Members representing the interests of workers
- two Members representing the interests of employers, and
- the Chief Executive Officer (CEO) of Safe Work Australia, who is responsible for managing Safe Work Australia's administration and assisting it in the performance of its statutory functions.

2.2 Safe Work Australia's role in managing the risks of lead risk work

Background

In 2009 Safe Work Australia Members agreed to establish a tripartite Lead Working Group in response to new evidence published by the National Health and Medical Research Centre (NHMRC) and the Australian Institute of Occupational Hygienists (AIOH) on the health effects of lead exposure, and associated blood lead levels.

In consultation with this group, Safe Work Australia commenced a program of work to review both the blood lead removal levels and workplace exposure standard, taking into account current toxicological information, overseas trends and revised classification information for lead.

The review consulted a variety of stakeholders including, jurisdictional regulators, the Australian Chamber of Commerce and Industry (ACCI), the Australian Industry Group (Ai Group), the Australian Council of Trade Unions (ACTU), the National Health and Medical Research Council (NHMRC), the Australian Institute of Occupational Hygienists (AIOH), the Australasian College of Toxicology and Risk Assessment (ACTRA), representatives from major business involved with the production and export of lead, the National Industrial Chemicals Notification and Assessment Scheme (NICNAS), and the Plastics and Chemicals Industries Association (PACIA).

The requirement for a review was further supported in 2011 when Safe Work Australia released the model Work Health and Safety Regulations following public consultation. The Decision RIS noted:

There were a number of submissions including from employer groups and unions for the blood lead levels proposed within the draft model WHS Regulations to be reviewed as soon as possible to reflect the latest toxicological information and current practicability standards.

In 2014, to inform this Consultation RIS, Safe Work Australia commissioned an independent, evidence based report. It included an extensive literature review and references over 350 individual reports and documents in support of its findings. The Report, written by ToxConsult Pty Ltd, was peer reviewed by the United States National Institute for Occupational Safety and Health and comment was sought through the Safe Work Australia website. The report was distributed to over 8000 stakeholders via email.

Next steps

Through this Consultation RIS, Safe Work Australia will gather information on the key issues previously outlined, and analyse these against the options to determine the impacts on the different businesses who undertake lead risk work, and how this affects the different jurisdictions.

A Decision RIS will be prepared recommending a preferred approach for managing lead exposure in the workplace.

Regulatory change will only take place once each jurisdiction has adopted any changes to the model work health and safety regulations into their laws.

3. Lead exposure and the need for regulation

3.1 What is lead and how is it used?

Lead is a naturally occurring metal with properties that make it useful for a wide range of applications like producing solder, batteries, x-ray shielding and ammunition.

The use of lead in the developed world has been progressively eliminated or reduced as knowledge has increased about its potential adverse health effects. However it still remains common in the environment [(1)].

In Australia removing lead from petrol and paint has significantly reduced risks to workers and the general population.[*]

Solid lead, in itself, presents little or no risk to people.

However, when lead is processed in a way that produces lead dust, fumes or mist (e.g. grinding or heating) it poses a risk to health.

Part 7.2 of the model Work Health and Safety Regulations applies to 'lead processes'.

Lead processes can include a wide range of activities, including:

- manufacturing dry lead compounds
- radiator repairs
- assembling, handling, repairing or dismantling batteries
- spraying, melting or casting lead alloys
- recovering lead from its ores or other compounds
- machine sanding or buffering surfaces coated in lead paint
- welding or cutting metal coated with lead
- spray painting with lead paint
- use of detonators or weapons
- foundry processes
- lead assay processes.

Appendix A contains a full list of lead processes.

3.2 Health effects

Lead has a wide range of biological effects on people, including the developing foetus, which are directly related to the concentration of lead in the affected organ systems. This includes effects on the nervous system, increased blood pressure, heart rate variability, kidney dysfunction, changes in immune system markers, reduced sperm quality and haematological effects.

Even small amounts of lead and lead compounds can be toxic when ingested or inhaled.

A report on the *Review of hazards and health effects of inorganic lead – implications for WHS regulatory policy* (the ToxConsult Report [(2)]) lists the effects of most concern as:

- carcinogenicity - lead compounds have been classified by the International Agency for Research on Cancer as probable human carcinogens

[*] On 15 March 2000, the Australian Government announced a phase-out of leaded petrol in Australia under the *National Fuel Quality Standards Act 2000*. On 1 January 2002, that phase-out was completed. Lead was completely banned as an additive to paint in Australia in 2010, although it's usually still present in trace amounts (and still limited to 0.1% and 0.2% for zinc-based paints).

- nervous system effects including difficulty concentrating and anger; anxiety, depression, hearing loss, panic, balance dysfunction and tremors
- changed risks for cardiovascular disease resulting from small, lead associated, increases in blood pressure
- changes in sperm quality that may be important for men with a natural tendency towards having low sperm count
- increased risk of detrimental intellectual development in unborn children, and
- increased risk of spontaneous abortion.

In a lead risk workplace, workers are usually exposed to lead particulates in air (dust and fumes) by breathing them in. Ingestion from hand-to-mouth transfer is a potentially significant route of exposure if a worker's personal hygiene is poor.

Toxicity depends on particle solubility and its size, since these determine how easily it is absorbed. The smaller the particle, the more rapid the absorption, and the more acute and severe the toxic effect.

Thermally generated fumes of lead are more often involved in high blood lead concentrations. On inhalation, fumes can pass easily through the lung alveolar wall directly into the blood stream. These fumes contain the easily soluble lead suboxide.

Absorption through the skin is negligible.

Once in the body, lead circulates in the blood; while most is excreted some can remain in human tissues, organs and bones.

Blood lead levels in affected workers may be reduced by removing them from lead-risk work until their blood lead levels are sufficiently reduced.

3.3 How is it measured?

The two most common types of monitoring used in Australian workplaces are:

- biological monitoring of workers for blood lead levels—expressed in micrograms lead per 100mL or decilitre (µg/dL), and
- air monitoring in the workplace for lead.

Historically public health authorities have tried to set 'safe' blood lead levels. It now appears no 'safe' threshold can be identified in relation to developmental neurotoxicity, vascular toxicity and other systemic effects. Efforts have shifted to build a better understanding of health effects at different blood level levels [(1)].

3.4 Work health and safety requirements

WHS laws require businesses to do what is reasonably practicable to ensure the health and safety of their workers. This requires businesses to eliminate or minimise risks associated with workers' exposure to lead at work, so far as is reasonably practicable.

Jurisdictions (other than the ACT) place specific controls around the use of lead in workplaces, for example requirements for:

- health monitoring workers at risk, including requirements for removal if prescribed blood lead levels are exceeded
- provision of information about health risks of 'lead processes' to affected workers
- confining lead process areas
- restricting certain activities in lead process areas (e.g. eating, drinking)

- providing amenities (e.g. change rooms and washing facilities)
- launder requirements for personal protective equipment contaminated with lead (PPE)
- disposal requirements.

Regulations only cover key requirements for managing risks of lead exposure.

Other regulations include respirator fit testing, the management of worker personal hygiene factors, regular maintenance and cleaning of workplace clothing and personal protective equipment.

If respirators are used, workplaces maintain a 'clean shaven' work policy to ensure their effectiveness.

Biological monitoring of blood lead levels

Australian WHS laws (except the ACT) mandate blood lead levels to trigger:

Requirement	Prescribed level	Reference[†]
Mandatory health monitoring of lead risk workers	(a) for a female of reproductive capacity—10µg/dL (0.48µmol/L) except 20µg/dL in WA (b) in any other case—30µg/dL (1.45µmol/L)	Model WHS Regulations, reg 394 **Vic**: Occupational Health and Safety Regulations 2007 (Vic), reg 4.4.17 **WA**: Occupational Safety and Health Regulations 1996 (WA), reg 5.53
Removal from lead risk work	**In all jurisdictions except WA:** • for females not of reproductive capacity and males—50µg/dL (2.42µmol/L) • for females of reproductive capacity—20µg/dL (0.97µmol/L) • for females who are pregnant breastfeeding—15µg/dL (0.72µmol/L) **In WA:** Employers must remove the employee from the work if pregnant or breast-feeding (that is, immediately upon notification, which is mandatory in WA). Workers must also be removed if they have had an excessive exposure to lead or are experiencing adverse health effects related to lead exposure	Model WHS Regulations, reg 415 **Vic**: Occupational Health and Safety Regulations 2007 (Vic), reg 4.4.23 **WA**: Occupational Safety and Health Regulations 1996 (WA), reg 5.63
Return to lead risk work	**In all jurisdictions except WA:** • females not of reproductive capacity and males—40µg/dL (1.93µmol/L) • for females of reproductive capacity—10µg/dL (0.48µmol/L) **In WA:** Upon certification by an appointed medical practitioner.	Model WHS Regulations, reg 417 **Vic**: Occupational Health and Safety Regulations 2007 (Vic), reg 4.4.25 **WA**: Occupational Safety and Health Regulations 1996 (WA), reg 5.64

[†] All jurisdictions other than Victoria, Western Australia and the ACT apply the model WHS Regulations on lead.
While the ACT adopted the model WHS laws, it did not adopt Part 7.1 (hazardous chemicals) or Part 7.2 (lead) of the regulations. Hazardous chemicals are regulated under the Dangerous Substances Act.

Minimum frequency of testing for workers involved in 'lead risk work' is also mandated except in the ACT:

Requirement	Prescribed frequency: Initial testing	Thereafter	Reference
Frequency of biological monitoring	**In all jurisdictions except WA:** Before the worker first commences lead risk work One month after commencing lead risk work	**In all jurisdictions except WA:** Depending on blood lead level and whether females not of reproductive capacity or females of reproductive capacity and males every 6 months, 3 months or 6 weeks	Model WHS Regulations, reg 407 **Vic:** Occupational Health and Safety Regulations 2007 (Vic), reg 4.4.22 **WA**: Occupational Safety and Health Regulations 1996 (WA), reg 5.59
	In WA: Within the first month of commencing job then 6 months after initial monitoring	**In WA:** At subsequent times as determined by appointed medical practitioner	

The frequency of testing increases as the blood lead levels become greater, from every six months to every six weeks. Workers with levels close to the mandated blood lead removal level are monitored most frequently. Additional information on current regulatory requirements can be found at Chapter 7.

Air monitoring in the workplace: workplace exposure standards for lead

All Australian jurisdictions require airborne lead contaminants at work to be at or below concentrations of 0.15 mg/m^3 (inhalable). This is a mandatory exposure standard, prescribed by regulation in all jurisdictions.

Mandatory notifications

Businesses must notify their WHS regulator if they remove a worker from lead risk work because their blood lead level has exceeded the removal level.

In some jurisdictions public health laws[‡] require medical laboratories and medical practitioners to notify their local health department of any blood test results for lead above 10 µg/dL. These notifications generally include basic details about the patient, for example, age, gender and whether the exposure occurred during the course of work.

Jurisdictional differences

Blood lead removal levels, the workplace exposure standard for lead and related requirements are mandatory under model WHS laws.

Where jurisdictions have varied their WHS regulations from the model, a lack of data means it is not possible for this RIS to calculate the marginal impact of each proposed change for each jurisdiction. Instead this RIS assesses the impact of each proposal as if the model WHS laws had been adopted without variation in all jurisdictions in Australia.

Requirements are generally the same in all jurisdictions, subject to the differences outlined above in the table above.

[‡] See Appendix B

Western Australian Government

In 2012 a Western Australian (WA) specific RIS process on the model WHS Regulations was undertaken [(5)].

The final WA Decision RIS concluded the adoption of the model WHS lead risk work provisions would **not** have material impact on Western Australian workplaces and recommended adoption.

The WA RIS identified no major transitional issues for lead risk work.

3.5 International standards

Blood lead removal levels

Safe Work Australia has reviewed leading international standards for 'blood lead removal levels'—that is, the blood levels at which workers must be removed from lead risk work (See Figure 1).

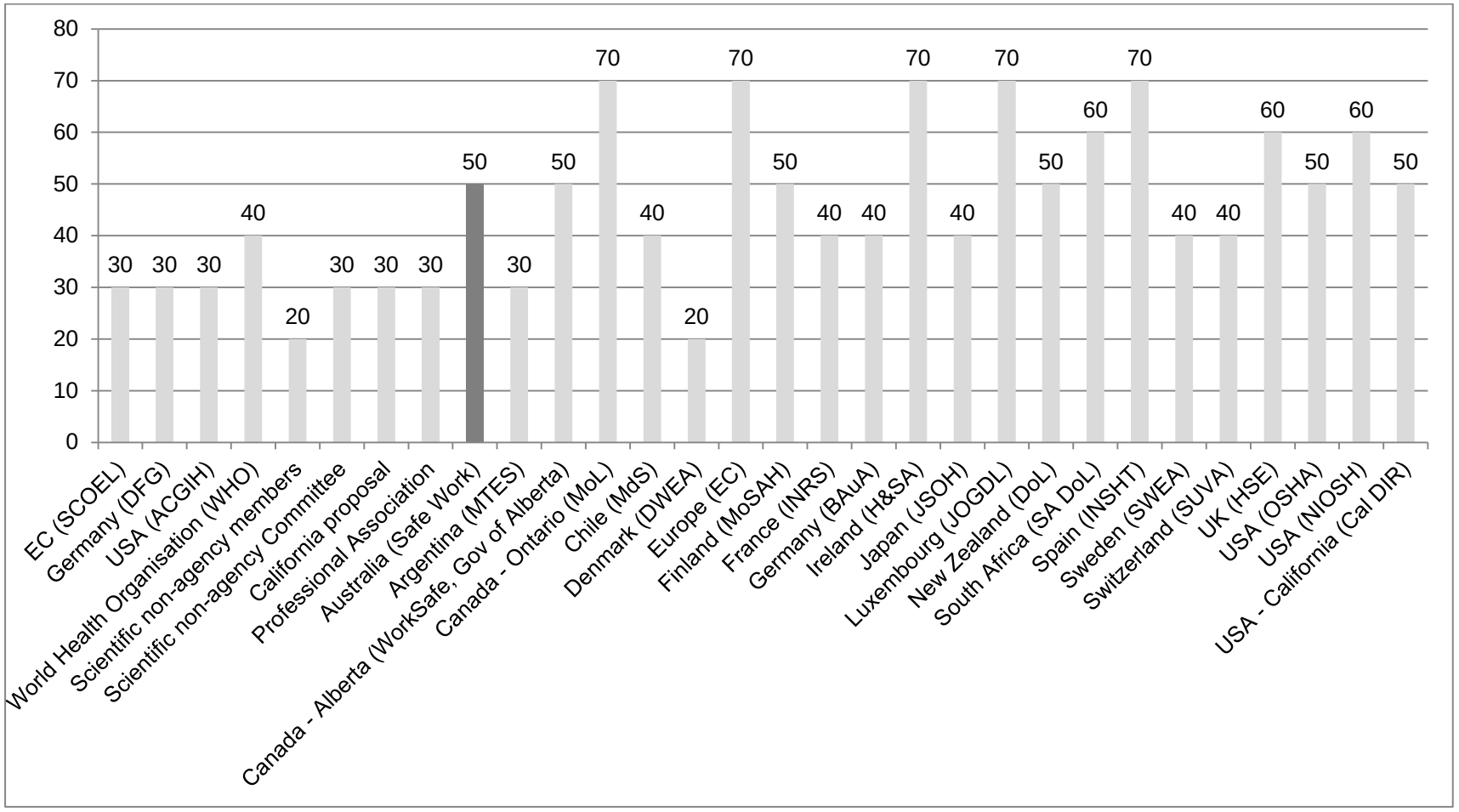
Recently established or revised blood lead removal levels are generally 50 µg/dL or less for all occupational sectors. These may be mandatory or advisory only [(2)]. Countries with levels above 50 µg/dL, generally do not have a large lead processing industry. The European Union only sets an 'upper limit' and encourages member countries to impose a lower removal level where appropriate.

Some countries set a blood lead removal level of 30 µg/dL as a health-based objective for females not of reproductive capacity and males.

Many publications also recommend lower blood lead removal levels of 7-25 µg/dL for females of reproductive capacity, or females who are pregnant.

The lower end of this range is close to or the same as the blood lead concentrations of 10 µg/dL recommended by the Centers for Disease Control (CDC) in 1991 (CDC 2005), the National Health and Medical Research Council (NHMRC 2009) and Option 3 of this Consultation RIS (see Figure 1).

Figure 1 International benchmark – recommended blood lead removal levels for females not of reproductive capacity and males [2]



Workplace exposure standard for lead

Safe Work Australia has identified a range of leading international workplace exposure standards for lead (See Figure 2).

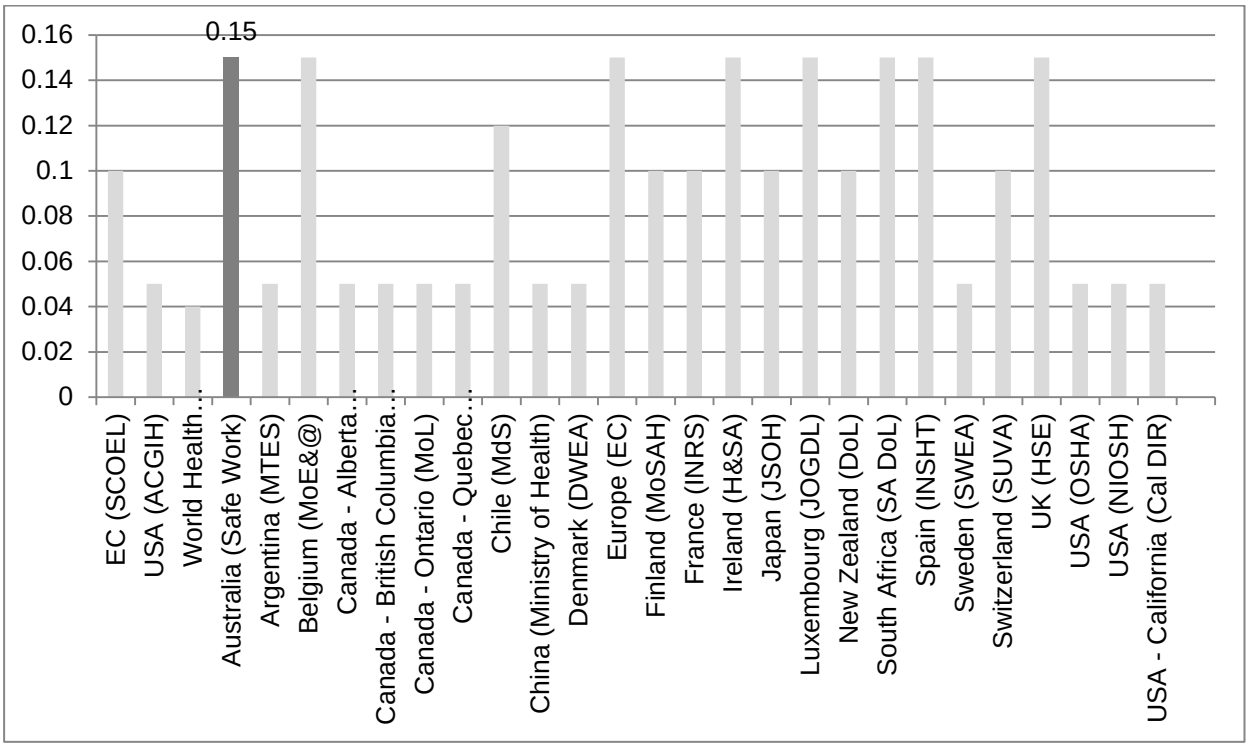
Other countries and organisations overseas set a workplace exposure standard for lead between 0.03 to 0.15 mg/m^3.

The Australian mandatory workplace exposure standard for lead is 0.15 mg/m^3 adopted from the American Conference of Industrial Hygienists (ACGIH) in 1991. The ACGIH determined through an evaluation of scientific evidence that exposure to lead above the recommended exposure standard may present a threat to worker health and safety.

In 1995, the ACGIH revised its workplace exposure standard downwards from 0.15 mg/m^3 to 0.05 mg/m^3 (proposed WES Option 3).

Despite this change the Australian workplace exposure standard for lead has not been amended to date.

Figure 2 International benchmark – workplace exposure standards for lead[(2)]



4. Statement of the problem

Current toxicological and epidemiological evidence suggests that current legislated blood lead levels and workplace exposure standards (WES) do not adequately protect worker health.

This Consultation RIS seeks to address the potential for adverse health effects, illness and disease in Australian workers caused by exposure to lead at work.

4.1 Toxicological and epidemiological evidence

Under Australian WHS laws mandatory testing for blood lead levels starts when work carried out in a lead process is likely to cause the blood lead level to exceed:

- for a female of reproductive capacity — 10µg/dL, or
- in any other case — 30µg/dL.

In 2009 the National Health and Medical Research Council (NHMRC) published an evidence-based Information Paper[3], suggesting any blood lead level over 10 µg/dL is of concern. It explains:

It was never intended that this goal of 10 µg/dL be interpreted as 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.

In May 2015 the NHRMC released a Statement[4] on the evidence of the effects of lead on human health. Its audience is the Australian community and policy makers.

This Statement updates the NHMRC's previous work and is based on independent scientific evidence summarised in the *NHRMC Information Paper: Evidence on the Effects of Lead on Human Health.*

The Statement advises:

a blood lead level greater than 5 micrograms per decilitre suggests that a person has been, or continues to be, exposed to lead at a level that is above what is considered the average 'background' exposure in Australia. If a person has a blood lead level greater than 5 micrograms per decilitre, it is recommended that the source of exposure should be investigated and reduced, particularly if the person is a child or pregnant woman. Identifying and controlling the source of lead exposure will reduce the risk of harm to the individual and to the community.

Recommended blood lead removal levels

In 2014, to inform this Consultation RIS, Safe Work Australia commissioned an independent, evidence based report. It included an extensive literature review and references over 350 individual reports and documents in support of its findings. The Report, written by ToxConsult Pty Ltd, was peer reviewed by the United States National Institute for Occupational Safety and Health and comment was sought through the Safe Work Australia website.

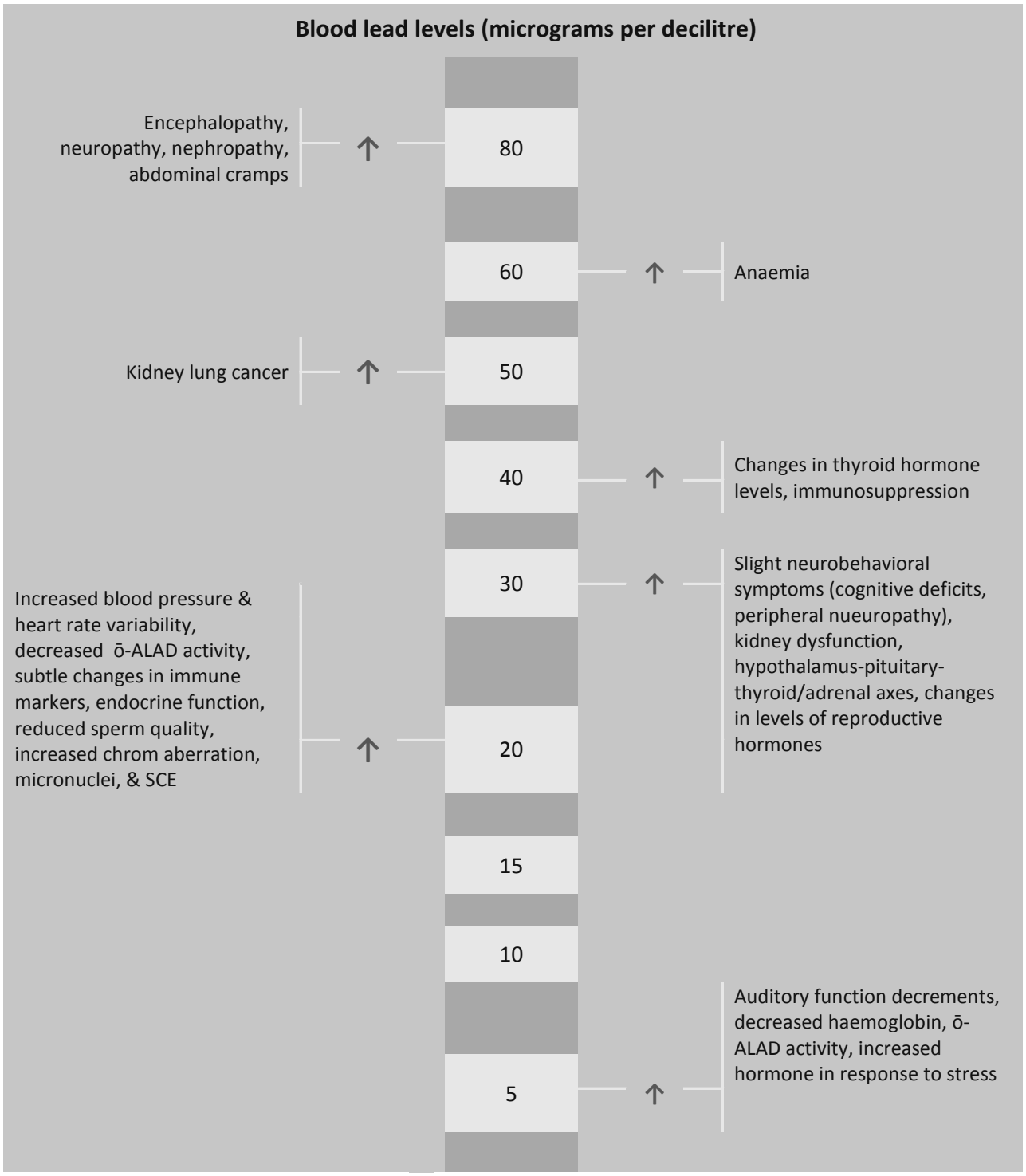
The purpose was to investigate whether Australian WHS laws reflect the latest toxicological and epidemiological evidence available internationally (see Figures 1 and 2).

The ToxConsult Report evaluated international standards and underlying evidence. It identified key epidemiological and toxicological studies relevant to setting blood lead removal levels and workplace exposure standards for lead.

The ToxConsult Report identified health endpoints including detrimental effects on the nervous system, increased blood pressure, heart rate variability, kidney dysfunction, changes in immune system markers, reduced sperm quality and haematological effects.

It concluded most adverse health endpoints are associated with average blood lead levels of >20 µg/dL. These associations become more robust and reliable at mean blood lead levels >30 µg/dL. Figure 3 illustrates the blood lead levels at which adverse effects become evident.

Figure 3 Blood lead response in adults from occupational epidemiology studies[(2)]



Upward arrows indicate the lowest blood lead level at which the health effects were reported in individuals in various studies. Blood lead levels at which people exhibit symptoms vary greatly between individuals. It is possible for people with blood lead levels of 40 micrograms per decilitre or more not to exhibit noticeable health effects.

On the basis of the evidence the ToxConsult Report recommended the following:

- For females of non-reproductive capacity and men two options are suggested:
  - A blood lead removal level of 20 µg/dL, or
  - A target blood lead removal level of 20 µg/dL and mandated blood lead removal level of 30 µg/dL.
- For women of reproductive capacity a BLRL of 10 µg/dL is recommended.

In addition to the health outcomes in Figure 3, the ToxConsult Report found studies have shown exposing a foetus to less than 5 ug lead/dL is associated with impairment of learning capacity and neuropsychological development in childhood. During pregnancy lead is mobilised from the maternal skeleton, which increases maternal blood lead and is transferred to the foetus. The ratio of maternal blood lead to foetal blood is between 0.7 to 1 at the time of birth.

Because of the almost direct relationship of maternal blood lead and foetal blood lead it is critical that the blood lead levels for females of reproductive capacity be kept as low as possible, and the ToxConsult Report recommends a blood lead removal level be no more than 10 ug/dL.

Lead is transferred to breast milk at a ratio of between 0.01 to 0.48 times the maternal blood lead levels. The ToxConsult Report concludes it is not possible based on current knowledge to determine whether lead in breast milk poses a risk to children.

Recommended workplace exposure standard for lead

The ToxConsult Report drew on a range of studies to establish a relationship between airborne lead contaminant levels and blood lead levels in exposed workers (Air Slope Factor).

At the current mandated workplace exposure standard of 0.15 µg/m^3, the ToxConsult Report estimated the average blood lead level a worker population would experience is likely to be 30 µg/dL, with an upper limit of approximately 60 µg/dL.

These estimates are reasonably consistent with the blood lead data from workers.

The ToxConsult Report recommends a revised workplace exposure standard for lead of 0.05 µg/m^3. This is a third of the current Australian workplace exposure standard for lead and is consistent with the level recommended by the ACGIH.

This is intended to ensure workers' blood lead levels do not generally exceed the removal level recommended in the Report of 30 µg/dL.

The ToxConsult Report estimates an exposure standard of 0.05 µg/m^3 will result in an average blood lead level of approximately 23 µg/dL, with an upper bound of 46 µg/dL.

5. Scope and magnitude of the problem

5.1 Gender and age

Indications from consultation with industry is that the overwhelming majority of workers in lead risk work are male (estimated at 96-97%), with an age range typical of a working population of between the ages of 20 and 59. This is consistent with reported gender distribution and ages of workers by comparable overseas organisations.

5.2 Lead usage in Australia

The use of lead in batteries for vehicles accounts for 80% of current lead usage. The remaining 20% of applications include underwater cable sheathing, solder, casting alloys, chemical compounds, ammunition, glassware and radiation protection. More than half of the lead currently used is recycled rather than mined[§].

5.3 Jurisdictional distribution

The most significant sources of lead risk work and their estimated jurisdictional impact are summarised below.

Recovering lead from its ores or other compounds

Australia is the largest exporter of lead in the world with Queensland holding the largest percentage of revenue at 65.5 per cent. Active mines are also located in Tasmania, South Australia, Western Australia, New South Wales, and the Northern Territory. It is estimated that there are 5,510 people employed in the silver, lead and zinc ore industry (ANZSIC B0807) in Australia.

Australia processes 60 per cent of its lead concentrates. Port Pirie in South Australia is the sole producer of primary refined lead. The operator, Nyrstar reports there are 747 employees. Mount Isa Mines in Queensland also smelts concentrate into lead bullion. Mount Isa Mines operated by Glencore employs 5,000 workers however there is no information to identify how many of these are lead risk workers. The copper, silver, lead and zinc smelting and refining industry (ANZSIC C2133) as a whole, employs 2,830 workers.

Table 1 provides a percentage breakdown of lead production distribution throughout Australia.

Table 1 percentage of Australian lead production[**]

State	Percentage (%)
Queensland	71
New South Wales	12
Northern Territory	6
Western Australia	5
Tasmania	4
South Australia	2

[§] Geoscience Australia, Australia's Identified Mineral Resources 2012, Zinc Lead Silver

[**] Australian Bureau of Agricultural and Resource Economics and Sciences (2010)

Assembling, handling, repairing or dismantling batteries

Secondary extraction through recycling of lead acid batteries is another form of lead risk work.

The capacity to recycle used lead acid batteries (ULAB) in Australia has five recycling facilities:

- Renewed Metal Technologies (RMT) (Wagga Wagga)
- Australian Refined Alloys (Sydney)
- Hydromet Corporation Ltd (Unanderra)
- Simstar Alloys Pty Ltd (Melbourne)
- V-Resource (Brisbane).

The capacity to reprocess used lead acid batteries in Australia is estimated to be around 150,000 tonnes per annum, with potential to expand as the supply of used batteries increases. Most recyclers are not operating at full capacity because they are unable to purchase sufficient quantities of batteries.

Table 2 number of battery recycling facilities by state

State	Facilities
New South Wales	3
Queensland	1
Victoria	1

Battery manufacturing

Century Yuasa Batteries is the only manufacturer of lead acid batteries within Australia. The manufacturing plant based in QLD, employs 150+ staff directly in the manufacture of lead acid batteries with an additional 450+ staff involved with the design, storage, sales and distribution of product around Australia and New Zealand.

Table 3 number of battery manufacturers by state

State	Facilities
Queensland	1

Foundry processes

There are a number of businesses who work with lead casting for a variety of purposes including counterweights and lead shielding. Locations include New South Wales, Queensland, Western Australia, and Victoria. Foundries processing lead in Australia include:

- Central Foundry Pty Ltd, Mascot NSW
- Northern Smelters, QLD
- Allcast Foundry, Malaga WA
- Matilda Foundry, Oakhurst QLD
- Midland Lead Australia, Bayswater WA
- Consolidated Alloys, head office VIC, with offices QLD, NSW, WA.

Table 4 number of foundries by state

State	Facilities
Queensland	3
Western Australia	3
New South Wales	2
Victoria	1

Use of detonators or weapons

Shooting ranges operate in all states and territories. Evidence suggests average blood lead levels in some firing ranges have dropped from 23-24 µg/dL in 2004, to 8 µg/dL in 2010[††].

This suggests Australian shooting ranges should be able to achieve average blood lead levels of <5 µg/dL by 2013. This level is below the current definition for lead risk work.

Thales Australia is responsible for the production of the majority of ammunition and explosives in Australia. The facilities at Benalla (Victoria) and Mulwala (NSW) are regulated by Comcare, the Commonwealth regulator.

The company has a workforce of more than 200 in Benalla, making bullets, bombs and grenades, and more than 400 staff at Mulwala produces gunpowder and explosive repellents.

Table 5 number of ammunitions and explosives production by jurisdiction

Jurisdiction	Facilities
Commonwealth	2

Spray painting with lead paint, machine sanding or buffering surfaces coated in lead paint

The painting and decorating services industry employs 46,800 workers across all jurisdictions.

Lead risk work associated with painting and paint removal is expected to drop due to the removal of lead in paints. Before 1970 paints containing high levels of lead were commonly used in domestic dwellings. Paint lead levels used in paint for domestic dwellings declined from 50 per cent before 1965 to 1 per cent in 1965, 0.25 per cent in 1992 and 0.1 per cent in 1997.

Lead was completely banned as an additive to paint in Australia in 2010, although it may be present in trace amounts (and still limited to 0.1% and 0.2% for zinc-based paints).[‡‡]

Given the ban of lead from paint, modern automated processes, the use of respiratory protective equipment throughout industry and the amount of exposure which would be required for workers to be considered lead risk work, most painters would not be considered as undertaking lead risk work.

There is insufficient data to accurately determine the actual number of lead risk workers in the painting industry.

[††] Department of Defence

[‡‡] http://www.build.com.au/beware-lead-paint-when-renovating

5.4 Lead risk work

The exact number of businesses and workers undertaking lead risk work is not known.

Data provided by WHS regulators indicates the majority of lead risk work occurs in Western Australia, Queensland, New South Wales, Victoria and South Australia. The Northern Territory and Australian Capital Territory indicated there is no lead risk work in those jurisdictions.

Safe Work Australia was unable to source relevant data for Tasmania and the Commonwealth. While these jurisdictions have only 5.7 per cent of the Australian workforce, they may have relatively high proportions of workers undertaking lead risk work. That is due to the Commonwealth's responsibility for defence (e.g. firing ranges and munitions) and Tasmania's mining industry.

A summary of this data is in Table 6.

Table 6 Workers removed from lead risk work (Notifications)

Jurisdiction	**Number of Workers undertaking lead risk work**	**Number of businesses that have lead risk work**	**Male workers removed**	**Female workers removed** (reproductive capacity)
Commonwealth	69^	n/a	n/a	n/a
New South Wales	510^{++}	301^{++}	0	0
Victoria	459^	148*	2	1
Queensland	198*^	43*	1	0
Western Australia	303$^{\#}$	70$^{\#}$	0	0
South Australia	100^{++}	9^{++}	2	1
Tasmania	37^	11^	n/a	n/a
Australian Capital Territory	0^{++}	0^{++}	0	0
Northern Territory	0^{++}	0^{++}	0	0
Total	**1686**	**582**	**5**	**2**

= Individual who participated in health surveillance for lead risk work, * = Number of notifications received by work health and safety regulator of lead risk work, ^ = Safe Work Australia estimates (see explanation below), n/a = no data relating to the number of notifications received, ++ = estimates as provided by work health and safety regulator

Safe Work Australia has included estimates to backfill missing or incomplete data.

Estimates were made by:

- taking the proportion of workers undertaking lead risk work in Western Australia, New South Wales and South Australia, and
- assuming an equivalent proportion of workers/businesses undertake lead risk work in other jurisdictions.

Using known data sourced from Western Australia, New South Wales and South Australia it is estimated approximately:

- 0.02 per cent of the workforce are engaged in lead risk work, and
- 0.03 per cent of businesses are estimated to be undertaking lead risk work. This estimate doesn't apply to the Commonwealth, as its jurisdiction is limited to the Commonwealth public sector and a small number of private-sector 'licensees'.

Based on these figures there are estimated to be 1,686 workers undertaking lead risk work in Australia. This estimate takes into account the recent closure of South Australia's last battery recycling plant, which employed 89 people until closed in 2014.

Overall these figures probably underestimate the extent of lead risk work in Australia as small businesses and self-employed persons are unlikely to be accounted for. Small and micro businesses tend to be less aware of the WHS obligations, so are less likely to comply with their notification requirements.

Question
How many workers does your business currently employ?
How many of those workers are classified as undertaking lead risk work? Of those lead risk works how many are: • Females not of reproductive capacity • Females of reproductive capacity • Males

5.5 Incidence and distribution of elevated blood lead levels

Safe Work Australia has obtained data from WHS regulators and public health authorities on notified blood lead monitoring results.

The estimated incidence of annual blood lead notifications for occupational exposures is in Table 7.

Queensland has an unusual distribution of blood lead levels compared to the other states. It has more notifications in the >=50µg/dL range than would be expected based on its worker population. This means the number of notifications estimated nationally at >=50µg/dL may be overestimated.

Victorian blood lead notifications exceed the number of estimated lead risk workers, suggesting there have been multiple notifications for some workers. Another less likely explanation is the population of Victorian lead risk workers has been underestimated.

The data may not be realistic for the Commonwealth, which is unlikely to have the same occupational distribution as WA, Queensland and Victoria.

Table 7 Estimated incidence of work related blood lead notifications per jurisdiction per year[§§]

Jurisdiction	**Blood lead level >=10µg/dL**	**Blood lead level >=20µg/dL**	**Blood lead level >=30µg/dL**	**Blood lead level >=50µg/dL**
Commonwealth^	66	32	13	1
New South Wales^	485	233	95	4
Victoria	542	267	109	3
Queensland	34	17	10	4
Western Australia[#]	194	86	32	0
South Australia^	95	46	19	1
Tasmania^	35	17	7	0
Australian Capital Territory	0	0	0	0

[§§] Western Australia, Victoria, Northern Territory and ACT (2014), Queensland (2011)

Jurisdiction	Blood lead level >=10µg/dL	Blood lead level >=20µg/dL	Blood lead level >=30µg/dL	Blood lead level >=50µg/dL
Northern Territory	0	0	0	0
Total	**1451**	**698**	**285**	**13**

= Individual who participated in health surveillance for lead risk work, ^ = Estimates

Using estimated numbers of workers undertaking lead risk work (Table 6) and estimated incidence of lead notifications (Table 7), a qualitative assessment of jurisdictional impacts has been compiled at Table 8.

Table 8 Qualitative assessment of jurisdictional impact

State / Jurisdiction	Impact
New South Wales	Considerable
Victoria	Considerable
Queensland	Considerable
Western Australia	Considerable
South Australia	Some
Tasmania	Some
Northern Territory	Minimal
Commonwealth	Minimal
Australian Capital Territory	Nil

5.6 Trends by industry

The data in Table 9 indicates occupations most affected by exposure to airborne lead contaminates are (in order from most to least affected):

- painters and paint removers—e.g. during renovation and construction
- engineering workers—e.g. welding/soldering/fabrication etc.
- ammunitions manufacturers
- recyclers, and
- foundry/smelting/metal casting workers.

These five industry sectors make up 83 per cent of health notifications in Victoria and Queensland.

Thirteen other industry sectors make up 16 per cent of notifications, with information about one per cent withheld.

The number of reported blood lead notifications is likely to underestimate the number of at risk workers.

Some industries which are known to carry out lead risk work are not separately itemised here—including battery recycling, radiator repair, lead lighting and mining. Notifications for these occupations are relatively low and consolidated in the ‘Other’ category. The low incidence can be attributed to small workforce for battery recycling, radiator repair and lead lighting and good risk controls in the mining industry.

Table 9 compares blood lead level notifications at 20, 30 and 50 µg/dL against the total amount of notifications (above 10 µg/dL) to provide an objective comparison across industries. Blood lead levels above 30 µg/dL show an average of 20 per cent of workers affected, with the exception of foundry and smelter work. This indicates any changes to removal levels are likely to affect most industries in much the same way.

Table 9 Breakdown of blood lead notifications across key industries over a one year period[***]

Industry	Blood lead level >=10µg/dL	Blood lead level >=20µg/dL	Per cent*	Blood lead level >=30µg/dL	Per cent*	Blood lead level >=50µg/dL	Per cent *
Painting and paint removal	143	67	47%	22	15%	4	3%
Engineering (welding/soldering/ fabrication etc.)	140	73	52%	34	24%	0	0%
Ammunitions manufacture	60	16	27%	7	12%	0	0%
Materials recycler	69	35	51%	14	20%	1	1%
Foundry/smelter/ casting	69	49	71%	18	26%	0	0%
Other	92	39	42%	19	21%	0	0%
Unknown	207	99	48%	40	19%	4	2%
Total	**780**	**378**	**48%**	**154**	**20%**	**9**	**1%**

* Percentage of overall notifications

Lead risk work is declining in Australia.

The Victorian WorkCover Authority's *Regulatory Impact Statement on the Occupational Health and Safety (Lead) Regulations 2000* notes, from 1985 to 2000, the number of workers undertaking lead risk work decreased substantially in Victoria.

Australia-wide numbers are expected to fall further over time as safer alternatives to lead (for example non-leaded ammunition) become more common and improved control measures are introduced for lead risk work.

Additionally the size of industries which have traditionally undertaken lead risk work are declining. In 2014 the closure of the last remaining battery recycling plant in South Australia almost halved the lead risk worker population in that State.

Safe Work Australia has no data to suggest the incidence of lead risk work is increasing in any sector or jurisdiction.

5.7 Limitations

The data presented in this Consultation RIS is incomplete and does not fully describe the magnitude and distribution of evaluated blood lead levels among Australian workers.

The most significant limitation is that some employers fail to provide blood lead testing to their lead-exposed workers and those who do, are not required to publish their results.

Comparable international lead poisoning prevention programs previously (1996-2008) looked at how many employers were providing blood lead testing in five industries where significant lead

[***] Victoria (2014), Queensland (2011), South Australia and Western Australia (2014)

exposure is possible. It found that 87% of battery manufacturers, 56% of non-ferrous foundries (lead-using), 14% of radiator repair (copper-brass), 8% of painting companies and only 1% of wrecking and demolition companies were conducting blood lead level testing (OLPPP, 2002; OLPPP, unpublished data, 2008).

The result of this testing deficiency is that the numbers of Australian workers with elevated blood lead levels are not accurately known, and it is not possible to accurately determine the relative risk of lead since the proportion of employers testing varies widely by industry. The numbers presented in this Consultation RIS underestimate of the number of Australian workers overexposed to lead.

The majority of publicly available Australian blood lead level research focuses on the effects of lead exposure on the community and in particular that of children and as such do not identify the individual's employer, making it difficult to determine if the exposure source is occupational and, if so, which industry the individual works in.

Although information is publicly available on the size of various industries and businesses this information does not so extend to specifications on the amount of lead risk workers.

Knowing the number of workers in undertaking a lead process does not correlate with the amount of lead risk workers. If exposure is controlled a worker in a lead process may not be in lead risk work. Efficient workplace controls, respiratory protection equipment, limited exposure (e.g. job rotation) and extended absences from work may result in blood levels in a worker dropping below the definition of lead risk work.

Although a requirement exists under WHS legislation for a business to notify the regulator work is lead risk, this information was found to be insufficient to accurately determine the size of lead risk work in Australia due to under reporting, non-compliance and difficulties in accessing or locating file information previously reported.

6. Objectives

The objective of this proposal is to reduce the potential for adverse health outcomes caused by exposure to lead in the workplace by:

- improving the regulatory framework in Australia to provide the highest level of protection to all workers, while ensuring practicability for businesses, and
- ensuring WHS policy and practice is based on the best available scientific evidence.

7. Options considered: blood lead levels (BLL)

Under model Work Health and Safety (WHS) laws, biological monitoring (blood lead level testing) is used as the primary method of measuring the amount of lead in a workers body. The purpose of biological monitoring is to detect any individual who is at risk, and monitor the effectiveness of the risk management strategies that have been enacted.

At risk workers must be immediately removed from carrying out lead risk work if their blood lead levels are at or greater than:

- 50 micrograms of lead per 100 mL of blood (µg/dL) for females not of reproductive capacity and males
- 20 µg/dL for females of reproductive capacity, and
- 15 µg/dL for females who are pregnant or breastfeeding.

This Consultation RIS considers three options for blood lead levels and discusses whether the current mandated blood lead levels for removal of workers' from lead risk work (the status quo) are adequate to protect workers' health and that of their unborn children.

Chapter 7 reviews the main duties for a person conducting a business or undertaking under the model WHS laws and outlines how each of these requirements would change under each option.

Chapter 8 focuses on how each of the options addresses the main objectives of this Consultation RIS.

Options considered

- Option 1: Status quo (no changes to mandated blood lead removal levels etc.)
- Option 2: Amending mandated blood lead removal levels and related requirements to reflect epidemiological and toxicological evidence:
  - a 20 µg/dL (target level) and 30 µg/dL (removal level) for women females of non-reproductive capacity and men males with a 10 µg/dL removal level for women females of reproductive capacity.
- Option 3: Gender neutral blood lead removal levels:
  - a 10 µg/dL blood lead removal level for all workers.

7.1 BLL Option 1 – Maintain the status quo (base case)

Model WHS laws on lead contain duties for businesses undertaking lead risk work.

Under the status quo there would be no change to these laws.

The main duties for a person conducting a business or undertaking (the business) are set out below. All other BLL options are compared against this option.

Notification of health risks

- Before commencing work in a lead process a business must give a worker information about the health risks and toxic effects associated with the lead process.
- If the lead process involves lead risk work the information must include the need for, and details of, health monitoring.

Lead risk work is defined as work carried out in a lead process that is likely to cause the blood lead level of a worker carrying out the work to exceed: for a female of reproductive capacity—10µg/dL (0.48µmol/L); or in any other case—30µg/dL (1.45µmol/L).

Identifying lead risk work

- If it is determined work is lead risk, the business must give the regulator written notice and keep a copy of the notice.
- If there is any change in the information provided then the business must give the regulator written notice.

Health monitoring

- Before the worker starts lead risk work the business must provide health monitoring which includes; biological monitoring (including blood test), a physical examination and an assessment of demographic, medical and occupational history.
- Health monitoring must be carried out by or under the supervision of a registered medical practitioner with experience in health monitoring. All expenses relating to health monitoring must be paid by the business.
- The business undertakes health monitoring one month after the worker first starts lead risk work.
- The level of lead in the workers blood from the last health monitoring test then determines how frequently biological monitoring must occur. The closer the blood level to the blood lead removal level, the more frequent.

For females not of reproductive capacity and males:

(i) if the last monitoring shows a blood lead level of less than 30µg/dL (1.45µmol/L)—6 months after the last biological monitoring of the worker; or

(ii) if the last monitoring shows a blood lead level of 30µg/dL (1.45µmol/L) or more but less than 40µg/dL (1.93µmol/L)—3 months after the last biological monitoring of the worker; or

(iii) if the last monitoring shows a blood lead level of 40µg/dL (1.93µmol/L) or more—6 weeks after the last biological monitoring of the worker;

For females of reproductive capacity:

(i) if the last monitoring shows a blood lead level of less than 10µg/dL (0.48µmol/L)—3 months after the last biological monitoring of the worker; or

(ii) if the last monitoring shows a blood lead level of 10µg/dL (0.48µmol/L) or more—6 weeks after the last biological monitoring of the worker.

- In providing health monitoring to a worker the business must provide relevant information (as listed in the regulations) to the registered medical practitioner including name, address, date of birth, work details.

Following health monitoring

- The business must take all reasonable steps to obtain a health monitoring report which must contain the items listed in the regulations including name, date of worker, results, pathology service used, any indication the blood lead removal level has been exceeded.
- The business must then give a copy of the report to the worker, the regulator and other persons conducting a business or undertaking.

If it is determined the workers' blood lead level exceeds the mandated removal levels

- The business must immediately remove a worker from lead risk work.
- The business must then arrange for worker to be medically examined by a registered medical practitioner with experience within 7 days of removal.
- The business is required to organise health monitoring under the supervision of a registered medical practitioner with experience at a frequency decided by the practitioner.
- The business must ensure the worker does not return to lead risk work until blood lead levels are less than those prescribed in the WHS regulations.

The worker's blood lead level is less than: (i) for females not of reproductive capacity and males—40µg/dL (1.93µmol/L); or (ii) for females of reproductive capacity— 10µg/dL (0.48µmol/L); AND (b) a registered medical practitioner with experience in health monitoring is satisfied that the worker is fit to return to carrying out lead risk work.

Record keeping

- The business must ensure reports are kept as a confidential record for at least 30 years.

Workers and other people at the workplace, like visitors, must take reasonable care for their own health and safety, co-operate with reasonable policies, procedures and instructions and not adversely affect other people's health and safety. Duties in relation to control of airborne contamination are described in Chapter 9.

Questions
How do you administer health monitoring? ☐ Medical practitioners hired directly (employed by the business) ☐ Health monitoring outsourced ☐ Other - Please provide details
What are the costs associated with managing worker blood lead levels? (Including both direct and indirect costs). You should take into consideration: • Biological and health monitoring (e.g. blood tests, pathology expenses, costs for medical practitioners and other staff) • Removal of lead risk workers • Administrative and notification requirements (e.g. record keeping, notifying the regulator) • Training (e.g. staff time off, costs of facilitator) • PPE and engineering controls

Any information you may have on blood lead removal levels, frequencies for testing or other hazard/risk control methods that are stricter than or exceed those prescribed in the regulations would be appreciated.

If you are located in a rural or remote area or face particular difficulties in meeting health monitoring requirements we are interested to hear more.

7.2 BLL Option 2 – Evidence-based approach

Under BLL Option 2 the model WHS laws would be amended to reflect changes to the scientific and toxicological evidence.

The proposed blood lead levels are primarily set to protect the health of workers. Blood lead removal levels would be set at the point where the evidence establishes a clear connection with potential adverse health endpoints.

Reducing blood lead removal levels has flow-on effects on return to work levels trigger points for mandatory health monitoring and the frequency of the health monitoring.

This option would see the following changes:

Table 10 Proposed amendments to blood lead levels

BLL Option 2	Risk Group	Current Level	Proposed Level
Triggers health monitoring	M/FNRC	30 µg/dL	20 µg/dL
	FRC	10 µg/dL	5 µg/dL
	P / BF		
Triggers removal from lead risk work	M/FNRC	50 µg/dL	30 µg/dL
	FRC	20 µg/dL	10 µg/dL
	P / BF	15 µg/dL	
Allows return to lead risk work	M/FNRC	40 µg/dL	20 µg/dL
	FRC	10 µg/dL	5 µg/dL
	P / BF		
Frequency of testing	M/FNRC	< 30µg/dL every 6 months =>30 µg/dL but <40 µg/dL every 3 months =>40 µg/dLevery 6 weeks	<20 µg/dL every 3 months =>20 µg/dL every 6 weeks
	FRC	< 10µg/dL every 3 months =>10 µg/dL every 6 weeks	<5 µg/dL every 3 months =>5 µg/dL every 6 weeks

M = Males; FNRC = Females not of reproductive capacity; FRC = Females of reproductive capacity; P/BF = Pregnant or breast feeding

Under BLL Option 2 the trigger point for health monitoring would be lowered to 20 µg/dL for females not of reproductive capacity and males and to 5 µg/dL for all other workers.

The blood lead level at which a worker must be removed from lead risk work would be lowered to 30 µg/dL for females not of reproductive capacity and males and to 10 µg/dL for all other workers.

Consequential amendments would also be made to frequency of blood lead testing. As workers' blood lead levels are decreased, more frequent testing is required as levels approach the

mandated removal level. This ensures workers' blood levels do not rise above the removal level for a significant period before being detected.

Under this option the frequency of testing would double in some cases—would be required twice as often for some workers engaged in lead risk work. This would double the costs of biological monitoring and related costs (e.g. including time not performing work to undergo testing).

Workers removed from lead risk work under BLL Option 2 would not be able to return to the lead risk work until their blood lead levels reduced to the levels which trigger health monitoring in the first place. That is 20µg/dL for females not of reproductive capacity and males and 5µg/dL females of reproductive capacity, pregnant and breast feeding workers. This approach ensures workers do not exceed blood lead removal levels shortly after being returned to lead risk work, and provides an adequate period within which to monitor workers' blood levels, review existing control measures and put alternative risk control measures into place, if required.

7.3 Summary of changes to the regulations for Option 2

The following section of the Consultation RIS provides a representation of expected changes to the model WHS Regulations should Option 2 be adopted.

Changes to existing regulations (the status quo) are represented by strike-though of text to indicate wording likely to be removed and bold text to indicate additions, alterations or modifications to the regulations.

Notification of health risk

Lead risk work is defined as work carried out in a lead process that is likely to cause the blood lead level of a worker carrying out the work to exceed: for a female of reproductive capacity—~~10µg/dL~~ **5µg/dL** (~~0.48µmol/L~~ **0.24µmol/L**); or in any other case~~—30µg/dL~~ **20µg/dL** (~~1.45µmol/L~~ **0.97µmol/L**).

Health monitoring

- The level of lead in the workers blood from the last health monitoring test then determines how frequently biological monitoring must occur. The closer the blood level to the blood lead removal level, the more frequent testing is required.

For females not of reproductive capacity and males:

(i) ~~if the last monitoring shows a blood lead level of less than 30µg/dL (1.45µmol/L)—6 months after the last biological monitoring of the worker; or~~ **Deleted**

(ii) if the last monitoring shows a blood lead level of ~~30µg/dL (1.45µmol/L) or more but~~ less than ~~40µg/dL~~ **20µg/dL** (~~1.93µmol/L~~ **0.97µmol/L**)—3 months after the last biological monitoring of the worker; or

(iii) if the last monitoring shows a blood lead level of ~~40µg/dL~~ **20µg/dL** (~~1.93µmol/L~~ **0.97µmol/L**) or more—6 weeks after the last biological monitoring of the worker;

For females of reproductive capacity:

(i) if the last monitoring shows a blood lead level of less than ~~10µg/dL~~ **5µg/dL** (~~0.48µmol/L~~ **0.24µmol/L**)—3 months after the last biological monitoring of the worker; or

(ii) if the last monitoring shows a blood lead level of ~~10µg/dL~~ **5µg/dL** (~~0.48µmol/L~~ **0.24µmol/L**) or more—6 weeks after the last biological monitoring of the worker.

If it is determined the workers' blood lead level exceeds the mandated removal levels

- The business must immediately remove a worker from lead risk work.

- The business must ensure the worker does not return to lead risk work until blood lead levels are less than those prescribed in the WHS regulations.

The worker's blood lead level is less than: (i) for females not of reproductive capacity and males~~— 40µg/dL~~ **20µg/dL** (~~1.93µmol/L~~ **0.97µmol/L**); or (ii) for females of reproductive capacity~~— 10µg/dL~~ **5µg/dL** (~~0.48µmol/L~~ **0.24µmol/L**); AND (b) a registered medical practitioner with experience in health monitoring is satisfied that the worker is fit to return to carrying out lead risk work.

Questions
If BLL Option 2 is implemented, how much would the change cost your business? For example would you need to undertake more health monitoring more often for more workers? Please provide details of transitional and ongoing costs per year if possible. If your business already meets the standards in BLL Option 2 then the cost is Nil.
Based on your current knowledge of blood lead levels in your workplace would you need to: • Increase blood lead level monitoring? • Put in place new controls, or improve existing controls to maintain levels?
How long would it take you to make the changes needed to meet the new blood lead levels?

7.4 BLL Option 3 – Gender-neutral approach

Under BLL Option 3, the most protective blood lead level proposed under BLL Option 2 would apply across all genders and circumstances, as set out in Table 11.

This option does not discriminate on the basis of reproductive capacity or gender. It also improves protections for all workers and unborn children of female workers against lead exposure at work.

This option would see the following changes:

Table 11 Proposed amendments to blood lead levels

BLL Option 3	Risk Group	Current Level	Proposed Level
Triggers health monitoring	M/FNRC	30 µg/dL	5 µg/dL
	FRC	10 µg/dL	
	P / BF		
Triggers removal from lead risk work	M/FNRC	50 µg/dL	10 µg/dL
	FRC	20 µg/dL	
	P / BF	15 µg/dL	
Allows return to lead risk work	M/FNRC	40 µg/dL	5 µg/dL
	FRC	10 µg/dL	
	P / BF		

BLL Option 3	Risk Group	Current Level	Proposed Level
Frequency of testing	M/FNRC	< 30µg/dL every 6 months =>30 µg/dL but <40 µg/dL every 3 months =>40 µg/dLevery 6 weeks	<5 µg/dL every 3 months =>5 µg/dL every 6 weeks
	FRC	< 10µg/dL every 3 months =>10 µg/dL every 6 weeks	

M = Males; FNRC = Females not of reproductive capacity; FRC = Females of reproductive capacity; P/BF = Pregnant or breast feeding

Under BLL Option 3 the trigger point for health monitoring would be 5µg/dL for all workers regardless of gender or reproductive capacity.

The blood lead level at which a worker must be removed from lead risk work would be lowered to 10µg/dL.

As with BLL Option 2, consequential amendments would also be made to frequency of testing. As workers' blood lead levels are decreased, more frequent testing is required as blood lead levels reach trigger points for removal. This ensures workers' blood levels do not rise above removal levels for a significant period before being detected.

Workers removed from lead risk work under BLL Option 3 would not be able to return to the lead risk work until their blood lead levels reduced to the levels which trigger health monitoring in the first place (5µg/dL).

This option may be difficult to implement due to the close relationship between return to work blood lead levels and removal levels. This may be particularly difficult in communities where background levels are high.

7.5 Summary of changes to the regulations for Option 3

The following section of the Consultation RIS provides a representation of expected changes to the model WHS Regulations should Option 3 be adopted.

Changes to existing regulations (the status quo) are represented by strike-though of text to indicate wording likely to be removed and bold text to indicate additions, alterations or modifications to the regulations.

Notification of health risk

Lead risk work is defined as work carried out in a lead process that is likely to cause the blood lead level of a worker carrying out the work to exceed~~: for a female of reproductive capacity—10µg/dL~~ **5µg/dL** (~~0.48µmol/L~~ **0.24µmol/L**)~~; or in any other case—30µg/dL (1.45µmol/L).~~

Health monitoring

- The level of lead in the workers blood from the last health monitoring test then determines how frequently biological monitoring must occur. The closer the blood level to the blood lead removal level, the more frequent.

~~*For females not of reproductive capacity and males:*~~

(i) ~~if the last monitoring shows a blood lead level of less than 30µg/dL (1.45µmol/L)—6 months after the last biological monitoring of the worker; or~~ **Deleted**

(ii) if the last monitoring shows a blood lead level of ~~30µg/dL (1.45µmol/L) or more but~~ less than ~~40µg/dL~~ **10µg/dL** (~~1.93µmol/L~~ **0.48µmol/L**)—3 months after the last biological monitoring of the worker; or

(iii) if the last monitoring shows a blood lead level of ~~40µg/dL~~ **10µg/dL** (~~1.93µmol/L~~ **0.48µmol/L**) or more—6 weeks after the last biological monitoring of the worker;

~~*For females of reproductive capacity:*~~

~~(i) if the last monitoring shows a blood lead level of less than 10µg/dL (0.48µmol/L)—3 months after the last biological monitoring of the worker; or~~

~~(ii) if the last monitoring shows a blood lead level of 10µg/dL (0.48µmol/L) or more—6 weeks after the last biological monitoring of the worker.~~

If it is determined the workers' blood lead level exceeds the mandated removal levels

- The business must immediately remove a worker from lead risk work.
- The business must ensure the worker does not return to lead risk work until blood lead levels are less than those prescribed in the WHS regulations.

The worker's blood lead level is less than:

(i) ~~for females not of reproductive capacity and males—40µg/dL (1.93µmol/L); or~~ **Removed**

(ii) ~~for females of reproductive capacity—10µg/dL~~ **5µg/dL** (~~0.48µmol/L~~ **0.24µmol/L**); AND

(b) a registered medical practitioner with experience in health monitoring is satisfied that the worker is fit to return to carrying out lead risk work.

Question
If BLL Option 3 is implemented, how much would the change cost your business? For example would you need to undertake more health monitoring more often for more workers? Please provide details of transitional and ongoing costs per year if possible.
Based on your current knowledge of blood lead levels in your workplace, to meet the level of 10 µg/dL for all workers, would you need to: • Increase blood lead level monitoring? • Put in place new controls, or improve existing controls to meet these levels?
How long would it take you to make the changes needed to meet the new blood lead levels?

7.6 Options for transitional arrangements

BLL Options 2 and 3 both involve changes to the current regulatory framework, so appropriate transitional arrangements need to be considered.

For example:

Transitional Option A—a four-year transitional period with no half-way mandatory targets. Businesses would have four years to comply with the new standards.

Transitional Option B—a two-year transitional period. Businesses would have two years to comply with the new standards.

It is proposed transitional arrangements for any changes to workplace exposure standards (Chapter 9) would need to match transitional arrangements for changes to corresponding blood lead removal levels.

The more significant the change, the more time would be allocated to allow for the transition and minimise disruption.

See Appendix C for more details on the transition.

8. Impact analysis (costs and benefits): blood lead levels

Safe Work Australia has analysed the impact of the proposed options by seeing whether they meet the main objectives in addressing the problem.

Any change to the obligations imposed on workers or businesses under the model WHS Regulation are compared to the status quo (base case).

Interpretation and compliance with existing obligations has been considered and an attempt has been made to address what is likely to occur by looking at how industry has performed in the past, by comments received via consultation with industry and by looking at businesses in Australia who have already introduced voluntary measures above and beyond those mandated in the regulations and how this has effected them.

Impacts for different size business or particular industries are examined only where general impacts do not apply.

8.1 Affected parties

Parties identified as potentially being affected by this Proposal include:

- businesses undertaking lead risk work
- unions, workers and their families, and
- government regulators.

See Chapter 5 for more information about the incidence and distribution of lead risk work in Australia.

8.2 BLL Option 1 – Status quo

The status quo (the base case) assumes no action by government to reduce adverse health outcomes associated with exposure to lead.

The base case is not expected to produce any health benefits. The base case would therefore fail to:

- achieve the objective of reducing the potential for adverse health outcomes caused by exposure to lead in the workplace
- improve the regulatory framework in Australia to provide the highest level of protection to all workers, while ensuring practicability for businesses
- address and reflect the latest scientific and toxicological evidence of the hazard of the lead, putting workers at risk.
- address the associated problem of alignment with international best practice, and
- send a signal to the workplace regarding the potential seriousness from exposure to lead.

Data from WHS and public health regulators and bodies suggests this option would leave an estimated 285 more lead risk workers per year at risk of adverse health risks[†††], than if evidence-based levels applied (i.e. reducing blood lead removal levels to 30 µg/dL).

[†††] See Table 7

8.3 BLL Option 2 – Evidence-based approach

The adoption of an evidence based approach is consistent with the objectives to reduce the potential for adverse health effects due to exposure to lead and to improve the regulatory framework in Australia to provide the highest level of protection to all workers, while ensuring practicability for businesses.

The use of the evidence based approach represents an efficient use of Safe Work Australia resources, and enables industry, workers and the community to align with current knowledge in terms of exposure control and the related flow of benefits to the worker and the community. Thereby ensuring the WHS Regulations:

- are internationally consistent,
- reflect the latest scientific and toxicological evidence, thereby reducing the risk to human health.
- provide an acceptable level of protection for nearly all workers in lead risk jobs
- provide better health outcomes for lead risk workers, and
- reduce the direct and indirect costs of adverse health effects caused by workplace exposure to lead.

This option supports the broad objectives of Government to improve health and safety, and is also consistent with the primary responsibility of Safe Work Australia to lead the development of policy to improve work health and safety arrangements across Australia.

While this option meets the health-based objective of this Consultation RIS more information is sought about its practicability—including compliance costs.

Consultation with industry has identified there are some large businesses which have implemented voluntary blood lead removal levels of 30 µg/dL for females not of reproductive capacity and men. That is, a workplace policy to remove at risk workers from lead risk work at blood lead levels below those mandated in the model WHS Regulations.

The introduction by business of lower removal levels in line with BLL Option 2 and regulated lower removal levels by comparable international health and safety bodies (see Figure 1), demonstrates the implementation of the levels proposed in the evidence based approach is technically achievable.

A qualitative assessment of the costs and benefits for this option is provided below. The information below identifies where the costs will be borne, and where benefits will be realised, as a result of changing the blood lead levels. A quantitative assessment of costs and benefits is difficult to assess because of the lack of data. The consultation process undertaken here should result in more data.

Benefits

If Australia revises the mandated blood lead removal level for females not of reproductive capacity and males to 30 µg/dL this will lead to benefits through reduced incident rates in adverse health effects, including[‡‡‡]:

- cancer
- effects on the nervous system
- increased blood pressure
- heart rate variability

[‡‡‡] also see figure 1

- kidney dysfunction
- change in immune system markers
- low sperm quality
- haematological effects
- neurobehavioral symptoms (cognitive deficits, peripheral nueuropathy), and
- changes in thyroid and reproductive hormone levels.

The Victorian WorkCover Authority's *Regulatory Impact Statement on the Occupational Health and Safety (Lead) Regulations 2000* notes:

The principal benefit [of a change to lead regulation] will be the decline in the number of lead poisonings resulting from exposure to lead processes. This will lead to reduced risk to families, lower accident compensation payments, reduced health costs, reduced costs to families and environmental benefits through reductions in the use of lead.

A reduction in the incidence of occupational lead poisonings can be expected. This in turn will reduce levels of lead exposure among families of lead workers. Unborn children and infants are especially susceptible to the adverse effects of secondary lead exposure. These adverse consequences include premature births, smaller babies, decreased mental ability in infants and learning difficulties and reduced growth in young children.

Identified cost savings incurred by employees as a consequence of injury and/or illness, can include:

- Uncompensated medical and rehabilitation costs
- Travel
- Loss of income
- Loss of future earnings
- Expenditures consequential to a new lifestyle
- Loss of leisure opportunities and general decline in quality of life
- Loss of self esteem
- Reduced social interaction and social status, and
- Loss due to family members nursing worker.

Some economic benefits associated with a change to blood lead levels are outlined below.

- Medical – a reduction in health effects would see a reduction in ongoing medical expenditure, in particular for long lasting health effects such as cancer.
- Staffing – a reduction in blood lead levels would see less accumulation of lead in the body and therefore a reduction in the amount of time a worker is removed from lead risk work. Consequentially, this would require a shorter period of time where the business may require the cost of additional staff member to replace them.
- Healthier workforce – a healthier workforce and the implementation of best practice could see a higher retention of staff, with potentially more candidates for employment opportunities. A reduction in illness would also see a potential increase in productivity.

Safe Work Australia is seeking information on the major industries that would be affected by revising the removal levels and an estimate of the number of workers that are likely to be exposed to lead risk work in each sector.

For businesses where current exposure control methods are sufficient to meet the proposed removal levels there will be no direct net cost associated with the proposed changes.

For these businesses there will be no extra compliance costs to industry and the level of worker exposure will be unchanged.

However, indirect benefits include the establishment of a standard against which future monitoring can take place.

If current exposure control methods are insufficient to meet the proposed changes, and monitoring is undertaken to assess this, then there will be costs associated with upgrading worker exposure control measures in order to meet the revised. If done successfully the benefits associated with reduced worker exposure to lead will be realised.

Where a change to exposure control measures is required, it is difficult to quantify the expected additional costs to industry of implementing the proposed change, as there is a lack of quantitative data. Therefore, this information is sought via the public consultation process.

Costs

This section investigates the expected costs which can associated with the adoption of BLL Option 2. Expected costs for Option 3 above and beyond those described in this section are explained in section 8.4.

This Consultation RIS attempts to quantify costs for tasks per worker in association with the control of lead exposure in the workplace. However, without additional information from industry on the number of lead risk workers, the extrapolation of overall industry cost is not possible.

Information on possible costs to review and upgrade the blood lead removal levels is sought from affected industries.

Training and instruction

Under BLL Option 2, training and instruction is likely to be required for workers who have the potential to be exposed to lead as part of revising the blood lead removal levels.

It is estimated [(6)] workers are provided with an average of 2.9 hours of training and instruction at an average cost (weighted) of $55 per hour per worker (CPI adjusted).

Medical examination

The adoption of BLL Option 2 would see an initial increase in the number of workers who would come under the definition of lead-risk work. This number is expected to decline in line with public and occupational increased awareness of the toxicity of lead, the flow on effects from the banning of lead from petrol and paint, the continuing substitution of lead products for products which contain other materials as well as the closure of some businesses.

It is estimated [(6)] the average cost of a medical examination, including a report is $200 per worker (CPI adjusted).

Occupational and personal hygiene practices

It is expected the adoption of BLL Option 2 would see a greater emphasis on existing controls surrounding occupational and personal hygiene practices in order to reduce hand-to-mouth contamination. This would likely include increased cleanliness and more emphasis on compliance with showering and laundering as well as workplace restrictions on chewing and eating.

It is assumed once systems are in place and workers are familiar with the increased adherence to the existing provisions this will become less of an imposition. There may be additional costs for cleaning and laundering.

Removal from lead risk work

Where the results of the blood tests indicate exposure to excessive levels of lead, the worker must be removed from that job to one that is not a lead-risk job. The employee cannot be returned to a lead-risk job until tests indicate blood lead levels have reduced below the relevant prescribed level. A worker who is removed from a lead-risk job must have a medical examination. Further medical examinations are required to determine whether a worker is suitable to return to a lead-risk job.

It is assumed there will be minimal additional cost from removal of lead risk workers. In a survey conducted by WorkCover Victoria in 2000 of key stakeholders, only one employer reported any costs associated with removal, but provided no detail as to the nature or level of costs involved.

Medical

Assumed medical related impacts and costs associated with a change to blood lead levels include:

- initial increase in the number of workers requiring health monitoring, and
- an increase in the number of tests due to increased frequency.

Workers who have not changed their work practices while awaiting the result of their testing may continue to increase in blood lead levels or exceed removal levels. The costs associated with increased frequency of blood lead level testing may be offset against the benefits associated with early detection of elevated blood lead levels.

For businesses where medical practitioners are hired directly (full time) rather than the task being out-sourced, no or little medical testing is conducted (non-compliant or small business) or where all staff and members of the nearby community are tested periodically as a matter of course it is anticipated the cost will be negligible.

Staffing

Assumed staff related impacts and costs associated with a change to blood lead levels include:

- initial increase in the number of workers removed from lead risk work, and
- possible initial increase in job rotation or need to have temporary workers.

Administrative

Assumed administrative related impacts and costs associated with a change to blood lead levels include:

- initial increase in the number of workers being notified of health risks (there are minimal costs associated with this duty), and
- record keeping – initial increase.

Additional information and comment on assumed cost is requested via the public consultation process.

Cost of controls

The WHS laws require a business or undertaking do all that is reasonably practicable to eliminate or minimise risks.

The ways of controlling risks are ranked from the highest level of protection and reliability to the lowest. This ranking is known as the hierarchy of risk control. Businesses must work through this hierarchy to manage risks.

The laws require a business consider is whether hazards can be completely removed from the workplace. If it is not reasonably practicable to completely eliminate the risk then consider the following options in the order they appear below to minimise risks, so far as is reasonably practicable:

- substituting the hazard for something safer e.g. substituting high hazard chemicals with less hazardous chemicals
- isolate the hazard from people e.g. isolating operations in one room with access restricted to properly protected personnel or placing a process, or a part of it, within an enclosure which may also be fitted with exhaust extraction to remove contaminants, and
- use engineering controls e.g. local exhaust ventilation to capture airborne contaminants close to their point of release.

If after implementing the above control measures a risk still remains, a business must consider the following controls in the order below to minimise the remaining risk, so far as is reasonably practicable:

- use administrative controls e.g. warning signs, written policies and work procedures, and
- use personal protective equipment (PPE) e.g. respiratory protective equipment (RPE) and protective clothing.

A combination of the controls set out above may be used if a single control is not enough to minimise the risks.

The WHS laws encourage training and supervision always be provided to ensure administrative controls are effectively implemented.

Current industry practice requires RPE and good occupational / personal hygiene practices in addition to local exhaust ventilation in order to meet regulatory requirements.

Engineering controls

The cost of installation of engineering control measures is significant for some businesses, particularly for those handling and producing large volumes of lead-based materials. This is especially the case for those firms installing local extraction ventilation. In some circumstances, these costs are difficult to ascertain because the control measures have been installed over many years and have been added to or modified. In addition, nearly 50 per cent of the businesses consulted indicate [(6)] they have installed these measures for other purposes in addition to the control of lead.

Installation costs can vary significantly, ranging from a low of $700 to a high of $2 million. Recurrent costs can range from $700 to $25,000. Given the disparity in costs, and the multipurpose use of many systems, it is not possible to adequately cost the implementation of these higher order control systems. This will have the effect of understating costs of compliance with the proposed options.

It should be noted that in survey of key stakeholders conducted by WorkCover Victoria [(6)] only one business surveyed stated compliance with the Regulations was the primary reason for implementing control measures. Nineteen of the respondents stated that control measures were implemented to provide for the health and safety of workers, suggesting that such measures would be used, even in the absence of the current or proposed requirements.

The proposed option will lead to the inclusion of some businesses which previously did not have to comply with the WHS Regulations, due to their workforce blood lead levels being below the definition of lead risk work. Furthermore, the introduction of lower removal levels will mean that a number of businesses currently complying will need to implement additional control measures.

Occupational and personal hygiene practices

Consultation with businesses which have either reduced target blood lead levels or introduced voluntary blood lead removal levels above and beyond those prescribed in the regulations have attributed their success to:

- worker training in lead health, hygiene awareness and personal habits
- mandatory respiratory protection as a primary method of control, with equipment fit tested, accompanied by a mandatory clean-shaven policy
- a reduction in worker hand-to-mouth contamination, using approaches such as:
  - areas designated for eating and smoking
  - automated washing troughs
  - architect designed surfaces to enhance cleaning
  - dedicated cleaners, with detailed cleaning plans
  - a strictly enforced regime, by contract (employment conditions), and
  - checking and auditing of performance.

Given existing requirements under the model WHS Regulations in regards to washing and changing facilities as well as occupational and personal hygiene, it is expected there will be little or no additional cost involved with this requirement.

Impact on business

Safe Work Australia expects minimal additional cost on businesses above and beyond current or planned investment.

This section should be read in conjunction with the costs and benefits associated with workplace exposure standard – See Chapter 9.

8.4 BLL Option 3 – Gender-neutral approach

This section (BLL Option 3) investigates the expected benefits and costs above and beyond those described in section 8.3 – BLL Option 2.

The adoption of a gender neutral approach is consistent with the objectives to reduce the potential for adverse health effects due to exposure to lead and to improve the regulatory framework in Australia to provide the highest level of protection to all workers, while ensuring practicability for businesses.

This option would exceed best practice and introduce a blood removal level to Australia lower than any other mandated blood lead removal level in the world.

Under this option the same blood lead removal level would apply to all workers, regardless of gender or reproductive capacity. The level that protects the most vulnerable group—pregnant or breastfeeding females—has been applied for this purpose.

This involves reducing blood lead removal levels to 10 µg/dL for all workers. Consistent with the approaches explained above, workers removed for exceeding this threshold could only be returned to lead risk work level once their blood lead levels returned to 5 µg/dL—for all workers.

This is very close to normal 'background' levels—estimated to be between 2 µg/dL and 3 µg/dL.[(2)] A change in definition of lead risk work to 5 µg/dL, background levels for average Australians are estimated to be between 2 µg/dL and 3 µg/dL[(2)]. This proximity means health monitoring would probably be required for all workers undertaking lead risk work.

Benefits

This option

- aligns with the NHMRC (2009) and World Health Organisation (2008) recommended level of concern of 10 µg/dL.
- provides a gender neutral approach towards the control of lead exposure in the workplace.
- introduces a worldwide best practice workplace standard for the control of lead exposure in the workplace.

Other benefits associated with adoption of Option 3 are primarily outlined under section 8.3 – BLL Option 2 – Evidence based approach.

Anticipated health benefits above and beyond those realised under BLL Option 2 include reduced incident rates in adverse health effects, including:

- Increased blood pressure & heart rate variability,
- decreased Delta-aminolevulinic acid dehydratase (ō-ALAD) activity,
- subtle changes in immune markers,
- endocrine function,
- reduced sperm quality,
- increased chromosomal aberration, micronuclei, & sister-chromatid exchanges (SCE)

Costs

Assumed costs above and beyond those realised under BLL Option 2 include:

Medical

- increase in the number of workers requiring health monitoring
- increase in the number of tests due to increased frequency

Staffing

- increase in the number of workers removed from lead risk work
- possible initial increase in job rotation or need to have temporary workers

Administrative

- increase costs associated with record keeping

Impact on business

Although technically feasible, this option is expected to require substantially greater financial investment with a smaller return in benefits when compared to BLL Option 2.

8.5 Comparison of BLL options

Three BLL options are discussed in this Consultation RIS, including suggestions for transitional arrangements should there be support for change.

All three involve mandating blood lead removal levels and related requirements in law.

It is considered that de-regulating this area of WHS law is an unviable option, as it is likely to involve a diminution in safety standards which would be unacceptable to most stakeholders. For this reason, it is not proposed here.

To assist judgement of the relative merits of the three options Safe Work Australia has examined them against associated key objectives / deliverables.

Table 12 comparison of BLL options against key objectives and deliverables

Key objectives / deliverables	**Option 1** **Status quo**	**Option 2** **Evidence-based option**	**Option 3** **Gender neutral approach**
Reduces the potential for adverse health outcomes caused by exposure to lead in the workplace.	No reduction	Yes	Yes – but not a great amount over option 2
Improves the regulatory framework in Australia to provide the highest level of protection to all workers, **while ensuring practicability for businesses**	No improvement	Yes	Yes
Addresses and reflects the latest scientific and toxicological evidence of the hazard of the lead, putting workers at risk.	No – blood lead levels are out of date and do not reflect latest evidence	Yes	Yes
Addresses the associated problem of alignment with international best practice, and	No – WES out of date and does not align with international best practice	Yes	Yes
Sends a signal to the workplace regarding the potential seriousness from exposure to lead	No	Yes	Yes – above and beyond option 2

9. Options considered: workplace exposure standard (WES) for lead

Most occupational exposure to lead is by inhalation or ingestion of airborne particles which have landed on clothing, work surfaces, food items, smoking materials and unprotected skin. On its own controlling airborne lead contaminants is a critical part of managing risks of lead at work, but current WHS laws for lead require air monitoring to always be conducted in association with biological monitoring. Biological monitoring is considered the most effective way of measuring the amount of lead actually absorbed by a worker because it takes into account both ingestion and inhalation routes of exposure.

The evidence shows there is a link between the levels of airborne lead contaminants and blood lead levels of affected people.

If there is support to reduce blood lead levels in workers, then consideration needs to be given as to how that is to be achieved. Consideration is given here to maximum levels of airborne lead contaminants at work.

The Australian mandatory workplace exposure standard for lead is 0.15 mg/m^3. If blood lead levels in workers are to be reduced, this standard needs to be reduced proportionately.

This Consultation RIS considers four options for the Australian workplace exposure standard for lead, with a view to meeting the objectives in Chapter 6.

Options for the Australian Workplace Exposure Standard (WES) for lead are:

- Option 1: Status quo (workplace exposure standard of 0.15 mg/m^3)
- Option 2: Workplace exposure standard of 0.05 mg/m^3
- Option 3: Workplace exposure standard set to protect the most vulnerable group (0.01 mg/m^3)
- Option 4: Non-regulatory approach (non-mandatory) work airborne level of 0.15 mg/m^3, 0.05 mg/m^3 or 0.01 mg/m^3 dependant on the adopted BLL option)

9.1 WES Option 1 – Status quo

The Australian mandatory workplace exposure standard for lead is 0.15 mg/m^3. It is out of date, with no change since being adopted from the American Conference of Industrial Hygienists (ACGIH) in 1991. Since then the ACGIH has revised the workplace exposure standard for lead to a more protective level of 0.05 mg/m^3 (proposed WES Option 3).

The current Australian exposure standard is now inconsistent with the latest toxicological and health data.

If the exposure standard of 0.15 mg/m^3 is met, only a small portion of females not of reproductive capacity and males would exceed the current blood lead removal level of 50 µg/dL. It is unlikely that female workers of reproductive capacity would meet their (more protective) blood lead removal levels.

Additionally the current standard is insufficient to allow the blood lead removal levels recommended by the ToxConsult Report to be met.

The current standard is also inconsistent with leading international standards (up to three times as high) and widely perceived as ‘lagging’ behind.

The main duties for a person conducting a business or undertaking (the business) are set out below.

Managing risk from airborne contaminants

- The business must ensure that no person at the workplace is exposed to an airborne concentration that exceeds the exposure standard for the substance or mixture.

Monitoring airborne contamination levels

- The business must ensure that air monitoring is carried out to determine the airborne concentration if:

  (a) it is not certain on reasonable grounds whether or not the airborne concentration exceeds the relevant exposure standard; or

  (b) monitoring is necessary to determine whether there is a risk to health.

How air monitoring is conducted

To conduct an effective air monitoring program a sound understanding of the nature of contaminant concentrations in the workplace, the statistics relevant to their measurement and the interpretation of measurement results is required. Safe Work Australia guidance material recommends this is done by engaging the services of an expert in air monitoring, like a qualified occupational hygienist.

Where monitoring of airborne contaminants is used to estimate a worker's exposure compared to the exposure standard, the monitoring must be conducted in the breathing zone of the person, also known as 'personal monitoring'. If a respirator must be worn, air monitoring samples are usually taken outside the respirator. Breathing zone samples are usually obtained by fastening a sampling device, like a special meter or collection tubes to a shirt or jacket lapel. Air sampling often involves drawing air through a device and a sampling pump may also be required to be worn.

Analyses of samples taken in the workplace should be carried out by a NATA-accredited laboratory.

How risks of airborne contaminants are managed

In simple cases the risk of airborne contaminants can be managed through the application of basic controls like improving ventilation or providing workers with protective equipment. However higher-risk operations which generate airborne contaminants require engineering controls like local exhaust ventilation, fume cupboards, down-flow booths or mechanical extraction.

Record keeping

- The business must ensure that the results of air monitoring are recorded, and kept for 30 years after the date the record is made.

Questions
How often do you undertake air monitoring for lead levels? For example: regularly or on an ad hoc basis.
How much does ensuring compliance with exposure standards cost your business? You should take into consideration: • Air monitoring costs (e.g. equipment) • Staffing costs (e.g. in-house occupational hygienist, external consultant)
Have you needed to implement controls because of a high or increasing airborne lead contamination levels?

9.2 WES Option 2 – Evidence-based approach

Under WES Option 2 the Australian mandatory workplace exposure level would be reduced to the level recommended by the ToxConsult Report—0.05 mg/m^3.

This is intended to ensure most workers' blood lead levels do not generally exceed the recommended blood lead removal levels.

The ToxConsult Report estimates this exposure standard will result in an average blood lead level of approximately 23 µg/dL, with an upper bound of 46 µg/dL.

This would allow more workers to have blood lead levels less than the recommended 30 µg/dL but more than 50 per cent would exceed the lower 20 µg/dL target.

Primary duties under the WHS laws would remain the same (i.e. conducting an effective air monitoring program, monitoring air contaminants, implementing controls) it is the reliance on control methods which is increased in order to achieve the desired result.

It is expected this option is unlikely to impose a significantly greater level of reliance on engineering controls (typically exhaust ventilation), respiratory protective equipment (RPE) and protective clothing above and beyond that already used by business.

WES Option 2 is consistent with international best practice and in line with the current ACGIH recommended exposure standard, on which the Australian standard was originally based.

This option also complements the recommended blood lead removal levels (BLL Option 2) in Section 7.2 above.

Comment is sought on whether this option is reasonably practicable. In particular detailed information is sought about compliance costs for this option, including information about:

- whether businesses already meet or exceed the proposed standard
- how difficult the proposed standard would be to meet (e.g. technical feasibility), and
- whether existing controls could be used to meet the proposed standard (e.g. ventilation).

Question
If WES Option 2 is implemented, how much would the change cost your business per year? Please provide details of transitional and ongoing costs if possible. If your business already meets the standards in WES Option 2 then the cost is Nil.
Based on your knowledge of meeting the current requirements, to meet the level of 0.05 mg/m^3 would you need to: • Increase the monitoring on your workplace? • Increase other any other controls to maintain levels?

9.3 WES Option 3 – Most protective

Under this option the Australian mandatory workplace exposure level would be reduced from 0.15 mg/m^3 to 0.01 mg/m^3.

This is 20 times higher than the Australian ambient air guideline of 0.005 mg/m^3 (annual average) for lead.

This option would enable the 'gender neutral' blood lead level targets described in Option 3 above to be complied with in most cases.

Under this option more than 50 per cent of workers would have blood lead levels below 10 µg/dL.

As with Option 2, primary duties under the WHS laws would remain the same (i.e. conducting an effective air monitoring program, monitoring air contaminants, implementing controls) it is the reliance on control methods which is increased in order to achieve the desired result.

This option exceeds international best practice and there does not appear to be enough of an evidence base for its adoption.

Although technically feasible, this option is likely to require a significant level of reliance on engineering controls (typically exhaust ventilation), respiratory protective equipment (RPE) and protective clothing in order to achieve the desired result.

There is uncertainty as to whether this option is reasonably practicable. Comments are sought on this point.

Questions
If WES Option 3 is implemented, how much would the change cost your business per year? Please provide details of transitional and ongoing costs if possible.
Based on your knowledge of meeting the current requirements, to meet the level of 0.01 mg/m^3 would you need to: • Increase the monitoring on your workplace? • Increase other any other controls to maintain levels?

9.4 WES Option 4 – Non-regulatory approach

WES were not always used as mandatory legal limits. They became legal limits in most jurisdictions following the introduction of the National Occupational Health and Safety Commission's (Safe Work Australia's predecessor) hazardous substances regulatory framework. Prior to this, they were used as guidance values rather than for compliance purposes. This is consistent with the approach advocated by the ACGIH.

Exposure standards were adopted into Commonwealth, state and territory health and safety laws between 1995 and 2003. From 2012 onwards most jurisdictions (except Victoria and Western Australia) adopted uniform model WHS laws that maintained previous arrangements—that is, mandatory exposure standards.

In lead risk work, a large proportion of exposure is controlled through occupational health and hygiene practice. This means a business can comply with the WES and have workers who present with blood lead levels higher than the mandated removal levels if controls are not adequately followed e.g. cleaning, laundering, handwashing and personal hygiene practices.

As addressed earlier in this chapter, most occupational exposure to lead is by inhalation or ingestion of airborne particles which have landed on clothing, work surfaces, food items, smoking materials and unprotected skin. On its own controlling airborne lead contaminants which are inhalable is a critical part of managing risks of lead at work, but current WHS laws require air monitoring to always be conducted in association with biological monitoring which is considered the most effective way of measuring the amount of lead actually absorbed by a worker because it takes into account both ingestion and inhalation routes of exposure..

It may not be necessary to be undertake air monitoring on a routine basis to monitor a workers exposure to lead. This approach is consistent with other regulations which provide that where biological monitoring is being undertaken as part of health monitoring there is no need to undertake air monitoring. Blood lead level analysis is a reliable means of assessing recent

absorption of inorganic lead. The test determines a workers level of exposure to lead and is used to establish what further action should occur – for example more frequent testing of worker, removal of the worker from the lead process area, airborne lead assessment, etc.

This option moves away from the mandated workplace exposure standard system for lead to a non-mandated exposure level. Standard workplace duties under WHS laws to eliminate or minimise risk would still apply, however these would come into place when there is a change in work conditions or where there are indications workers are at potential health risk. The WES for inorganic lead would be removed from the *Workplace Exposure Standards for Airborne Contaminants* and relocated to health monitoring guidance material.

The proposal would not place new demands on employers but may reduce the need for air monitoring.

In the current model WHS Regulations WESs define adequate control of inhalation exposure, ie. they tell employers how much of the substance is allowed in the air breathed in by their workers.

This option proposes a new definition of adequate control:

- apply the principles of good occupational health/hygiene practice contained within legislation, for example:
    - cleaning methods (regulation 397)
    - prohibition on eating, drinking and smoking (regulation 398)
    - provision of changing and washing facilities (regulation 399)
    - laundering, disposal and removal of personal protective equipment (regulation 400)
    - review of control measures (regulation 401)
- comply with the proposed blood lead levels.

Compliance with the general duty to eliminate or minimise risk to health and safety so far as is reasonably practicable would become the main duty under the model WHS Regulations and a tool for establishing if controls are effective.

In practice, worker health would be managed primarily through biological monitoring (blood lead levels), as it is now.

In order for worker's blood lead levels to be below the removal levels mandated in the WHS Regulations, a business would need to ensure:

- local exhaust ventilation / isolation are effective and maintained
- a strict occupational health / personal hygiene regime, and
- the use of respiratory protective equipment, where necessary (fit tested and accompanied by a clean-shaven policy).

The non-mandatory WES would be set at 0.15 mg/m^3, 0.05 mg/m^3 or 0.01 mg/m^3 dependant on the adopted BLL option as described in this Consultation RIS. The presence of elevated blood lead levels would be indicative of failed control measures rather than hazardous airborne levels. The WES fails to take into consideration ingestion via hand-to-mouth.

The good practice requirement would represent what a good employer currently does to ensure that blood lead removal levels are not exceeded.

The current model WHS Regulations set out the principles of good occupational health / personal hygiene practice. This would not change.

Questions
Based on your knowledge of meeting the current requirements, to meet the requirement of managing health and safety risks so far as is reasonably practicable without a prescribed WES, would you need to: • Change the way you approach air monitoring in your workplace? • Would this reduce your costs? • Do you think it would be harder or easier to comply with blood lead level requirements if the exposure standard was non mandatory?

9.5 Options for transitional arrangements

It is proposed transitional arrangements for any changes to workplace exposure standards would need to match transitional arrangements for changes to corresponding blood lead removal levels—for example two or four year transitional periods.

The more significant the change, the more time would be allocated to allow for the transition and minimise disruption.

9.6 Impact analysis (costs and benefits): workplace exposure standards

Workplace surveys [(6)] indicate that only 80 per cent of lead process businesses use air monitoring. This is believed to be an overestimate of proportion of businesses that carry out air monitoring under the WHS laws.

By way of comparison, the Victorian RIS for Hazardous Substances Regulations [(6)] reported that five (5) per cent of businesses would use air monitoring to gauge, where a WES existed, whether or not it had been exceeded.

Impact and cost on medium and large businesses (>100 workers)

It appears large businesses tend to use WES and are more aware of regulatory requirements. Many employ occupational hygienists to control chemical exposures or have the capacity to engage consultants to undertake this work. In addition some large businesses set their own internal exposure standards in line with international best practice and emerging health and toxicological information.

It is assumed this proposal would have minimal impact on medium and large businesses for Option 2 and some impact for Option 3.

Impact on self-employed persons and small business (<100 workers)

The experience of occupational hygienists and regulators suggests that self-employed persons and small businesses in particular have a low level of understanding of WES requirements and may not use them in controlling exposures.

Option 1

The status quo (base case) assumes no action is taken by government to reduce adverse health outcomes associated with airborne contamination and exposure to lead. The base case is not expected to produce any health benefits. The base case would therefore fail to:

- achieve the objective of reducing the potential for adverse health outcomes caused by exposure to lead in the workplace.

- improve the regulatory framework in Australia to provide the highest level of protection to all workers, while ensuring practicability for businesses
- address and reflect the latest scientific and toxicological evidence of the hazard of the lead, putting workers at risk.
- address the associated problem of alignment with international best practice, and
- send a signal to the workplace regarding the potential seriousness from exposure to lead.

Options 2-3

These options would maintain the current WES system and the duties under the WHS Regulations associated with them. It therefore has the advantage of maintaining a system familiar to occupational health and safety professionals.

But while this approach would address the concerns about appropriate airborne exposure limits for lead it would not address the difficulties many small businesses have with understanding and applying WES.

Impact on business

It is expected this Option 2 is unlikely to impose a significantly greater level of reliance on engineering controls (typically exhaust ventilation), respiratory protective equipment (RPE) and protective clothing above and beyond that already used by business.

Although technically feasible, Option 3 is likely to require a significant level of reliance on engineering controls (typically exhaust ventilation), respiratory protective equipment (RPE) and protective clothing in order to achieve the desired result.

Safe Work Australia is seeking comment on the analytical feasibility of appropriate monitoring, the availability of equipment, and if the monitoring equipment is robust and reproducible enough for a regulatory value of:

- 0.05 mg/m^3
- 0.01 mg/m^3.

Impact on self-employed persons and small business

Safe Work Australia does not expect any disproportionate costs on self-employed persons and small business as a result of the proposed changes.

This section should be read in conjunction with the costs and benefits associated with biological monitoring (blood lead levels) – See Chapter 8.

Option 4

This option proposes the WES for lead be linked to advice on good practice. The aim being that if businesses apply the good practice and adequate blood lead levels as prescribed by the WHS Regulations are maintained, they will be complying with the duty.

Benefits

Some assumed economic benefits associated with a change to blood lead levels are outlined below.

- Medical – a reduction in health effects would see a reduction in ongoing medical expenditure, in particular for long lasting health effects such as cancer.

- Cleaning – reduced airborne levels will mean less build-up of lead dust on surfaces. This will make thorough cleaning processes easier and reduce associated costs.
- Hand-to-mouth contamination - reduced airborne levels will mean less build-up of lead dust on surfaces including clothing, work surfaces, food items, smoking materials and unprotected skin. This will make it easier to reduce hand-to-mouth contamination reducing blood lead levels and associated costs.
- Staffing – a reduction airborne levels will also see a reduction in blood lead levels. A reduction in blood lead levels would see a reduction in the amount of time a worker is removed from lead risk work. Consequentially, this would require a shorter period of time where the business may require the cost of additional staff member to replace them.
- Indirect benefits - reduced contamination of non-work environments (e.g. taking lead dust home on clothing).
- Monitoring – a non-regulatory approach to the WES may see a reduction in air monitoring in favour of occupational health and personal hygiene practices.
- Healthier workforce – a healthier workforce and the implementation of best practice could see a higher retention of staff, with potentially more candidates for employment opportunities. A reduction in illness would also see a potential increase in productivity.

Additional information and comment on assumed cost is requested via the public consultation process.

Costs

Some assumed costs associated with a change to blood lead levels are outlined below.

- Initial re-training for workplaces where there has been no move towards the introduction of the proposed levels.
- Possible purchase and maintaining of plant and equipment (e.g. ventilation) above planned investment. This will be a one-off transitional cost.

Respiratory protective equipment

- Possible initial reliance in respiratory protective equipment as a primary method of protection

General impact on business

This option would not place new demands on employers, but it would reduce the need for routine monitoring. In addition, the good practice advice would set a WES into context of other WHS requirements and emphasise that control is not just about using engineering means to reduce exposure, but that process design, housekeeping and maintenance are all important considerations.

Inevitably a non-mandatory WES would result in a greater reliance on biological monitoring as well as occupational health and personal hygiene practices as outlined in the WHS Regulations.

It is assumed this proposal would have little impact on self-employed persons and small businesses. The proposal would not place new demands on businesses but would reduce the need for air monitoring.

Additional information and comment on assumed cost is requested via the public consultation process.

9.7 Comparison of WES options

The status quo (base case) assumes no action is taken by government to reduce adverse health outcomes associated with airborne contamination and exposure to lead. The base case is not expected to produce any health benefits. The base case would therefore fail to meet the key objectives.

Options 2-3 would retain a system familiar to health and safety professionals, but would not address other concerns as it would retain the concept of the WES as a "safe" limit and would not help employers understand what they have to do to comply with WESs.

In contrast, Option 4 proposes a simpler, more user-friendly system, by relying on good practice control advice (i.e. biological monitoring, occupational and personal hygiene) as a primary method of risk control. This would set out in straightforward, practical terms what employers have to do to comply with the WES.

To assist judgement of the relative merits of the four options Safe Work Australia has examined them against associated key objectives / deliverables (See Table 13).

Table 13 comparison of WES options against key objectives and deliverables

Key objectives / deliverables	**Option 1** **Status quo**	**Option 2** **Evidence-based option**	**Option 3** **Most protective**	**Option 4** **Non-regulatory approach**
Reduces the potential for adverse health outcomes caused by exposure to lead in the workplace.	No reduction	Yes	Yes	Yes
Improves the regulatory framework in Australia to provide the highest level of protection to all workers, while ensuring practicability for businesses	No improvement	Yes	Yes	Yes
Addresses and reflects the latest scientific and toxicological evidence of the hazard of the lead, putting workers at risk.	No – WES out of date and do not reflect latest evidence	Yes	Yes	Yes
Addresses the associated problem of alignment with international best practice, and	No – WES out of date and does not align with international best practice	Yes	Yes	Yes
Sends a signal to the workplace regarding the potential seriousness from exposure to lead	No	Yes	Yes	Yes

10. Consultation plan

A comprehensive stakeholder engagement plan includes a range of strategies to bring the Consultation RIS to the attention of interested parties. Safe Work Australia will use its existing social media channels, Facebook and LinkedIn.

The Consultation RIS will be published on the business.gov.au website which will also result in promotion of the submission process on the business.gov.au social media channels, Twitter and Facebook, as well as an alert being sent to a list of email subscribers to the site.

The following stakeholders will be sent a letter inviting them to participate in the consultation process:

- Australian Institute of Occupational Hygienists (AIOH)
- National Health and Medical Research Council (NHMRC)
- The Lead Group Inc
- Mining companies with a close interest in the issues, such as:
  - Nyrstar
  - Xstrata
  - Rio Tinto
  - BHP Billiton
- Australian Battery Recycling Initiative
- Australian Battery Industry Association
- Century Yuasa Batteries
- National Industrial Chemicals Notification and Assessment Scheme (NICNAS)
- Various other lead risk work businesses as identified via desktop research.

Safe Work Australia is particularly interested in hearing from those businesses involved in lead process activities where worker blood lead levels are likely to exceed 10 µg/dL, including:

- manufacturing dry lead compounds
- radiator repairs
- assembling, handling, repairing or dismantling batteries
- spraying, melting or casting lead alloys
- recovering lead from its ores or other compounds
- machine sanding or buffering surfaces coated in lead paint
- welding or cutting metal coated with lead
- spray painting with lead paint
- use of detonators or weapons
- foundry processes.

Electronic mail-outs will also be sent to several Safe Work Australia subscriber lists to promote the Consultation Regulation Impact Statement. These lists have over 10,000 subscribers.

Safe Work Australia will also engage work health and safety regulators and social partners through:

- Safe Work Australia Members and the WHS Strategic Issues Group; both of which will encourage jurisdictions to publish links to the discussion paper and public comment web page, and
- Communications Reference Group; which will receive advance copies of media releases and promotional materials including website banners, suggested subscriber mail-outs and social media posts, to distribute to their networks and audiences.

Safe Work Australia will also work with national organisations, businesses and associations to promote the consultation process on their respective websites and through their contact lists.

11. Conclusion

Blood lead removal levels, workplace exposure standards for lead and related requirements have been regulated under Australian WHS laws—without change—for many years.

These standards are outdated and may not provide adequate protection to the majority of workers and especially females of reproductive capacity. It is important they are revised and updated, to ensure better health outcomes for workers undertaking lead risk work.

The options proposed in this Consultation RIS put forward a number of regulatory approaches for bringing them up-to-date and into line with international best practice.

A non-regulatory option for workplace exposure standards is also considered. It is considered non-regulatory options for blood lead removal levels and related requirements would not meet the objectives of this Consultation RIS.

12. References

(1) NHRMC (2014), Evaluation of evidence related to exposure to lead
(2) Dr Roger Drew, Ms Tarah Hagen (2014) *Review of hazards and health effects of inorganic lead – implications for WHS regulatory policy*
(3) NHRMC (2009), Information paper – blood lead levels for Australians
(4) NHMRC (2015), NHMRC Statement: Evidence on the Effects of Lead on Human Health
(5) Marsden Jacob Associates (2012) *Regulatory Impact Statement, Model Work Health and Safety Regulations and Codes of Practice in Western Australia*
(6) The Victorian WorkCover Authority's *Regulatory Impact Statement on the Occupational Health and Safety (Lead) Regulations 2000*

Appendix A: Meaning of a lead process

A ***lead process*** consists of any of the following carried out at a workplace:

(a) work that exposes a person to lead dust or lead fumes arising from the manufacture or handling of dry lead compounds;

(b) work in connection with the manufacture, assembly, handling or repair of, or parts of, batteries containing lead that involves the manipulation of dry lead compounds, or pasting or casting lead;

(c) breaking up or dismantling batteries containing lead, or sorting, packing and handling plates or other parts containing lead that are removed or recovered from the batteries;

(d) spraying molten lead metal or alloys containing more than 5% by weight of lead metal;

(e) melting or casting lead alloys containing more than 5% by weight of lead metal in which the temperature of the molten material exceeds 450°C;

(f) recovering lead from its ores, oxides or other compounds by thermal reduction process;

(g) dry machine grinding, discing, buffing or cutting by power tools alloys containing more than 5% by weight of lead metal;

(h) machine sanding or buffing surfaces coated with paint containing more than 1% by dry weight of lead;

(i) a process by which electric arc, oxyacetylene, oxy gas, plasma arc or a flame is applied for welding, cutting or cleaning, to the surface of metal coated with lead or paint containing more than 1% by dry weight of lead metal;

(j) radiator repairs that may cause exposure to lead dust or lead fumes;

(k) fire assays if lead, lead compounds or lead alloys are used;

(l) hand grinding and finishing lead or alloys containing more than 50% by dry weight of lead;

(m) spray painting with lead paint containing more than 1% by dry weight of lead;

(n) melting lead metal or alloys containing more than 50% by weight of lead metal if the exposed surface area of the molten material exceeds 0.1 square metre and the temperature of the molten material does not exceed 450°C;

(o) using a power tool, including abrasive blasting and high pressure water jets, to remove a surface coated with paint containing more than 1% by dry weight of lead and handling waste containing lead resulting from the removal;

(p) a process that exposes a person to lead dust or lead fumes arising from manufacturing or testing detonators or other explosives that contain lead;

(q) a process that exposes a person to lead dust or lead fumes arising from firing weapons at an indoor firing range;

(r) foundry processes involving:

  (i) melting or casting lead alloys containing more than 1% by weight of lead metal in which the temperature of the molten material exceeds 450°C; or

  (ii) dry machine grinding, discing, buffing or cutting by power tools lead alloys containing more than 1% by weight of lead metal;

(s) a process decided by the regulator to be a lead process under regulation 393 of the model Work Health and Safety Regulations.

Appendix B: Australian state and territory legislation for blood lead notification [12]

	Level	Who	Notifier	Legislation	Details
New South Wales	Notifiable—venous sample Notifiable ≥10 µg/dL (>0.72 µmol/dL)	Regional public health unit	Laboratories	Public Health Act 2010 (NSW)	Guide
Victoria	Notifiable >10 µg/dL (>0.48 µmol/dL)	Department of Health	Laboratories and medical practitioners	Public Health and Wellbeing Act 2008 (Vic)	Webpage
Queensland	Notifiable≥10 µg/dL (≥0.48 µmol/dL)	Local Public Health Unit	Medical practitioners	Public Health Regulations 2005 (Qld)	On 17 July 2014 the Queensland Government indicated it would reduce the current mandatory blood lead notification level from 10 micrograms per decilitre (ug/dL) to 5 ug/dL. It subject to regulatory change. Statistics
Western Australia	A person who is or may be suffering from lead poisoning		Medical practitioners	Health Act 1911 (WA); Health (Notification of Lead Poisoning) Regulations 1985 (WA)	Form
South Australia	—	—	—	—	—
Tasmania	Notifiable >10 µg/dL (>0.48 µmol/dL)	Department of Health	Laboratories	Public Health Act 1997 (Tas)	Guide
Australian Capital Territory	—	—	—	—	—
Northern Territory	—	—	—	—	—

[12] NHRMC (2014), Evaluation of evidence related to exposure to lead

Appendix C: Transitional options: blood lead levels

Table 14 Blood lead removal levels

			Four year transition		Two year transition
Option	**Risk Group**	**Current Level**		**0-4 years**	**0-2 years**
Option 1 - Status Quo	M/FNRC	50 µg/dL		n/a	n/a
	FRC	20 µg/dL		n/a	n/a
	P / BF	15 µg/dL		n/a	n/a
Option 2 - Evidence based option	M/FNRC	50 µg/dL		30 µg/dL	30 µg/dL
	FRC	20 µg/dL		10 µg/dL	10 µg/dL
	P / BF	15 µg/dL			
Option 3 - Single value for all workers	M/FNRC	50 µg/dL		10 µg/dL	10 µg/dL
	FRC	20 µg/dL			
	P / BF	15 µg/dL			

M = Males; FNRC = Females not of reproductive capacity; FRC = Females of reproductive capacity; P/BF = Pregnant or breast feeding

Table 15 Return to work levels

			Four year transition		Two year transition
Option	**Risk Group**	**Current Level**		**0-4 years**	**0-2 years**
Option 1 - Status Quo	M/FNRC	40 µg/dL		n/a	n/a
	FRC	10 µg/dL		n/a	n/a
	P / BF			n/a	n/a
Option 2 - Evidence based option	M/FNRC	40 µg/dL		20 µg/dL	20 µg/dL
	FRC	10 µg/dL		5 µg/dL	5 µg/dL
	P / BF				
Option 3 - Single value for all workers	M/FNRC	40 µg/dL		5 µg/dL	5 µg/dL
	FRC	10 µg/dL			
	P / BF				

M = Males; FNRC = Females not of reproductive capacity; FRC = Females of reproductive capacity; P/BF = Pregnant or breast feeding

Table 16 Lead risk work definition

			Four year transition		Two year transition
Option	**Risk Group**	**Current Level**		**0-4 years**	**0-2 years**
Option 1 - Status Quo	M/FNRC	30 µg/dL		n/a	n/a
	FRC	10 µg/dL		n/a	n/a
	P / BF			n/a	n/a
Option 2 - Evidence based option	M/FNRC	30 µg/dL		20 µg/dL	20 µg/dL
	FRC	10 µg/dL		5 µg/dL	5 µg/dL
	P / BF				
Option 3 - Single value for all workers	M/FNRC	30 µg/dL		5 µg/dL	5 µg/dL
	FRC	10 µg/dL			
	P / BF				

M = Males; FNRC = Females not of reproductive capacity; FRC = Females of reproductive capacity; P/BF = Pregnant or breast feeding

Table 17 Frequency of biological monitoring

			Four year transition		Two year transition
Option	**Risk Group**	**Current Requirement**		**0-4 years**	**0-2 years**
Option 1 - Status Quo	M/FNRC	< 30µg/dL every 6 months =>30 µg/dL but <40 µg/dL every 3 months =>40 µg/dL every 6 weeks		n/a	n/a
	FRC	< 10µg/dL every 3 months		n/a	n/a
	P / BF	=>10 µg/dL every 6 weeks		n/a	n/a
Option 2 - Evidence based option	M/FNRC	< 30µg/dL every 6 months =>30 µg/dL but <40 µg/dL every 3 months =>40 µg/dLevery 6 weeks		<15 µg/dL every 3 months =>20 µg/dL every 6 weeks	<15 µg/dL every 3 months =>20 µg/dL every 6 weeks
	FRC	< 10µg/dL every 3 months =>10 µg/dL every 6 weeks		<5 µg/dL every 3 months =>5 µg/dL every 6 weeks	<5 µg/dL every 3 months =>5 µg/dL every 6 weeks
	P / BF				

Option 3 - Single value for all workers	M/FNRC	< 30µg/dL every 6 months =>30 µg/dL but <40 µg/dL every 3 months =>40 µg/dL every 6 weeks		<5 µg/dL every 3 months =>5 µg/dL every 6 weeks	<5 µg/dL every 3 months =>5 µg/dL every 6 weeks
	FRC P / BF	< 10µg/dL every 3 months =>10 µg/dL every 6 weeks			

M =M = Males; FNRC = Females not of reproductive capacity; FRC = Females of reproductive capacity; P/BF = Pregnant or breast feeding

Appendix D: Request for stakeholder comment

For ease of reference, questions and requests for stakeholder comment appearing throughout this Consultation RIS are summarised below. Written submissions do not need to address each question.

Background information

1. How many workers does your business currently employ?

2. How many of those workers are classified as undertaking lead risk work?

Of those lead risk workers how many are:

- Females not of reproductive capacity?
- Females of reproductive capacity?
- Males?

Blood Lead Levels – Option 1 – status quo

3. How do you administer health monitoring?

☐ Medical practitioners hired directly (employed by the business)

☐ Health monitoring outsourced

☐ Other - Please provide details

4. What are the costs associated with managing worker blood lead levels (Including both direct and indirect costs)?

You should take into consideration:

- Biological and health monitoring (e.g. blood tests, pathology expenses, costs for medical practitioners and other staff)
- Removal of lead risk workers
- Administrative and notification requirements (e.g. record keeping, notifying the regulator)
- Training (e.g. staff time off, costs of facilitator)
- PPE and engineering controls

Please provide any information you may have on blood lead removal levels, frequencies for testing or other hazard/risk control methods that are stricter than or exceed those prescribed in the regulations.

If you are located in a rural or remote area or face particular difficulties in meeting health monitoring requirements we are interested to hear more. [Comment]

Blood Lead Levels – Option 2 – Evidence Based approach

5. If BLL Option 2 is implemented, how much would the change cost your business?

For example would you need to undertake more health monitoring more often for more workers? Please provide details of transitional and ongoing costs per year if possible.

If your business already meets the standards in BLL Option 2 then the cost is Nil.

6. Based on your current knowledge of blood lead levels in your workplace would you need to:

- Increase blood lead level monitoring?
- Put in place new controls, or improve existing controls to maintain levels?

7. How long would it take you to make the changes needed to meet the new blood lead levels?

Blood Lead Levels – Option 3 – Gender neutral approach

8. If BLL Option 3 is implemented, how much would the change cost your business?

For example would you need to undertake more health monitoring more often for more workers? Please provide details of transitional and ongoing costs per year if possible.

9. Based on your current knowledge of blood lead levels in your workplace, to meet the level of 10 µg/dL for all workers, would you need to:

- Increase blood lead level monitoring?
- Put in place new controls, or improve existing controls to meet these levels?

10. How long would it take you to make the changes needed to meet the new blood lead levels?

Workplace Exposure Standard – Option 1 – status quo

11. How often do you undertake air monitoring for lead levels?

For example: regularly or on an ad hoc basis.

12. How much does ensuring compliance with current exposure standards cost your business?

You should take into consideration:

- Air monitoring costs (e.g. equipment)
- Staffing costs (e.g. in-house occupational hygienist, external consultant)

13. Have you needed to implement controls because of a high or increasing airborne lead contamination levels?

Workplace Exposure Standard – Option 2 – Evidence-based option

14. If WES Option 2 is implemented, how much would the change cost your business per year?

Please provide details of transitional and ongoing costs if possible.

If your business already meets the standards in WES Option 2 then the cost is Nil.

15. Based on your knowledge of meeting the current requirements, to meet the level of 0.05 mg/m^3 would you need to:

- Increase the monitoring on your workplace?
- Increase other any other controls to maintain levels?

Workplace Exposure Standard – Option 3 – Most protective

16. If WES Option 3 is implemented, how much would the change cost your business per year?

Please provide details of transitional and ongoing costs if possible.

17. Based on your knowledge of meeting the current requirements, to meet the level of 0.01 mg/m^3 would you need to:

- Increase the air monitoring in your workplace?
- Increase any other controls to maintain levels?

Workplace Exposure Standard – Option 4 – Non regulatory approach

18. To meet the requirement of managing health and safety risks so far as is reasonably practicable without a prescribed WES, would you need to change the way you approach air monitoring in your workplace?

19. Would this reduce your costs?

20. Do you think it would be harder or easier to comply with blood lead level requirements if the exposure standard was non mandatory?