Please find below my answers to questions raised during the Senate Environment and Communications Reference Committee.

Question 2.
(Page 27: Hansard):

CHAIR: Unfortunately, gentlemen, I am going to have to wrap up. Perhaps, Dr Ewald, you could take it on notice. I would be interested in the polluter pays numbers you were talking about earlier for those power stations. If you have any information about how they set those numbers specifically for those pollutants, I would be very interested.
Dr Ewald: DEA made a submission to the review of the New South Wales load based licensing system, and I think it would be relevant to table that document.
CHAIR: Thank you. I would be interested to see how they send those. Thank you for giving evidence today, gentlemen

The DEA submission to the load based licensing review answers most of the chair's questions.
A fuller explanation is in the attached EPA document, with the full list of pollutant weightings in appendix 3. They do not explain how they arrived at these specific values for the pollutant weightings, and I do not know who undertook that work. They may have undertaken a study of relative toxicities, or they may have adopted the relativities from a similar scheme in another country.
Im also attaching an electronic version of the DEA document I tabled, in case it is useful to you in that format .

Regards

Ben Ewald

Submission to NSW EPA on the Review of the load-based licensing scheme

December 2016

Doctors for the Environment Australia

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Healthy planet, healthy people.

Submission to the NSW Environmental Protection Agency on the review of the Load-based licensing scheme.[1]

Doctors for the Environment Australia (DEA) is an independent voluntary organisation of medical doctors and students who work to address the adverse health effects of environmental damage, pollution and anthropogenic global warming in a broad public health context.

DEA welcomes the opportunity to make a submission to the review of the NSW Load Based Licensing system. The submission will address health aspects of the regulations and how they could be made more effective. Our analysis is consistent with and complementary to the DEA policy on air quality[2].

Australia has a health problem from air pollution. Even though our air quality is better than in many comparable countries there would be a health gain from reducing current levels of exposure. The best estimate is that air pollution causes 3,000 deaths per year nationally.[3] Research published in 2015 using detailed modelling of population distribution and observed $PM_{2.5}$ levels estimated that a 10% reduction in $PM_{2.5}$ for Sydney would, over 10 years, result in 650 (95% confidence interval 430-850) fewer premature deaths, a gain of 3,500 (95% CI: 2300–4600) life-years and about 700 (95% CI: 450–930) fewer respiratory and cardiovascular hospital visits.[4]

Coal-fired power stations (CFPS) are substantial sources of air pollutants. The three main pollutants are sulphur dioxide, SO_2, a mix of nitrogen oxides referred to as NOx, and particulate matter in the PM_{10} or $PM_{2.5}$ size range. SO_2 and NOx are both powerful respiratory irritants, causing asthma, chronic lung disease, and restricted lung growth in children. Fine particle pollution causes similar respiratory problems but is also associated with ischaemic heart disease, lung cancer, and increases in mortality. CFPS also release small quantities of highly toxic mercury.

The pollutants can travel long distances, so even though power stations are located outside cities they are contributing to major city pollution as well as having impacts on the local towns. This has been illustrated in Sydney where research by CSIRO and the Australian Nuclear Science Technology Organisation (ANSTO) showed that half of the sulphate particles at Richmond in western Sydney could be traced back to one of the coal-fired power stations despite these being located 70, 90 and 140 Km away.[5]

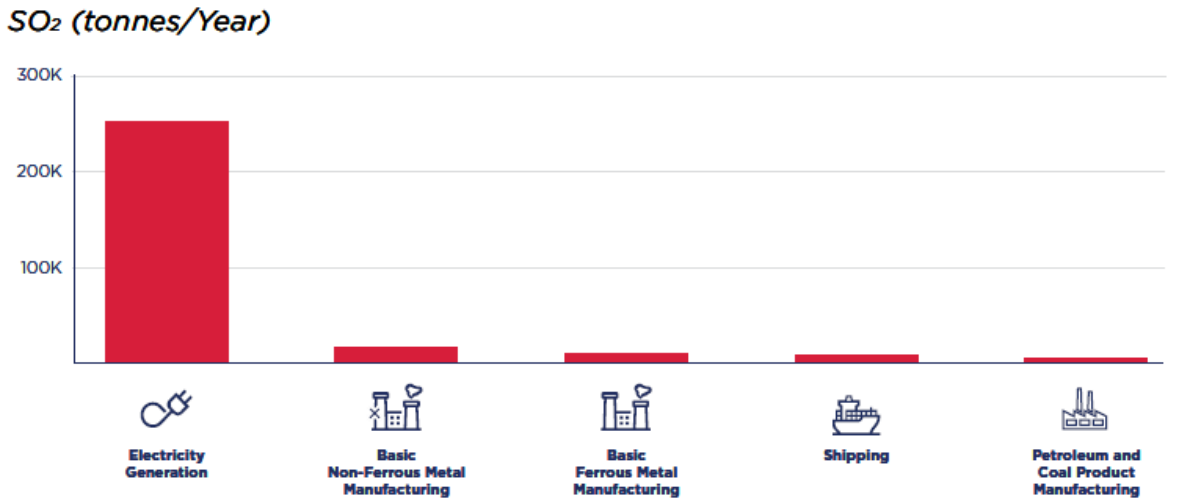
Sulphur dioxide is released in large quantities by coal fired power stations. The amount of SO_2 is mostly determined by the coal quality. SO_2 condenses to sulphate particles in the atmosphere, which are a component of $PM_{2.5}$. NPI figures for Australia show that in 2014-15 the electricity

sector released 560,000 tonnes (51%) of the total from all industry of 1,100,00 tonnes.

NOx are released from vehicle exhaust however electricity generation is the dominant source. In 2014 nationally CFPS released 380,000 tonnes, being 52% of all industrial sources.

$PM_{2.5}$ is a subfraction of PM_{10}, the particles regulated in the LBL system. The NPI shows that in 2014-15 CFPS released 8,900 tonnes (29%) out of national 31,000 tonnes from all industry sources.

While the Load-based Licensing system can influence pollution loads from large industrial emitters it cannot influence pollution from distributed sources such as vehicles, shipping, or wood burning home heating, so the proportion of total load from key sources is critical to its success. The following figures from the '*Clean Air for NSW*' EPA 2016 consultation paper illustrate the major sources of pollutants for the Sydney greater metropolitan region. In every case, large industrial emitters are the dominant sources.



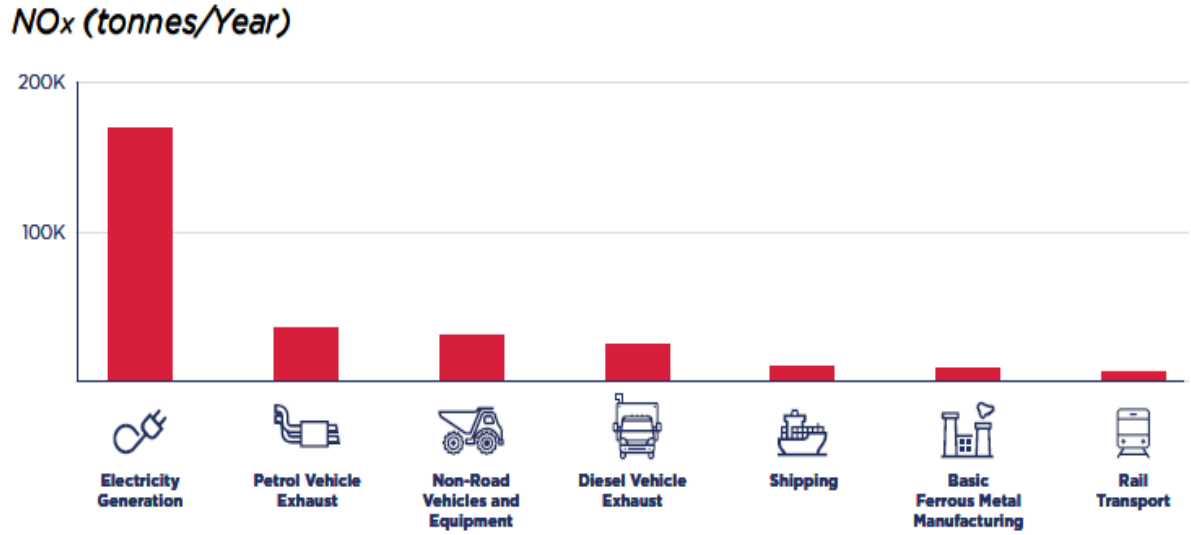
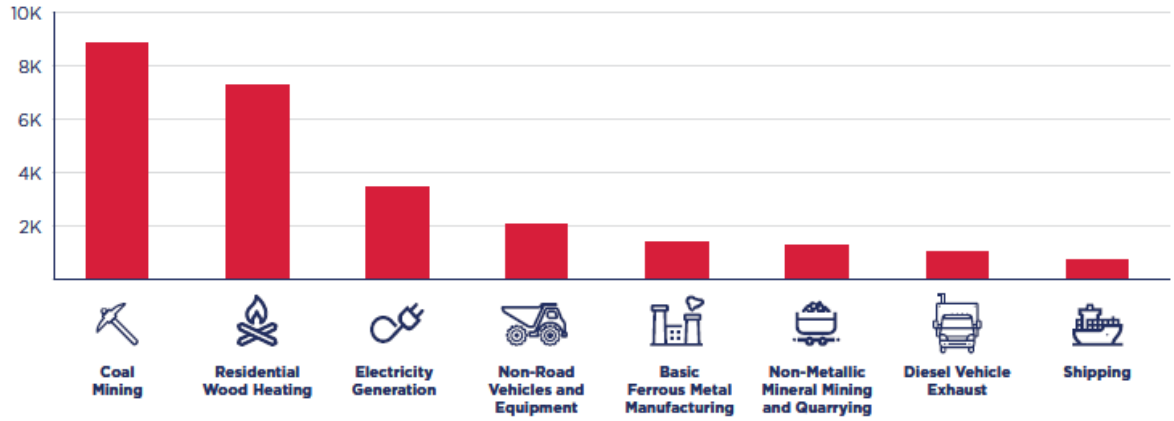


FIGURE 5: TOP DIRECT HUMAN-MADE SOURCES OF $PM_{2.5}$ EMISSIONS (TONNES/YEAR) FOR GMR (EPA 2012)



We believe that community wellbeing will be optimised if the polluter pays principal is implemented, with fees that reflect the health externalities and are high enough to provide an economic incentive to improve processes, select higher quality fuel, or to close poorly performing plant.

The objectives of the NSW Load Based Licensing system

a) *To provide incentives to reduce the load of pollutants emitted based on the polluter pays principle and to do so within an equitable framework.*

b) *To reduce pollution (in particular, assessable pollutants) in a cost effective and timely manner.*

c) *To give industry incentives for ongoing improvements in environmental performance and the adoption of cleaner technologies.*

d) *To provide incentives that are complementary to existing regulation and education programs for environment protection.*

DEA agrees with these objectives and sees the current review process as an opportunity to improve the capacity of the license system to meet these objectives.

Principles

We agree with the underlying principles that the polluter pays, that the licensing system should be equitable, and should lead to cost effective solutions. We wish to add further underlying principles that the protection of human health is the fundamental motivation for licensing, and that

pollution fees should accurately reflect the health externalities of electricity production.

Associated values are that environmental regulations should be fair and transparent, and stable over time so as to create investment certainty. Fairness dictates that all industries over a certain pollution threshold should be covered by the scheme.

Coverage

The objective to reduce pollution in an equitable way is undermined if substantial polluters are not covered by the scheme. The most glaring example is the mining sector as the biggest emitter of $PM_{2.5}$, the pollutant for which there is most certainty of health benefit when reductions are achieved. Omitting the mining industry from LBL coverage unfairly leaves other industries paying for pollution while mining gets away free.

Review of the formula

We disagree with the use of a Fee Rate Threshold. As protection of human health is the underlying motivation, and a tonne of pollutant is equally toxic whichever plant it comes from, there is no logical basis for charging different plants different fees per tonne.

The pollutant relativities and zone factors are appropriate.

The unit fee is way too small, and this is the main reason the system is failing to meet its objectives. When we calculate the LBL fee for Bayswater as an example of a typical CFPS, using NPI data for 2014, the fee is 32.95 cents per MWh of electricity produced. With a typical wholesale power price of $40, that is only 0.82 % of the sale price. (Sources www.npi.gov.au and www.aemo.com.au)

Worked example:

In 2014 Bayswater power station emitted the following air pollutants to generate each MWh of electricity: 4.4 kg SO_2, 2.9 Kg NOx, 0.06 Kg PM_{10}, 0.000013 Kg Mercury 0.03 Kg Fluoride. These figures are the NPI amounts divided by the AEMO reported generation.

	Amount	Pollutant weighting	Zone weighting	Fee unit value	Fee/MWh cents
SO2	4.4	2.2	1	$44.78	4.3
NOx	2.9	9	2	$44.78	23.5
Particulate 10	0.06	125	1	$44.78	3.4
Mercury	0.000013	110000	1	$44.78	0.7
Fluoride	0.03	84	1	$44.78	1.1
Total					32.95

Formula: Amount x weighting x Zone x Fee unit divided by 10,000= fee

What would the correct level of fees be?

The theory of Pigovian taxes proposes that the most efficient level of production will be reached when the pollution fee is equal to the externality cost. Pigovian taxes are measures designed to discourage behaviours or economic activities that harm people or the environment. An example is a tobacco tax designed to reduce the number of people who smoke so as to reduce future health care costs. An externality is a cost of production not reflected in the market price of a product. Externality costs are generally born by society at large rather than the entity doing the production.

Externality costs have been estimated for air pollution from coal fired electricity production in Australia by the Australian Academy of Technological Science and Engineering in 2009, as being $13 per MWh based only on the effects of three pollutants; SO_2, NOx and PM_{10}. While there is some uncertainty about this figure, it is based on the best analysis of these costs from Europe, and adjusted for Australia's population density. As it ignores Fluoride and Mercury it may be an underestimate.

We have calculated that based on reported pollution and power output from 2014-15 an externality of $13 per MWh would be matched by applying a load based licensing pollution fee unit of $2,192.58 to the five big coal fired generators in NSW. This is 49 times the current fee, and total fees for the five big NSW coal fired generators would be $687 million.

As it is unlikely that the resultant increase in the price of electricity would be politically popular, the license fees could be recycled to generators in proportion to their output. This strategy has been used in the successful Swedish load based licensing system. In 2014 this would have resulted in net fees and subsidies as shown in the following table:

Power station	Fee or subsidy per GWh of production
Bayswater	-$3,693.88
Eraring	$3,425.53
Mt Piper	-$7,375.48
Liddell	-$492.34
Vales Point	-$1,458.74
Zero pollution generator	$11,582.64

Recommendations

1. That the fee rate threshold be abolished, and there be a flat fee per Kg for each pollutant.
2. That the fee unit be set at the value of $2,192.58 to reflect the true external cost of pollution, and to allow the system to achieve its objective of creating a financial incentive for improvement.
3. The fee should be brought in over two stages and fixed for 10 year periods to give industry certainty for investment decisions.
4. That negotiation with the other states in the NEM commence, to introduce a similar polluter pays system in VIC, QLD and SA so as to prevent cross border price effects.
5. Mining should be brought into the load based licensing scheme, due to its dominant status as the biggest source of PM_{10}.
6. The use of the revenue raised is a matter for further discussion. It could be used to limit the effect on electricity prices, to fund energy efficiency measures, or to strengthen the electricity transmission network to accommodate the increasing number of low pollution generators.
7. The reporting years for licensing purposes should be synchronised to Australian financial years to simplify public understanding of the data.

Ben Ewald, Member, Doctors for the Environment Australia
December 2016

References

[1] http://www.epa.nsw.gov.au/licensing/lbl/lblreview.htm

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[5] *Revealing the Sources of Sydney's Air Pollution*. D.Cohen, J. Crawford, E.Stelcer, A Atanacio, ANSTO 2014. http://www.ansto.gov.au/AboutANSTO/MediaCentre/News/ACS049674

NSW EPA's Load-based Licensing Scheme

Overview and facts about load-based licensing

Published by:

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59–61 Goulburn Street, Sydney
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ISBN 978 1 76039 032 7
EPA 2015/0399

October 2016

Contents

List of figures and tables

Glossary of key terms

Actual load	mass of emissions of an assessable pollutant estimated as specified in the Load Calculation Protocol
Administrative fee	an administrative fee based on the type and scale of licensed activity
Agreed load	the load agreed between the licensee and the EPA under a load reduction agreement, after pollution reduction improvements have been made
Annual return	statement of compliance with licence conditions and report of actual, weighted or agreed pollutant loads generated by a premise
Assessable load	the basis of pollutant load fees calculated by licensees
Assessable pollutant	a pollutant specified in Schedule 1 of the Regulation that attracts load-based fees
Critical zone weighting	a weighting that applies to a specific assessable pollutant in sensitive areas or areas that are no longer resilient to pollutant loads
Environment protection licence	a licence required for activities specified in the *Protection of the Environment Operations Act 1997* administered by the EPA
Fee rate threshold	this represents an 'emission intensity' that should be achievable by the industry using reasonable industrial practice for that sector; pollution fees ($/kilogram) increase once the threshold is exceeded
Load Calculation Protocol	a Protocol prescribing the methods licensees must use to estimate and report pollutant loads
Load-based fee	a fee based on the quantity and types of pollutants discharged and the type of receiving environment
Load limit	a pollution emission limit that can be placed on a licence as a condition
Load reduction agreement	voluntary agreement between a licensee and the EPA that provides immediate fee reductions for committing to future reductions of assessable pollutants
Pollutant fee unit	a fixed dollar value set by regulation used in the load-based fee calculation formula for any licence fee period
Pollutant load	the amount of pollution emitted by a licence holder estimated in accordance with the Load Calculation Protocol
Pollutant weighting	a weighting assigned to a pollutant that reflect its potential to cause environmental harm
Regulation, the	the Protection of the Environment Operations (General) Regulation 2009
Scheduled activity	an activity, as listed in Schedule 1 of the POEO Act, required to be licenced by the EPA under an environment protection licence
Technical Review Panel	a Panel that advises the EPA on the LBL scheme and the contents of the Load Calculation Protocol
Weighted load	a weighting applied to actual loads of pollution when pollution management measures or approved green offsets are used to minimise environmental harm

Introduction

This document provides an overview of the NSW Environment Protection Authority's (EPA's) load-based licensing (LBL) scheme.

The LBL scheme encourages cleaner industrial production through the 'polluter pays' principle[1]. It operates within the EPA's licensing framework under the *Protection of the Environment Operations Act 1997* (the POEO Act) and Protection of the Environment (General) Regulation 2009 (the Regulation) and is also governed by the Load Calculation Protocol.

Within NSW, specific commercial and industrial facilities must hold an environment protection licence (EPL) administered by the EPA. The LBL scheme requires some of these licensees to pay part of their licence fees based on the loads of pollutants their activities release into the environment. By reducing the pollutant loads, the fees paid are also reduced thereby providing an ongoing economic incentive to achieve better environmental outcomes than those required by legislation or licence conditions alone; i.e. to improve their environmental performance beyond compliance.

The polluter pays approach

The EPA uses a range of other regulatory approaches and tools to control pollution emissions in NSW, including legislation, policy, education, licensing, investigation, other economic incentives and compliance and enforcement action. LBL complements these other regulatory approaches. For example, in addition to matters like licence and statutory limits, LBL fees are one of the factors that licensees consider when determining the need for plant upgrades. LBL fees change the economics of these decisions and provide an incentive for licensees to implement plant improvements sooner than they may have otherwise if LBL fees were not part of the equation.

LBL focuses on the amount of pollution released to the environment and the load fee is calculated on the potential environmental impact of that pollution, not on concentration levels; the lower the potential for environmental impact, the lower the fee. Instantaneous or acute environmental impacts are regulated by emission limits in EPLs whereas annual loads of pollutants, which can have a chronic or long-term impact, are regulated via the LBL scheme.

This offers polluters a financial incentive to reduce the pollution they produce. It also encourages industry to invest in pollution reduction in areas where it will most reduce fees.

LBL combines the strengths of several regulatory instruments to achieve better environmental and economic outcomes. In particular, it:

- incorporates incentives for ongoing pollution reduction
- gives licensees flexibility to implement cost-effective pollution abatement methods
- increases regulatory transparency
- provides the infrastructure for emissions trading schemes, and
- enables the long-term tracking of emissions.

[1] Defined as 'those who generate pollution and waste to bear the cost of containment, avoidance or abatement'. See section 6(2)(d)(i) of the *Protection of the Environment Administration Act 1991* (POEA Act)

Load-based licensing framework

Overview

Activities listed in Schedule 1 of the POEO Act are required to hold an environment protection licence, which is administered by the EPA. Some of these activities, but not all, are required to pay load-based fees on specific pollutants released to the environment. The scheme was designed to capture those facilities that collectively emit most of the target pollutants to the NSW environment. About 10 per cent of all licence holders are currently subject to the LBL scheme.

Schedule 1 of the Regulation sets out the licence fee system and lists any applicable assessable pollutants (those pollutants for which load-based fees may be payable).

Appendix 1 to this fact sheet lists all scheduled activities and highlights those that may be required to pay load-based fees on specific assessable pollutants.

The **Load Calculation Protocol** sets out the methods that licensees must use to estimate and report assessable pollutant loads. It is available on the EPA website at www.epa.nsw.gov.au/licensing/lblprotocol/index.htm.

Load Calculation Protocol

Licensees who are liable for load-based fees must estimate their emission loads in accordance with the Load Calculation Protocol (LCP). It provides licensees with the prescribed techniques required to estimate and report pollutant loads.

The LCP consists of two parts:

- Part A provides generic information for all licensees who are required to calculate pollutant loads.
- Part B sets out additional specific requirements that relate to particular fee-based activity classifications of licensed activities listed in Schedule 1 of the Regulation. It includes a worksheet to use for the calculations required by the LCP.

Technical Review Panel

The Technical Review Panel is a statutory technical advisory body constituted by the Regulation. It was established to advise the EPA on the content of the Load Calculation Protocol, matters connected with licences and matters referred to it by the EPA. The panel comprises seven members appointed by the Minister, including two representatives of the EPA, and five additional members representing industry, local government and environment groups, and an independent adviser.

The panel has met on a biannual basis or as needed. Prior to all meetings, the EPA invites LBL licensees to provide submissions to the panel, including applications for site-specific emission factors.

Reporting on LBL data

Information about all load data and fees paid is made available on the EPA's Public Register located on the EPA website at www.epa.nsw.gov.au/publicregister.

How the LBL fee is applied

Schedule 1 of the Regulation sets out the annual licence fee system and specifies all scheduled activities that may be required to pay load-based fees and the relevant assessable pollutants. Refer to **Appendix 2** for a list of assessable pollutants applicable for each activity (and associated fee rate threshold factors, discussed below).

An **annual return** includes an estimate of the load(s) of assessable pollutants released to the environment by a licensee and the calculated load-based fee for the licence fee period. Licensees must submit an annual return at the end of each 12 month licence fee period.

The annual licensing fee for licensees consists of:

- an administrative fee based on the type and scale of licensed activity (all licensees), and
- a load-based fee based on the quantity and types of pollutants discharged and the location of the receiving environment (for licensees subject to the LBL scheme).

However, due to the way the LBL scheme operates, LBL licensees pay either the administrative fee or the load-based fee, whichever is the higher.

The relationship between pollutant load and licence fees under the LBL scheme is illustrated in **Figure 1**, which shows that licence fees increase at a constant rate proportional to the amount of pollution released until the fee rate threshold is reached (described below), above which licence fees increase at a higher rate until the annual load limit is reached (if a load limit has been included on a licence). If the load limit is exceeded, the EPA will determine the appropriate compliance and enforcement actions in accordance with the EPA's Compliance Policy (see www.epa.nsw.gov.au/legislation/130251epacompl.htm).

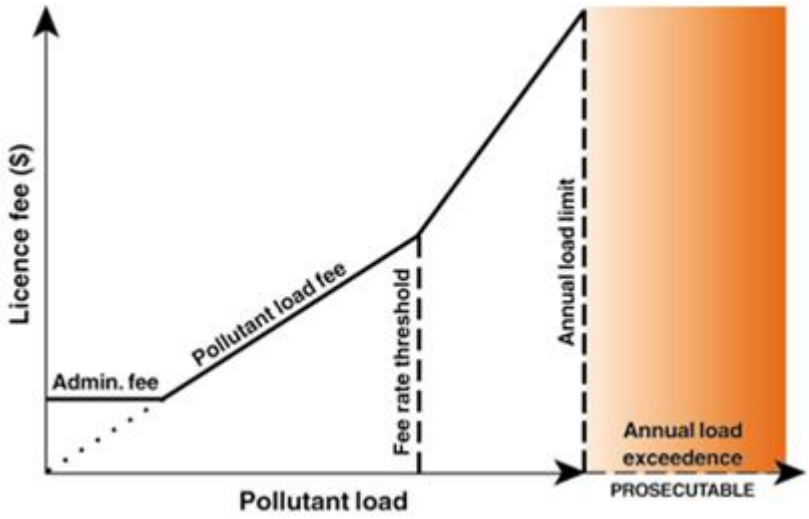

Figure 1: Fees payable under the LBL scheme

Load limits may be added to licences on a case by case basis. Where required, load limits may be applied for each type of assessable pollutant released from the premises. This ensures that increases in production do not cause an unregulated increase in pollution over time.

Calculating LBL fees

Load-based fees increase with the quantity and harmfulness of emissions. To determine the total LBL fees for a facility, the pollutant load fee is estimated for each assessable pollutant released to water or air and then the total fees are summed. The formulae consider:

- the kind of pollution discharged
- the sensitivity of the receiving environment
- measures taken to minimise the impact of the pollutant
- whether the operator has committed to reducing a pollution load in the future, and
- whether two or more fee-based activities apply for a pollutant at each licensed facility.

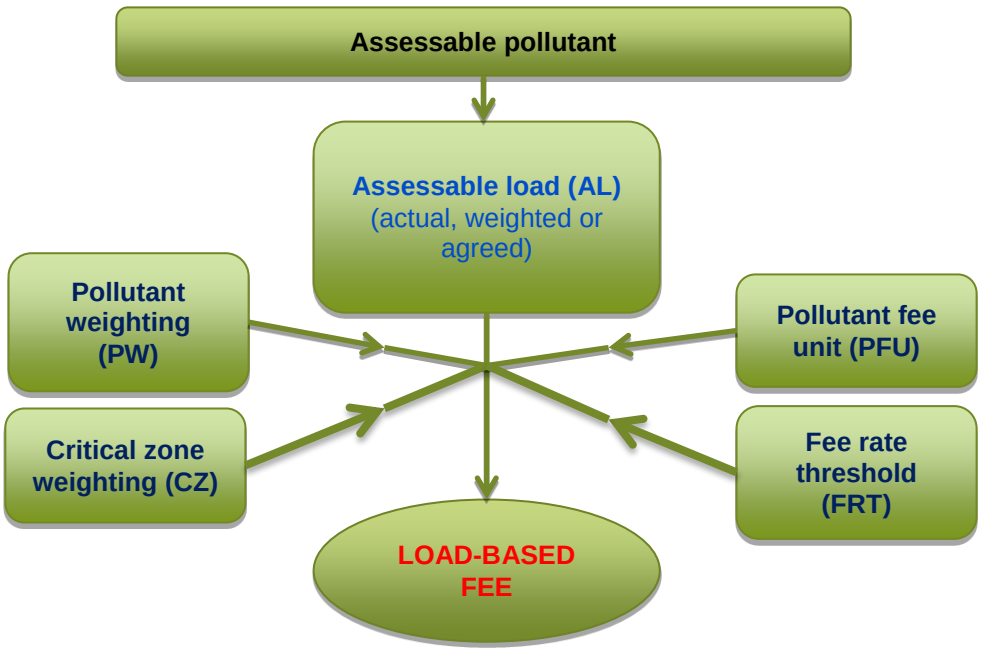

Figure 2: Elements of the load-based fee calculation

There is a standard and a more complex fee formula for pollutant load fees; the standard one is:

Formula A: $$\text{Pollutant load fee (\$)} = \frac{AL \times PW \times CZ \times PFU}{10{,}000}$$

Each component of the fee formula is illustrated in **Figure 2** and described in more detail below.

The **assessable load (AL)** is the basis of the load-based fee. The assessable load is the least of the actual, weighted or agreed loads for each assessable pollutant.

- The **actual load** is the annual mass of emissions of an assessable pollutant (in kilograms) and is measured in accordance with the Load Calculation Protocol.
- The **weighted load** is the actual load discounted by a factor to recognise actions taken to reduce the environmental impacts of the emissions. LBL recognises that certain methods of managing pollution loads can reduce environmental harm without reducing pollution loads. Licensees are encouraged to apply such methods through the provision of 'pollutant weighting' factors that reduce fees. In many cases, these methods can achieve superior environmental protection at a lower cost than the sophisticated treatment technologies. Methods of harm reduction currently eligible for weighted load discounts are effluent reuse, flow-optimised discharges (including participation in the Hunter River Salinity Trading Scheme) and approved green offsets.

- The **agreed load** is a future pollutant load agreed with the EPA under a load reduction agreement. This will reduce the assessable load of selected assessable pollutants. The licensee then pays a reduced annual fee as if planned pollution reduction improvements have already been achieved. Load reduction agreements can free up funds that would have been paid as fees for investment in improved environmental performance.

The **pollutant weighting (PW)** accounts for the impact of the pollutant. Each assessable pollutant has been given a weighting, ranging from zero (salt discharged to open coastal waters) to 930,000 (pesticides and PCBs to all waters), to reflect its potential to cause environmental damage. The approach to developing weightings for assessable pollutants was based on internationally accepted Life Cycle Impact Assessment methodology (ISO14040). For water pollutants, weightings vary depending on the type of receiving water (open coastal, estuarine or enclosed). Refer to **Appendix 3** for pollutant weightings.

The pollutant **critical zone weighting (CZ)** accounts for the sensitivity of a specific geographical area of NSW to a specific pollutant. Such weightings are used where there is a need to reduce pollutants released to the environment that may contribute to an adverse cumulative impact. Some receiving environments are already constrained in their ability to assimilate particular types of pollutants; for example the Sydney airshed, where nitrogen oxides and volatile organic compounds are discharged from a range of sources and may result in exceedances of ground-level ozone standards. Refer to **Appendix 4** for critical zones and weightings.

The **pollutant fee unit (PFU)** is the dollar value component of the load fee calculation formula and it is applied consistently regardless of the pollutant or activity in question. Increasing PFU amounts are included in the Regulation to ensure that the fee is not eroded by inflation. It is currently set at $44.78 (for the 2014–15 financial year).

The **more complex formula** is applied when a licensee is considered to be a 'poor performer' under the scheme. This formula is used where the licensee's assessable load of a pollutant is greater than a pre-determined **fee rate threshold (FRT)**.

Formula B: $$\text{Pollutant load fee (\$)} = \frac{(2AL - FRT) \times PW \times CZ \times PFU}{10{,}000}$$

The licensee determines the **FRT** by multiplying their production (for example, tank capacity or electricity generation) for the reporting period by the relevant FRT **factor** (an emissions intensity threshold set out in Schedule 1 of the Regulation for each pollutant and activity). If the licensee's assessable load of the pollutant exceeds the FRT, the licensee must pay double the 'assessable load' fee for the portion of emissions that exceed the FRT.

FRT factors are intended to represent a level of emission intensity that can be reasonably achieved in the sector using modern technology.

Additional calculations are required when the same pollutant is released from a single facility that undertakes two or more fee-based activities. In this case, the licensee essentially estimates the pollutant load fee for each activity separately using the appropriate formulae; either the standard formula (Formula A) or the more complex formula (Formula B). The resulting fees are added to determine the pollutant load fee for the specific pollutant for the whole facility.

Worked examples to calculate LBL fees

The following two worked examples demonstrate how the LBL fee is calculated for situations that require the use of Formula A and Formula B respectively. Note that these worked examples are hypothetical and do not represent the circumstances of actual licensees under the LBL Scheme.

Formula A worked example

A small sewage treatment processing plant in the Murrumbidgee catchment area treats 4500 megalitres of sewage while discharging 522 kg of phosphorus in a reporting period. In accordance with the Load Calculation Protocol, the facility has estimated its weighted load as 450 kg. The facility has no agreed load. Using this information, the assessable load (AL) of this facility is considered to be 450 kg, which is the lowest of these loads.

The facility must determine if the standard or more complex formula is required. This is done by first calculating the applicable fee rate threshold. The fee rate threshold factor for phosphorus discharged from small sewage treatment plants is 0.3 (found in **Schedule 1** of the General Regulation and reproduced in **Appendix 2** of this fact sheet). Multiplying the fee rate threshold factor by the production for the fee period gives the fee rate threshold.

4500 megalitres	X	0.3	=	1350 kg
(production for the fee period)		(FRT factor for phosphorus)		(FRT)

If the facility's assessable load of phosphorus is less than 1350 kg for the reporting period, then the pollutant load fee would be calculated using the standard formula. In this case the facility's assessable load of phosphorus is 450 kg, well below the fee rate threshold of 1,350 kg. The facility uses Formula A to calculate the pollutant load fee.

Other variables in the equation can be obtained from tables in Schedule 2 of the General Regulation, which are reproduced in **Appendix 3** and **Appendix 4** of this fact sheet. **Table A3b** shows that the pollutant weighting (PW) for total phosphorus discharged into enclosed waters is 680. **Table A4b** shows that the critical zone (CZ) weighting for total phosphorus discharged in the Murrumbidgee catchment is 3. The pollutant fee unit (PFU) is set at $44.78 for the 2014–15 financial year.

Inserting these values into **Formula A** gives a pollutant load fee for total phosphorus of $4110.80.

$$\frac{AL \times PW \times CZ \times PFU}{10{,}000} = \frac{450\text{ kg} \times 680 \times 3 \times \$44.78}{10{,}000} = \$4110.80$$

Formula B worked example

A ceramic production facility in the Fairfield LGA produced 20,000 tonnes of bricks and emitted 2000 kg of coarse particulates. The fee rate threshold must be calculated first to work out the applicable fee formula. The fee rate threshold factor for coarse particulates is listed in Schedule 1 under ceramics production and is 0.085. Multiplying the fee rate threshold factor by the production of the facility yields a fee rate threshold of 1700 kg.

20,000 tonnes of bricks	X	0.085	=	1700 kg
(production for the fee period)		(FRT factor for coarse particulates)		(FRT)

If the facility's load of coarse particulates had been less than 1700 kg for the reporting period, then the pollutant load fee would be calculated using Formula A. In this case the facility emitted 2000 kg, exceeding the 1700 kg fee rate threshold calculated above. The facility must use **Formula B** to calculate the pollutant load fee.

Again, other variables in the equation can be obtained from tables in Schedule 2 of the General Regulation, which are reproduced in **Appendix 3** and **Appendix 4** of this fact sheet. **Table A3a** shows that the pollutant weighting (PW) for coarse particulates is 18. **Table A4a** shows that Fairfield LGA is not a critical zone (CZ) for coarse particulates, as the pollutant is not listed, so the CZ variable is taken to be 1. The pollutant fee unit (PFU) is set at $44.78 for the 2014–15 financial year, as previously stated.

Inserting these values into the standard formula gives a pollutant load fee for coarse particulates of $185.39.

$$\frac{(2AL - FRT) \times PW \times CZ \times PFU}{10{,}000} = \frac{(2 \times 2000\text{ kg} - 1700\text{ kg}) \times 18 \times 1 \times \$44.78}{10{,}000} = \$185.39$$

Options to reduce LBL fees

Load-based licensing provides industry with a number of ways to reduce the fees they pay. Each of the following approaches reduces both the environmental impact of pollution and the LBL fee.

Reduce the actual pollutant load

A licensee would pay lower fees by reducing the amount of pollution released, or producing less damaging types of pollution. Since the load is based on total emissions from a site, the licensee can channel resources into improving those parts of the operation that result in the biggest pollution reductions at the lowest cost.

Reduce the impact of the pollutants on the environment

Fees can be decreased by reducing the environmental impact of the pollution released; through effluent reuse, flow optimised discharges, approved green offsets or other techniques permitted in the Load Calculation Protocol. In this instance, the fee will be calculated (or 'weighted') as if the actual load has been reduced. In some cases the weighted load could be zero. In many cases, good pollution management methods can protect the environment better and at lower cost than sophisticated treatment technology.

Effluent reuse

One method of harm reduction currently eligible for fee discounts is effluent reuse. The sustainable reuse of treated wastewater, to irrigate crops or in industrial processes (e.g. cooling water), can reduce liable fees on certain assessable pollutants in that effluent. This is provided strict environmental management criteria and public health requirements are met and any necessary planning consents and/or approvals from the NSW Office of Water have been granted and are being complied with.

For licensees who have water discharges, the incentive works in two ways – it influences the choice of management option, as well as the treatment level. For example, in certain circumstances, appropriately treated water from sewage treatment systems (STS), can be beneficially reused for watering certain crops, sports fields, parks and gardens. This can provide nutrients and water in dry inland areas, for example, where potable water supplies are constrained. Where wastewater is being reused in this way, it may not require the same high level of treatment to reduce the nutrient content at the facility, potentially reducing treatment costs.

Keeping these discharges out of local waterways while putting them to good use and reducing wastewater treatment costs at the same time can be a win/win/win outcome; however, other costs may be applicable where effluent is being reused, such as for treatments to reduce pathogen concentrations, for the storage and transport of effluent, and for ongoing monitoring, if required. In addition, approvals under other legislation (such as the *Local Government Act 1993*) are required for effluent reuse schemes. Reuse may be more cost-effective when a plant is designed with reuse in mind to minimise these costs.

Flow-optimised discharges

Pollutants discharged to rivers during periods of high flow may be flushed faster, thereby reducing environmental impact. This can attract a 50 per cent discount on discharges of assessable pollutant loads during peak flows in coastal rivers. An example of a flow optimisation approach is the Hunter River Salinity Trading Scheme. Participants in that scheme who are also subject to the LBL scheme receive a 75 per cent discount on salt discharges, reflecting the fact that discharges are managed to coincide with periods of high river flows and are limited to ensure salinity targets are not exceeded.

Green offsets

An offset is an action taken outside a licensed premise that compensates for the impact of pollution from a scheduled activity carried out at that premises. Part 9.3B of the POEO Act establishes the legislative framework for green offset works and green offset schemes.

In relation to LBL, a green offset work or scheme must be approved by the EPA and implemented either through regulations or via specific licence conditions relating to the work or scheme. Weighted loads for pollutants offset by the work or scheme are calculated in accordance with the Load Calculation Protocol.

Load reduction agreements

Licensees may enter into a voluntary load reduction agreement with the EPA to obtain fee savings in return for future pollutant load reductions. If an operator intends to introduce plant or operational changes that will reduce pollutant loads in the future, the EPA may agree to base the current fee on the future loads rather than the current loads. Using this approach, money that would otherwise be paid in fees can be used to make the changes needed to reduce pollution.

Appendix 1: Scheduled activities

Table A1: All scheduled activities under the POEO Act, with those that are subject to the load-based licensing scheme highlighted grey.

Agricultural processing
Dairy processing
General agricultural processing
Grape processing
Aquaculture and mariculture
Aquaculture and mariculture
Breweries and distilleries
Breweries and distilleries
Cement or lime works
Cement or lime handling
Cement or lime production*
Ceramic works
Ceramic waste generation
Ceramics production*
Production of container glass*
Production of float glass*
Production of other glass*
Chemical production
Agricultural fertiliser (inorganic) production
Agricultural fertiliser (phosphate) production
Ammonium nitrate production
Battery production
Carbon black production
Chemical production waste generation
Dangerous goods production
Explosives production
Paints/polishes/adhesives production
Pesticides and related products production
Pesticides and related products (toxic substances) production
Petrochemical production
Pharmaceutical and veterinary products production
Plastic resins production
Plastic reprocessing
Rubber products/tyres production
Soap and detergents production
Soap and detergents (toxic substances) production
Synthetic rubber production
Toxic substance production

Chemical storage
Chemical storage waste generation
General chemicals storage
Petroleum products storage
Coal works
Coal works
Coke production
Coke production
Composting
Composting
Concrete works
Concrete works
Container reconditioning
Container reconditioning
Contaminated soil treatment
Contaminated soil treatment
Contaminated groundwater treatment
Contaminated groundwater treatment
Crushing, grinding or separating
Crushing, grinding or separating
Electricity generation
Generation of electrical power from coal*
Generation of electrical power from diesel*
Generation of electrical power from gas*
Generation of electrical power otherwise than from coal, diesel or gas
Electricity generation (wind farms)
Energy recovery
Energy recovery from general waste
Energy recovery from hazardous and other waste
Extractive activities
Land-based extractive activity
Water-based extractive activity
Helicopter-related activities
Helicopter-related activity
Irrigated agriculture
Irrigated agriculture

Livestock intensive industries
Animal accommodation
Bird accommodation
Cattle, sheep or horse accommodation
Dairy animal accommodation
Pig accommodation
Livestock processing industries
General animal products production
Greasy wool or fleece processing
Rendering or fat extraction
Slaughtering or processing animals
Tanneries or fellmongeries
Logging operations
Logging operations
Marinas and boat repair
Boat construction/ maintenance (dry/floating docks)
Boat construction/ maintenance (general)
Boat mooring and storage
Metallurgical activities
Aluminium production (alumina)
Aluminium production (scrap metal)
Iron or steel production (iron ore)
Iron or steel production (scrap metal)
Metal coating
Metal processing
Metal waste generation
Non-ferrous metal production (ore concentrates)
Non-ferrous metal production (scrap metal)
Scrap metal processing
Mineral processing
Mineral processing
Mineral waste generation
Mining for coal
Mining for coal
Mining for minerals
Mining for minerals
Paper or pulp production
Paper or pulp production
Paper or pulp waste generation
Petroleum exploration, assessment & production
Petroleum exploration, assessment and production*
Petroleum products and fuel production
Petroleum products and fuel production*

Printing, packaging and visual communications
Printing, packaging and visual communications waste generation
Railway systems activities
Railway systems activities
Resource recovery
Recovery of general waste
Recovery of hazardous and other waste
Recovery of waste oil*
Recovery of waste tyres
Road construction
Road construction
Sewage treatment
Processing by small plants (up to 10,000 megalitres annual capacity)*
Processing by large plants (more than 10,000 megalitres annual capacity)*
Shipping in bulk
Shipping in bulk
Sterilisation activities
Sterilisation activities
Waste disposal (application to land)
Waste disposal by application to land
Waste disposal (thermal treatment)
Thermal treatment of general waste
Thermal treatment of hazardous and other waste
Waste processing (non-thermal treatment)
Non-thermal treatment of general waste
Non-thermal treatment of hazardous and other waste
Non-thermal treatment of liquid waste
Non-thermal treatment of waste oil
Non-thermal treatment of waste tyres
Waste storage
Waste storage
Wood or timber milling or processing
Wood or timber milling or processing
Wood preservation
Wood preservation
Mobile waste processing
Mobile waste processing
Transport of trackable waste
Transport of category 1 trackable waste
Transport of category 2 trackable waste
Miscellaneous water activities
Misc. Licensed discharge to waters (wet weather only)
Miscellaneous licensed discharge to waters (any time)

*Load-based fees apply when the activity reaches a specified production threshold.

Appendix 2: Assessable pollutants for scheduled activities

Table A2a: Scheduled activities subject to the LBL scheme with applicable assessable *air pollutants* and FRT factors for each activity

Scheduled activity	Arsenic	Benzene	Benzo(a)pyrene (equiv.)	Coarse particulates	Fine particulates	Fluoride	Hydrogen sulfide	Lead	Mercury	NO_x and NO_x (summer)*	SO_x*	VOCs &VOCs (summer)*
Cement or lime works												
Cement or lime production				0.1	0.28			0.00061	0.00054	3.2	0.16	
Ceramic works												
Ceramics production				0.085	0.11	0.12				0.22	0.53	
Production of container glass	0.00028			0.05	0.05			0.0018		4.02	3.12	
Production of float glass				0.11	0.11					2.00	3.64	
Production of other glass				2.75	2.75					4.29	4.16	
Chemical production												
Agricultural fertiliser (phosphate) production				0.022	0.13	1.1						
Ammonium nitrate production				0.77	0.33					1.5		
Carbon black production			0.005		0.3					11.0	8.0	0.4
Paints/polishes/adhesives production		0.015			0.035					0.068		2.1
Petrochemical production		0.25			0.02					0.96		0.5
Plastic resins production		0.00073			0.041					0.092		8.5
Plastic reprocessing		0.00073			0.041					0.092		8.5
Chemical storage												
Petroleum products storage		0.0005										0.05
Coke production												
Coke production	0.00085	0.028	0.00003	0.22	0.3		0.002	0.0021	0.0022	0.03	0.4	0.015
Electricity generation												
Generation of electrical power from coal	0.0037		0.00066	80.0	54.0	14.0		0.019	0.0042	2,700	5,300	
Generation of electrical power from diesel			0.0036		54.0					2,700	2,650	76
Generation of electrical power from gas										1,655		

Scheduled activity	Arsenic	Benzene	Benzo(a)pyrene (equiv.)	Coarse particulates	Fine particulates	Fluoride	Hydrogen sulfide	Lead	Mercury	NO_x and NO_x (summer)*	SO_x*	VOCs &VOCs (summer)*
Energy recovery												
Energy recovery from general waste	**0.00005**	**0.0000011**	**0.00002**		**0.7**			**0.035**	**0.003**	**2.5**	**0.07**	
Energy recovery from hazardous and other waste	**0.00005**	**0.0000011**	**0.00002**		**0.7**			**0.035**	**0.003**	**2.5**	**0.07**	
Metallurgical activities												
Aluminium production (alumina)				**0.75**	**0.96**	**0.75**		**0.00011**		**0.2**	**20**	
Aluminium production (scrap metal)				**0.048**	**0.066**	**0.056**				**0.74**	**0.46**	**0.68**
Iron or steel production (iron ore)	**0.000014**	**0.0011**	**0.003**	**0.47**	**0.38**		**0.018**	**0.0014**	**0.000041**	**3.81**	**6.6**	**7**
Iron or steel production (scrap metal)	**0.000057**			**0.085**	**0.33**			**0.00024**	**0.00013**	**0.12**	**0.5**	**0.09**
Non-ferrous metal production (ore concentrates)	**0.03**			**0.33**	**0.49**			**0.06**	**0.03**		**230**	
Non-ferrous metal production (scrap metal)				**0.011**	**0.033**			**0.002**		**0.37**	**0.99**	**0.11**
Paper or pulp production												
Paper or pulp production				**0.026**	**0.075**					**1.53**		
Petroleum exploration, assessment and production												
Petroleum exploration, assessment and production		**0.004**	**0.005**		**0.2**		**0.031**			**0.5**	**0.6**	**0.4**
Petroleum products and fuel production												
Petroleum products and fuel production	**0.000011**	**0.0004**	**0.000002**		**0.039**		**0.002**	**0.000059**	**0.000011**	**0.33**	**0.44**	**0.4**
Resource recovery												
Recovery of waste oil								**0.2**				**0.05**
Sewage treatment												
Processing by small plants (up to 10,000 megalitres annual capacity)												
Processing by large plants (more than 10,000 megalitres annual capacity)												
Waste disposal (thermal treatment)												
Thermal treatment of general waste	**0.00005**	**0.0000011**	**0.00002**		**0.7**			**0.035**	**0.003**	**2.5**	**0.07**	
Thermal treatment of hazardous and other waste	**0.00005**	**0.0000011**	**0.00002**		**0.7**			**0.035**	**0.003**	**2.5**	**0.07**	

* NO_x = nitrogen oxides; SO_x = sulfur oxides; VOCs = volatile organic compounds

Table A2b: Scheduled activities subject to the LBL scheme with applicable assessable *water pollutants* and FRT factors for each activity

Scheduled activity	Arsenic	BOD*	Cadmium	Chromium	Copper	Lead	Mercury	Oil and grease	Pesticides & PCBs*	Salt	Selenium	Suspended solids	Total nitrogen	Total PAHs*	Total phenolics	Total phosphorus	Zinc
Cement or lime works																	
Cement or lime production																	
Ceramic works																	
Ceramics production																	
Production of container glass																	
Production of float glass																	
Production of other glass																	
Chemical production																	
Agricultural fertiliser (phosphate) production																**0.002**	
Ammonium nitrate production													**0.11**				
Carbon black production																	
Paints/polishes/adhesives production																	
Petrochemical production																	
Plastic resins production																	
Plastic reprocessing																	
Chemical storage																	
Petroleum products storage																	
Coke production																	
Coke production								**0.011**				**0.13**		**0.000032**	**0.000032**		
Electricity generation																	
Generation of electrical power from coal										**3.6**	**0.025**	**0.18**					
Generation of electrical power from diesel																	
Generation of electrical power from gas										**0.0029**		**0.066**					

Scheduled activity	Arsenic	BOD*	Cadmium	Chromium	Copper	Lead	Mercury	Oil and grease	Pesticides & PCBs*	Salt	Selenium	Suspended solids	Total nitrogen	Total PAHs*	Total phenolics	Total phosphorus	Zinc
Energy recovery																	
Energy recovery from general waste																	
Energy recovery from hazardous and other waste																	
Metallurgical activities																	
Aluminium production (alumina)																	
Aluminium production (scrap metal)																	
Iron or steel production (iron ore)	**0.0091**		**0.0018**	**0.0054**	**0.0036**	**0.0018**	**0.000091**	**0.015**			**0.00091**	**0.24**					**0.0091**
Iron or steel production (scrap metal)																	
Non-ferrous metal production (ore concentrates)	**0.0003**		**0.0003**	**0.0003**	**0.0026**	**0.03**	**0.0003**				**0.0003**	**0.78**					**0.02**
Non-ferrous metal production (scrap metal)																	
Paper or pulp production																	
Paper or pulp production		**0.41**								**3.0**		**0.57**	**0.078**			**0.001**	**0.0013**
Petroleum exploration, assessment and production																	
Petroleum exploration, assessment and production		**0.14**						**0.12**		**3.6**		**0.36**		**0.07**	**0.27**		
Petroleum products and fuel production																	
Petroleum products and fuel production		**0.0034**						**0.0015**				**0.0052**		**0.000005**	**0.00011**		
Resource recovery																	
Recovery of waste oil								**4.8**									
Sewage treatment																	
Processing by small plants (up to 10,000 megalitres annual capacity)		**10**						**2**				**15**	**10**			**0.3**	
Processing by large plants (more than 10,000 megalitres annual capacity)		**10**	**0.00005**	**0.0025**	**0.01**	**0.0005**	**0.00005**	**2**	**0.00012**		**0.0025**	**15**	**10**			**0.3**	**0.012**
Waste disposal (thermal treatment)																	
Thermal treatment of general waste																	
Thermal treatment of hazardous and other waste																	

* BOD = Biochemical oxygen demand; PCBs = Polychlorinated biphenyls; PAHs = Polycyclic aromatic hydrocarbons

Appendix 3: Pollutant weightings

Table A3a: Pollutant weightings for assessable *air pollutants* included in the LBL scheme

Pollutant	Weighting
Arsenic	52,000
Benzene	740
Benzo[a]pyrene (equivalent)	29,000
Coarse particulates	18
Fine particulates	125
Fluoride	84
Hydrogen sulfide	320
Lead	11,000
Mercury	110,000
NO_x and NO_x (summer)*	9
SO_x*	2.2
VOCs and VOCs (summer)*	6.6

*NO_x = nitrogen oxides; SO_x = sulfur oxides; VOCs = volatile organic compounds

Table A3b: Pollutant weightings for assessable *water pollutants* included in the LBL scheme

Pollutant	Open coastal waters~	Estuarine waters#	Enclosed waters^
Arsenic	2,500	2,500	2,500
BOD*	0	0.5	1
Cadmium	67,000	67,000	67,000
Chromium	840	4,200	4,200
Copper	1,700	1,700	1,700
Lead	6,400	6,400	6,400
Mercury	180,000	180,000	180,000
Oil and grease	13	30	74
Pesticides and PCBs*	930,000	930,000	930,000
Salt**	0	0	8.4
Selenium	710	10,000	10,000
Total nitrogen	6	12	23
Total PAHs*	3,800	3,800	3,800
Total phenolics	4,900	4,900	4,900
Total phosphorus	0	120	680
Total suspended solids	9.5	9.5	78
Zinc	7	7	7

* BOD = Biochemical oxygen demand; PCBs = Polychlorinated biphenyls; PAHs = Polycyclic aromatic hydrocarbons
** The pollutant weighting for salt is zero if the salt is discharged into naturally salty surface waters with an electrical conductivity of more than 10,000 micro siemens per centimetre.
~ ocean waters east of the natural coastline of NSW, defined in Schedule 3 of the Regulation.
# waters (other than open coastal waters) that are ordinarily subject to tidal influence; that have a mean tidal range greater than 800 mm (being the average difference between the mean high water mark and the mean low water mark, expressed in millimetres, over the course of a year).
^all waters other than open coastal waters or estuarine waters.

Appendix 4: Critical zones & weightings

Table A4a: Critical zones and weightings for *air pollutants*

Pollutant	Local government areas (LGAs) in zone	Weighting
NO_x and VOCs	LGAs in the Sydney basin area* Blue Mountains City Kiama Shellharbour City Wollongong City	7 (or 28)*
NO_x and VOCs	Cessnock City Gosford City Lake Macquarie City Maitland City Muswellbrook Newcastle City Port Stephens Singleton Wollondilly Wyong	2

Note: CZ equals 1 for NO_x and VOC released outside the areas listed above and for all other air pollutants.

* A CZ weighting of **28** applies in the **Sydney basin area** during the summer months for NO_x and VOCs

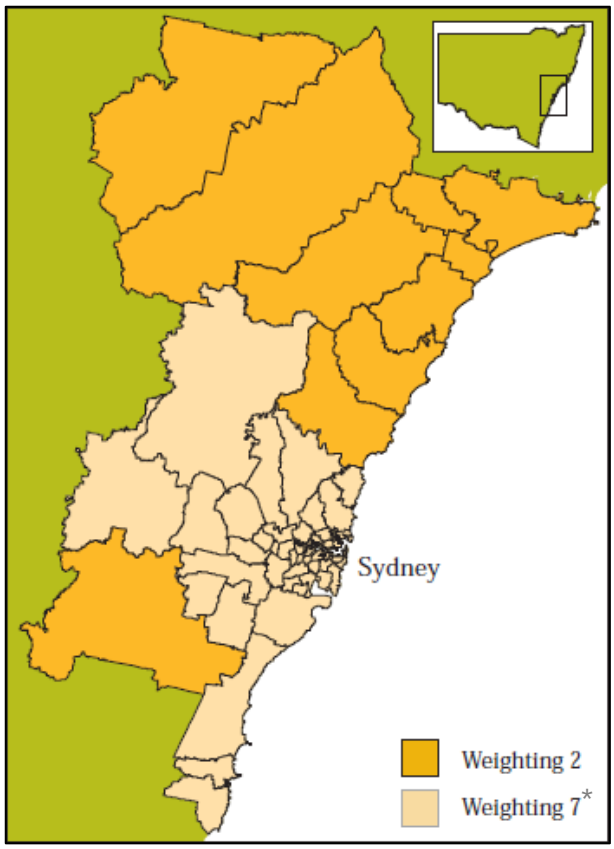

Table A4b: Critical zones and weightings for *water pollutants*

Pollutant	Catchments in zone	Weighting
Salt Total phosphorus Total nitrogen	Benanee Bulloo River Castlereagh Condamine/Culgoa Cooper Creek Darling Lachlan Lake Bancannia Lake Frome Macquarie River Moonie Murray Riverina Murray (Lower) Murray (Upper) Murrumbidgee Paroo Warrego	3
Total phosphorus Total nitrogen	Border Rivers Gwydir Hawkesbury-Nepean Namoi	3

Note: CZ equals 1 for salt, total phosphorous and total nitrogen discharged outside the areas listed in Table A4b and for all other water pollutants.