



**Environment Protection Authority
Lake Macquarie Lead Community Reference Group**

Minutes

20 May 2015, 5:00pm – 6:45pm

Chair: Greg Piper

Community Reference Group Attendees:

Adam Gilligan (EPA – until 6.00pm), Dr Craig Dalton (NSW Health), Anne Sullivan (Community), Nicole Gerrard (Community), Tony Cade (Community – until 6.30pm), Emma Hale (Community), Karen McCraw (School), Lloyd Hill (Business), Cr Wendy Harrison (LMCC), Sandie Pitter (LMCC), Tony Farrell (LMCC), Richard Bastow (Ferrier Hodgson – until 6.10pm),

Secretary: Jackie Teal (EPA)

Other Attendees:

John Coffey (EPA), Graeme Nyland (Environ – until 5.50pm), Dean Chapman (Lake Macquarie City Council)

Apologies: Cr Rob Denton (LMCC), Professor Mark Taylor (Macquarie University), Associate Professor Stephen Cattle (University of Sydney)

Agenda Item 1 - Welcome

Chair, Greg Piper MP (GP) welcomed the Lake Macquarie Lead Community Reference Group (CRG) and thanked them for nominating for the Committee and attending the 1st Meeting. He noted that the representatives would bring a diverse range of issues to this Forum.

GP welcomed the Lead Expert Working Group (LEWG) and thanked them for staying.

Introductions were provided by all in attendance.

Agenda Item 2 – Apologies

Cr Rob Denton (LMCC), Professor Mark Taylor (Macquarie University), Associate Professor Stephen Cattle (University of Sydney)

Agenda Item 3 – Housekeeping Issues

Jackie Teal (JT) explained the process and payment of sitting fees. Sitting Fee forms will be provided at each meeting which will need to be signed and returned to JT.

Agenda Item 4 – Scene Setting

GP provided background details of the operation of the Pasmenco site. He reiterated that the Group will consider the issues of lead in the wider Lake Macquarie LGA where the disposal of lead slag from the Pasmenco smelter was widespread. He acknowledged that the lead levels in blood in children were the main concern of the community.

GP advised that this Forum was a great opportunity for the CRG to ask questions of Government. He also advised that there would be an opportunity for the CRG to meet Professor Mark Taylor and Associate Professor Stephen Cattle.

Adam Gilligan (AG) noted that this Forum will be a two way communication – not just experts attending meetings to pass on information and encouraged the CRG to table community concerns. This forum will also encourage information to be shared between the LEWG, Health and EPA.

GP noted that he will ensure meeting timeframes are adhered to. It was agreed that visitors will be allowed to attend meetings but that they must only be 'observers'. It was also agreed that voting on issues was not considered necessary when there was clear consensus; where any person disagrees with a motion or proposed action then a vote will be taken.

Lloyd Hill (LH) expressed the importance of transparency in meetings, discussions, decisions and outcomes. Agreed by all.

Minutes of meetings as well as appropriate documentation will be published on the website: <http://www.epa.nsw.gov.au/MediaInformation/lake-macquarie-lead-community-reference-group.htm>

Agenda Item 5 – Pasmenco Site History and Lead Abatement Strategy

John Coffey (JC) acknowledged that those present would be very familiar with the background of the Pasmenco site and the Lead Abatement Strategy (LAS). He provided detailed information regarding the Pasmenco site, its expansion, modifications, closure and site remediation as well as the LAS.

The LEWG is considering if the LAS was suitable.

A presentation given by the EPA to the LEWG "Lead Exposure Management Actions" which summaries these issues will be provided to the CRG.

Discussions continued regarding the site and the containment cell with particular interest in the construction and maintenance of the cell. GP also asked how the cell is currently working with an emphasis on leachate.

It was agreed that Ferrier Hodgson provide a presentation to the next meeting regarding the overview of the construction technique and subsequent maintenance of the cell. This presentation will include the concept plan, design, build, capping and vegetation plans. Richard Bastow also advised that he could provide a fact sheet that will be made available to the community.

Questions were raised regarding the by-products of the smelter. JC advised that zinc and lead were the principle products.

ACTION 1: COPY OF EPA'S PRESENTATION TO THE LEWG TO BE PROVIDED TO CRG

ACTION 2: FERRIER HODGSON TO PRESENT AT THE NEXT MEETING ON THE CONTAINMENT CELL

ACTION 3: FERRIER HODGSON TO PROVIDE FACT SHEET ON CONTAINMENT CELL

Agenda Item 6 – Blood Lead Study

Dr Craig Dalton (CD) made a presentation on blood lead levels in children.

CD distributed materials "The Whistle Blower", "NHMRC Statement: - Evidence on the Effects of Lead on Human Health" Flyer; and "Lead Safe Blitz 2006" DVD (a copy is available from the EPA).

A copy of the presentation is attached as Attachment 1.

Discussions continued on blood lead levels and what age groups should to be tested with the question raised that primary school children should be included in any testing. CD advised that active babies and toddlers are the main target due to their mobility ie. contact with ground and then hand/mouth.

Discussions also followed on pre-school testing. LH asked if a child had a high blood lead level was there a follow up screening? CD advised that there was a follow up and that family members could also be tested.

The 2015 upcoming Blood Level tests were discussed and the schedule set out below:

- Finger Prick Test
- Rapid Test on Site
- Result within the hour
- Free <5 years and pregnant women

The Plan:

- 3 week clinic in North Lake Macquarie
- 2:00pm to 6:00pm
- 4 nights per week
- Saturday morning
- Results delivered in the Clinic
- Short questionnaire to be completed

ACTION 4: COPY OF PRESENTATION TO BE PROVIDED TO CRG

Agenda Item 7 – VegeSafe Grant

Attached is the Vegesafe Grant application submitted to Lake Macquarie City Council by Mark Taylor. The project intends to research the current extent of metal and metalloids contamination in Boolaroo area and provide advice to the local community about measures to minimise exposure to contaminants.

JC asked if lead in food was a critical issue to the CRG. Karen McCraw advised that this issue was the last issue that she thought the CRG should focus on. View proposed that raised garden beds making use of clean soil was a safer method for vegetable gardens.

Anne Sullivan asked the question of water tanks risks of lead contaminant. JC advised that the lead issues in Lake Macquarie were associated with the slag and land contamination not air emissions or fall out so that water tanks were not an issue.

Nicole Gerrard asked for a copy of the LAS – John advised that they were working with Council to release the LAS.

ACTION 5: COPY OF VEGESAFE GRANT TO BE PROVIDED TO CRG

Agenda Item 8 – Matters for Future Consideration

GP advised he is happy to receive any matters from individuals that they would like tabled at future meetings. All papers/documents will be collated prior to any meetings. GP and JT available to receive any contributions.


Agenda Item 9 – Next Meeting Date and Agenda Items

JT to arrange a meeting in 4 weeks.

Meeting Closed: 6.45pm


ACTION ITEMS

NO.	WHO	WHAT	WHEN
1	EPA	Copy of "Lead Exposure Management Actions" Presentation to CRG	Next meeting – 18 June
2	Ferrier Hodgson	Presentation on Containment Cell	Next meeting – 18 June
3	Ferrier Hodgson	Fact Sheet on Containment Cell	Next meeting – 18 June
4	Craig Dalton	Copy of Blood Level Presentation to CRG	By next meeting – 18 June
5	Dean Chapman	Copy of VegSafe Grant to CRG	By next meeting – 18 June



Health
Hunter New England
Local Health District


Lead in North Lake Macquarie – new concerns



Dr Craig Dalton
Hunter New England Population Health

Summary

- Long history of elevated blood lead levels in North Lake Macquarie
- Remediation and Abatement did not impact on blood lead levels while smelter operating
- Rapid reduction in blood lead levels after smelter closed in 2003
- Lead Abatement Strategy by Administrators completed 2013
- Recent Macquarie Uni study – high leads in soil
- Blood lead survey in 2015




- University student study into soil and house dust levels released in November 2014.
- Supervised by Newcastle Herald Report Matthew Kelly and Prof Mark Taylor, Macquarie Uni



Over 50 stories on the issue..



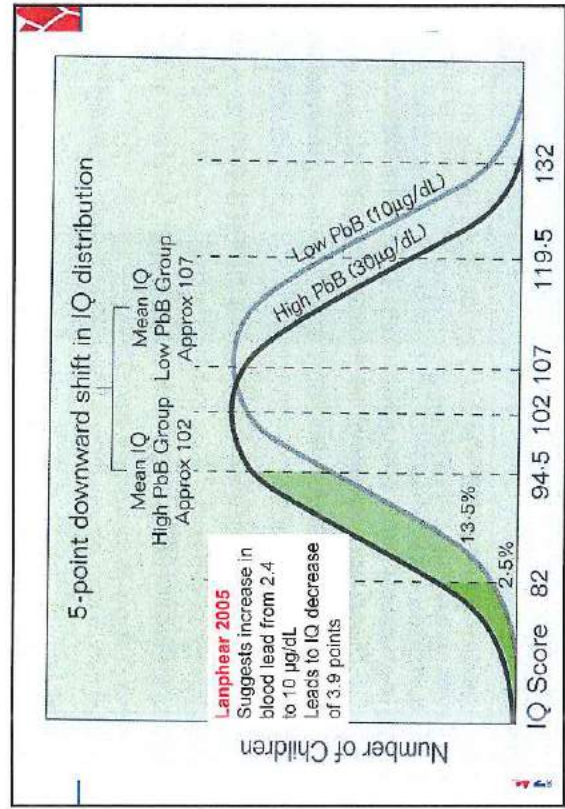
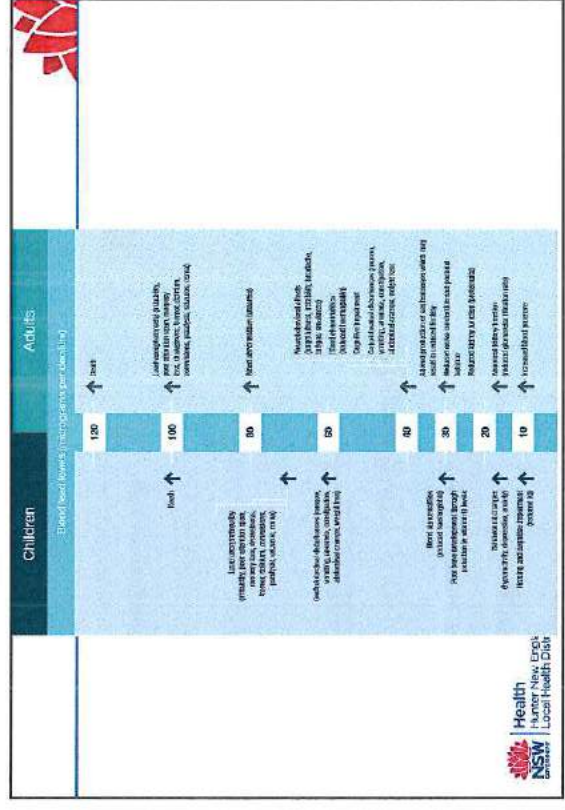
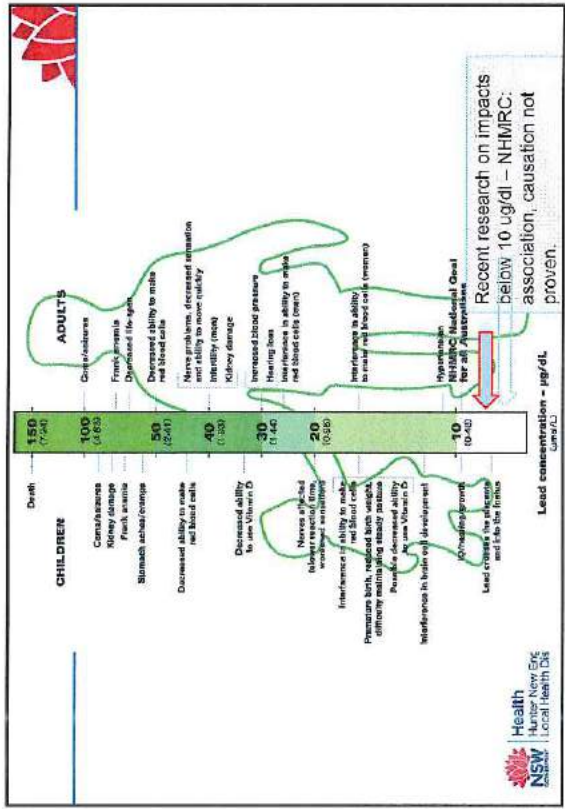
- **Expert warns over...** ...
- **TOXIC TRUTH** ...
- **TOXIC TRUTH: Reddies demand action** ...
- **TOXIC TRUTH: Meeting to discuss Penrith** ...
- **TOXIC TRUTH: Chasing up with 500m in fees** ...

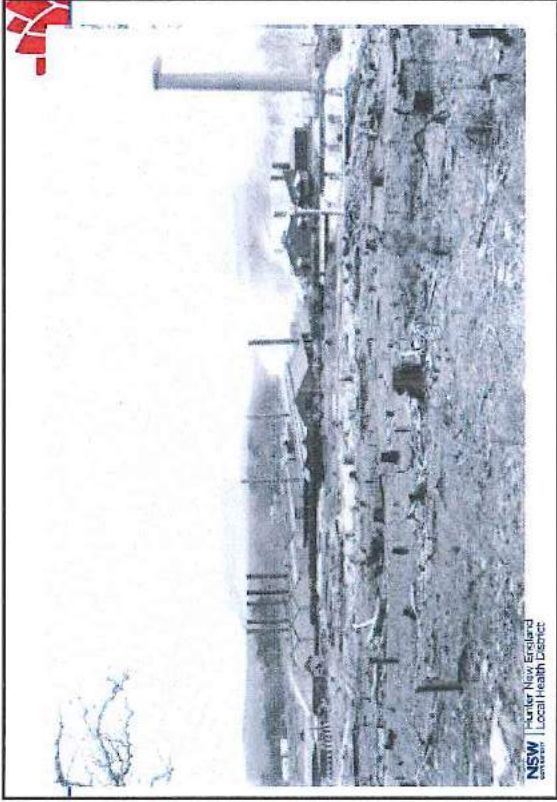
Community concerns raised at public meeting related to land values. Only 6 calls to HNE regarding children's health to date.

Macquarie study found:

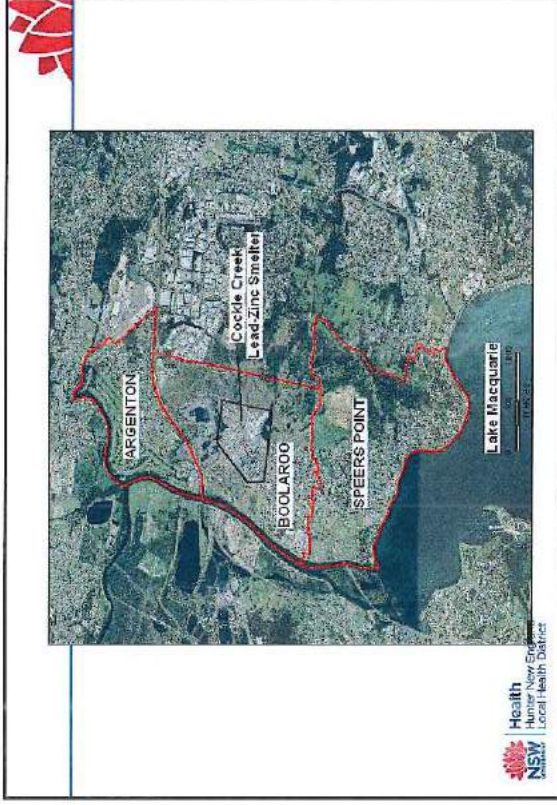
- Approximately 50% of samples of soil > 300 ppm = the HEALTH INVESTIGATION LEVEL
- NOT the "National Standard" for soil as reported in Herald
- Blood leads are the determinant of health impact not soil or environmental testing

Health Hunter New England Local Health District





NSW Health
Hunter New England
Local Health District



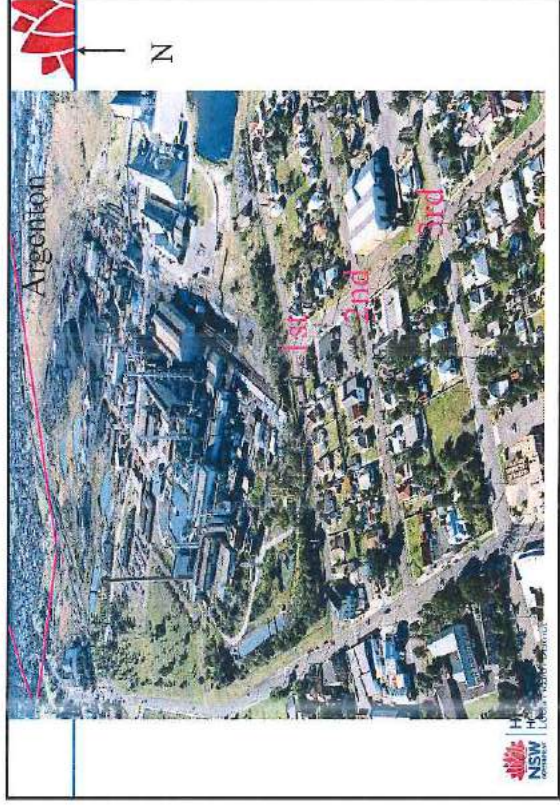
NSW Health
Hunter New England
Local Health District

**Emergence of the blood lead issue
Pasmenco operations**



NSW Health
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- Lead Production began in 1897, ceased in 1922 and resumed again in 1961. Closed in 2003
- Produced zinc, lead and sulphuric acid as major products
- About \$50M to local economy every year



NSW Health
Hunter New England
Local Health District

Emergence of the blood lead issue




- 1991 Investigation indicated:**
 - » 6% blood lead levels (1-4yrs) >25µg/dl
 - » 67% blood lead levels (1-13yrs) >= 10µg/dl
 - » An association between higher lead levels and distance from the smelter (with the exception of slag infills)

Emergence of the blood lead issue

Social and health impacts

- Mixed reaction to 1991 blood lead survey
 - Shock
 - Denial
 - Misinformation
 - Guilt
 - Blame
 - Economic pressures

Balancing risk communication


- Balance between communicating real risks of lead (and other contamination) versus effect of stigma.
- Health effects of stigmatisation, anxiety, unemployment, decreasing land values, community division.
- Balancing expenditures dog washing or surgery?

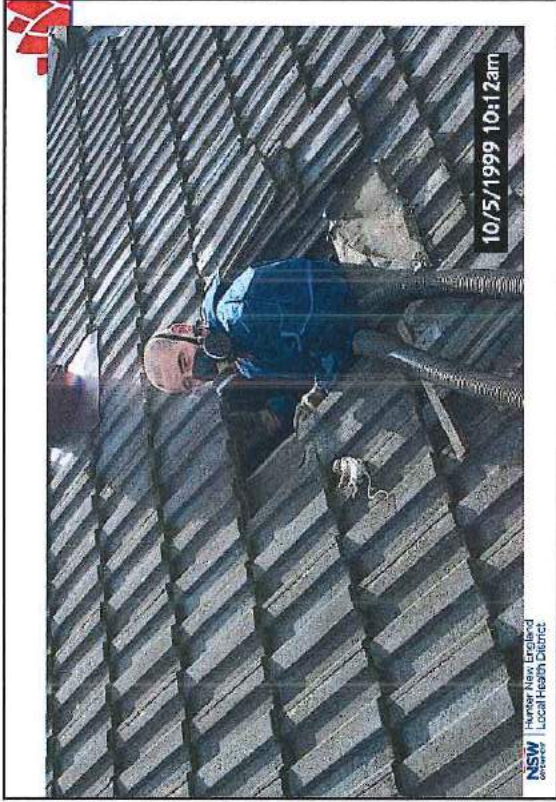




Individual house remediation

- 25 houses remediated over a period of 3 years
- Homes identified where children had blood lead levels over 15 µg/dl
- Problems:
 - Families with higher lead levels being singled out
 - Little else on offer to assist other families
 - Poor understanding of difference between "renovation" rather than remediation
 - Many believed problem would be "fixed" after remediation
 - Costs ranged from \$5,000 to \$50,000 per house

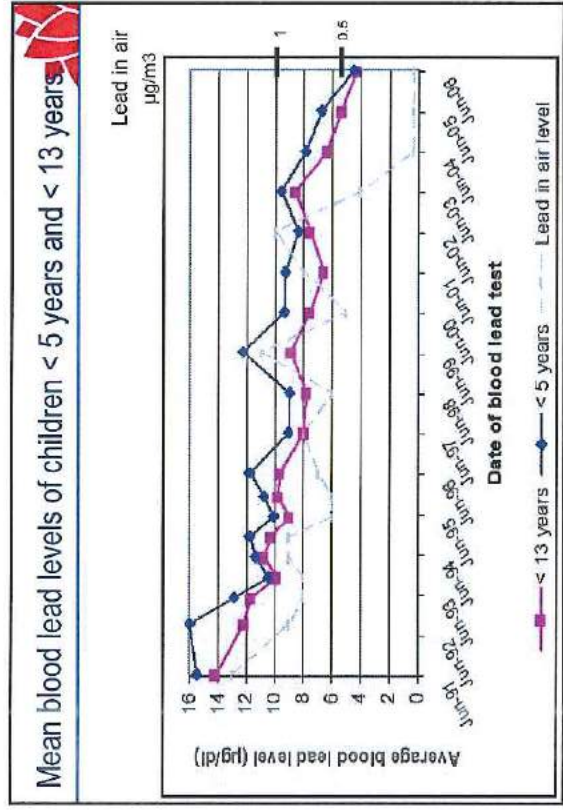
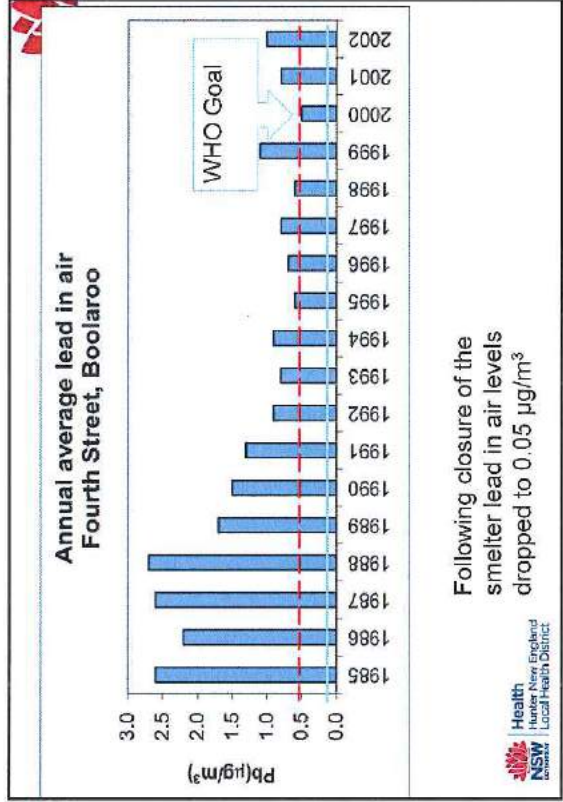




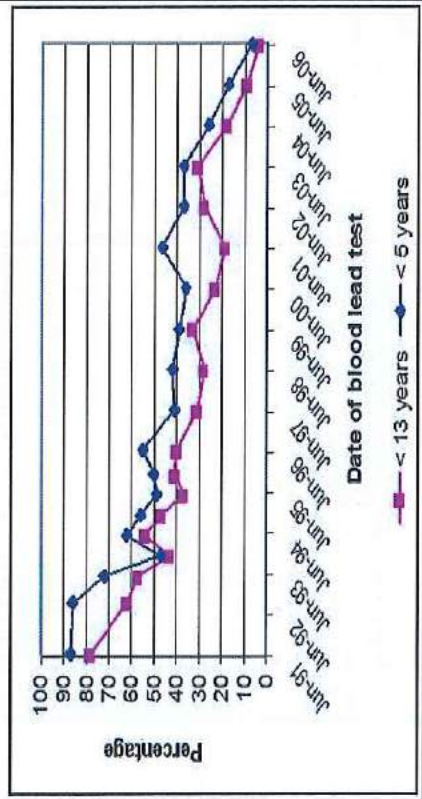
Zonal remediation - Extent of work

- Homes in concentric circles from Pasmenco
- 660 homes were remediated
- Zonal ceased due to lack of impact on blood lead levels in 2001.

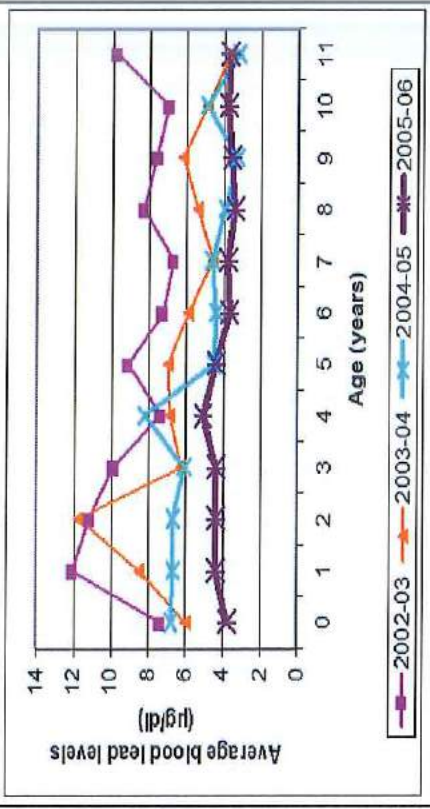
Health
New South Wales
Hunter New England
Local Health District



Percentage of blood lead levels greater than or equal to 10 µg/dl.



Mean blood lead levels among children < 12 years from 2002-03 to 2004-05 by age group.



Blood lead levels < 5 yrs of age 2009-2014

	<5 ug/dL	5-9 ug/dL	10+ ug/dL	Total				
	No.	%	No.	%	No.	%		
NLM	14	82.4	3	17.6	0	17	100	
Non	231	90.6	11	4.3	13	5.1	255	100

Learnings relevant then and now...

- Lead in air was more important determinant of blood lead levels than soil
- Local data is best to inform local action
- Remediation did not appear to be effective so we stopped it.
- Important not to "blame" the community if our health promotion programs do not achieve the outcome we desire.
- "Risk" is a socially constructed issue – people don't agree and no one, especially experts are objective.
- Health hazard warnings can have their own health impact

Following closure of the smelter

- Environmental Health Centre closed October 2006
- Lead control services mainstreamed
 - Leadsafe DVD produced, distributed to every household, library,
 - Focus on lead paint
 - Lead and industry history book produced




What now

- 2015 Blood lead survey
- Finger prick
- Rapid test on site
- 3 week clinic in NLM
- Free
- < 5 years of age only/pregnant women
- Assess risk factors for elevated blood lead
- Collaboration with community/GPs




Thank you and Acknowledgements



Hunter New England Population Health is a unit of the Hunter New England Area Health Service.

Supported by funding from NSW Health through the Hunter Medical Research Institute.

Developed in partnership with the University of Newcastle.



Environmental Research Grants 2014 - 2015

Application Form ~ Closing date ~ Tuesday 27 January 2015

The blue shaded areas of this Application Form MUST be completed and submitted with your research proposal

Project Title	VegeSafe for Boolaroo – Informing the Boolaroo community of the extent of heavy metals (lead) in garden soils and provide advice to reduce associated exposure risks
Name of Faculty and / or Institution	Dept of Environmental Sciences Faculty of Science and Engineering, Macquarie University, Sydney
Project Budget Total ex GST	\$11,000

Main Researcher Contact Details	
Title	Professor
First Name	Mark
Surname	Taylor
Email	mark.taylor@mq.edu.au
Phone – business	02 9850 4221
Address – business mailing	Dept of Environmental Sciences Faculty of Science and Engineering, Macquarie University, North Ryde, NSW 2109

Précis (Maximum 250 words providing summary of essential points on proposed research project)

VegeSafe is a community science participation initiative started by Environmental Science staff and students at Macquarie University. We seek to inform the community about metal and metalloids contaminants in their garden soil through our soil metal testing program. Our research in several Australian cities shows that urban soils and those close to industry are often metal enriched, but because home-owners are unaware, they are subject to potential risks of exposure.

Metal exposure and in particular lead, is known to adversely impact human health, particularly young children who are more vulnerable because their growing bodies absorb more lead and they have persistent hand to mouth behaviours. These issues have particular relevance to the Lake Macquarie area and specifically to the community at Boolaroo from past smelting activities.

VegeSafe intends to research the current extent of metal and metalloids contamination in the Boolaroo area by conducting a comprehensive soil analysis program involving laboratory standard metal testing. By working closely with LMCC, we aim to better inform local communities of the current soil metal levels and the associated risks to residents. Through the facilitation of community workshops and the analysis program, we seek to educate people of potential exposure pathways and how to limit those risks. Participants will receive a formal soil results report with links to information and advice about "what to do next" if their soils contain elevated concentrations of metals and metalloids.

Research Partner 1 Contact Details	
Title	PhD candidate
First Name	Paul
Surname	Harvey
Email	paul.harvey@mq.edu.au
Phone – business	02 9850 9876
Address – business mailing	Dept of Earth and Planetary Sciences, Faculty of Science and Engineering, Macquarie University, NSW 2109

Research Partner 2 Contact Details	
Title	Research Assistant
First Name	Steven
Surname	George
Email	stevengorge365@gmail.com
Phone – business	0433 560951
Address – business mailing	Dept of Environmental Sciences Faculty of Science and Engineering, Macquarie University, NSW 2109

Supervisor Contact Details	
Title	Associate Professor (Acting Head of Department)
First Name	Paul
Surname	Beggs
Email	paul.beggs@mq.edu.au
Phone – business	02 9850 8399
Address – business mailing	Dept of Environmental Sciences Faculty of Science and Engineering, Macquarie University, NSW 2109

Referee 1 Contact Details	
Title	Dr
First Name	Heather
Surname	Handley
Email	heather.handley@mq.edu.au
Phone - business	02 9850 4403

Referee 2 Contact Details	
Title	Associate Professor (Acting Head of Department)
First Name	Paul

Supporting documentation. Lake Macquarie City Council - Research grant application:
VegeSafe for Boolaroo - Informing the Boolaroo community of the extent of heavy metals (lead) in garden soils and provide advice to reduce associated exposure risks

Applicants: M.P. Taylor, P. Harvey, S. George, Macquarie University.

Surname	Beggs
Email	paul.beggs@mq.edu.au
Phone - business	02 9850 8399

VegeSafe – Background

VegeSafe is a community science participation initiative started by Professor Mark P Taylor and Environmental Science colleagues and post-graduate students at Macquarie University. The program began in September 2013 at Macquarie University's annual Open Day event where we invited members of the public to bring their domestic soil to our stall for free metal analysis. Soils are tested using an Olympus handheld X-ray fluorescence spectrometer (XRF). Our work has been featured in several newspapers, magazines and on ABC and commercial radio programs (e.g. <http://www.abc.net.au/news/2014-08-29/growing-safe-veggies-in-your-sydney-backyard/5705016>). In February, 2015, VegeSafe will be the subject to a segment on the ABC's Gardening Australia program and our work will also be featured on an ABC Catalyst story in that same month.

At last count, VegeSafe has provided our unique service to over 580 households, community and school gardens across Australia. We have completed more than 2000 individual soil tests for participants. We have helped Sydney metropolitan households, schools and community gardens as well as a communities and individuals from Brisbane, Broken Hill, Perth, Melbourne and California.

Aims

The principal aim of the VegeSafe program is to inform and educate the community about harmful contaminants that may be present in their garden soil via our soil metal testing program. This principle is particularly relevant to the Lake Macquarie due to the legacy of the operation of the former Pasminco Cockle Creek Smelter (PCCS).

VegeSafe participants, and participants in this study, will receive a formal soil results report with links to information and advice about "what to do next" if their soils contain elevated concentrations of metals and metalloids. The elements we report routinely in our program are arsenic, cadmium, chromium, copper, manganese, lead, nickel and zinc. Other elements are also recorded where they are significantly elevated.

Upon completion of this study, our intention is to publish our results in an international, peer-reviewed journal, such as the Journal of Environmental Management. The renewed interest in lead contamination in the Lake Macquarie area highlights the need for council policy relating to soil metal contamination to be evidence-based using contemporary research data. Additionally, the LMCC will receive a final report covering the full extent of the research undertaken and its findings as to the scope of the soil metal contamination as they specifically relate to Boolaroo and the PCCS.

Method

As per our VegeSafe program, we anticipate that property owners from the Boolaroo community will provide soil samples collected from their residences according to the sampling instructions on our VegeSafe website (<http://research.science.mq.edu.au/vegesafe/>). Initially we would aim to limit the sampling to Boolaroo, but could expand the program to other areas if there is demand and matching resources.

Checklist **Please ensure you provide the following:**

Submission which includes:	<input checked="" type="checkbox"/>
- Aim	
- Method	
- Objective	
- Reason for research	
- Benefit to Lake Macquarie City	
- Refer <i>Information for Researchers</i> package for full details	
Itemised Budget excluding GST	<input checked="" type="checkbox"/>
Project Time Line	<input checked="" type="checkbox"/>
Résumé attached	<input checked="" type="checkbox"/>
Résumé attached – if applicable	<input checked="" type="checkbox"/>
Résumé attached – if applicable	<input checked="" type="checkbox"/>
Acknowledgement that your research project will be covered by risk and liability insurance	<input checked="" type="checkbox"/>
Evidence will be requested if submission is successful	<input checked="" type="checkbox"/>

Please submit your application via email to:

ssarkar@lakemac.nsw.gov.au

by: **Tuesday 27 January 2015**

Sampling instructions and guidance will also be provided at each of the two workshops held in Boolaroo (at a Council nominated venue, if possible). Participants will be collect soil from their properties and return these in person at the first workshop or subsequent workshop to Vegesafe staff or via mail to Professor Mark Taylor at Macquarie University. Each participant will complete the consent form which is also on our Vegesafe website, which has already been viewed and approved by our Faculty and the University lawyer for content and appropriateness. We estimate that we will receive ~ 1000 sample, comprising 5 samples from 200 houses and have budgeted accordingly.

Field Methods

Surface soil samples will be taken from a depth 0 – 2 cm following the protocols detailed in the Australian Standard for sampling soils that are potentially lead contaminated (Australian Standard AS 4874-2000). Five samples will be collected from each property, three from existing garden/veggie beds, one from the front yard of the house and one from the rear yard. Ordinarily, we would prefer owners to collect samples from five approximately equally spaced places from their front and rear yards and combine into a single composite sample. However, experience suggests that this request is likely to be mis-interpreted and by focusing on single samples it will simplify the process and increase the likelihood of participants sampling correctly.

Following collection, and where necessary, we will place each sample in a re-sealable plastic bag and labeled with the location, date, and address of the sample. Samples will be oven dried at 40°C to eliminate soil moisture and have any obvious organic matter removed (e.g. large twigs and leaves). Soils will then be tested using an Olympus handheld X-ray fluorescence spectrometer (XRF). Removal of moisture is one of the single most important factors for enhancing the quality and reliability of results and is a step we do not ordinarily undertake with Vegesafe, for reasons of expediency.

Laboratory Methods

Following analysis by XRF, an estimated 100 samples (~10%, covering the range of measured XRF elemental concentrations) will be chosen for standard laboratory ICP-OES or ICP-MS (inductively coupled optical emission spectrometry (OES) / mass spectrometry (MS)) analysis to provide a greater degree of quality assurance/quality control (QA/QC) on the XRF data. Soils subject to ICP analysis will be sieved to <180 µm. The <180 µm fraction is selected because the PCCS's primary environmental contamination was via fine particulate emission from smelter stacks, making finer soil and dust fractions the most significant health exposure pathway. The selected samples will be analysed at the National Measurement Institute (NMI), Sydney, for total acid extractable metals and metalloids and will include arsenic, cadmium, lead and zinc concentrations. We also propose that 50 of these samples be sub-sampled and subject to bioavailable assessment at the NMI using standard Australian and New Zealand Environment Conservation Council protocols. Bioavailable metal analysis provides a more accurate estimate of the exposure risk from soils and is an appropriate additional step in the analysis and subsequent advice.

Results

Our results will be provided to each home owner via our standard soil report (example attached), which contains links to soil guidelines and what to do next if the soils contained elevated levels of metals. We can provide GIS plots of all of the results and summary results analyses of samples from different locations in the garden and the neighbourhood to the council. Ultimately, these findings will form part of our published research.

Program Objectives

- Promote safe and sustainable gardening for Boolaroo residents including growing their own vegetables.
- Identify significant contamination prone areas and associated risks from the existence of historical lead smelting contaminated soils within the Boolaroo residential area.
- Provide advice to participating Boolaroo residents who request further information.
- Advise and facilitate a two (2) community workshops in the Boolaroo area to educate on healthy soils and advise on remediation strategies for gardens.
- To promote Vegesafe as a Macquarie University community science participation service by working closely with the LMCC and Boolaroo residents.
- To provide the LMCC with a evidence based platform to inform future policy and strategy as it relates to soil metal contamination by industry

Reason for research

Our research shows beyond question that industries such as smelting operations leave soils in the near vicinity heavily contaminated with metals and metalloids. The activities of the PCCS and the duration of its operations of over 100 years in the Boolaroo area represent an example of this.

The recent series of articles published by the Newcastle Herald has (re)exposed the scale of the existing issues of metal contamination at Boolaroo and created significant interest in this issue, specifically how it relates to the health of families in the area. Vegesafe has received numerous independent inquiries by concerned residents who reside in the area surrounding the PCCS. Many of these inquiries have centered specifically around the safety of garden soils for the cultivation and consumption of vegetables and the risks that metal enriched soils pose to families with young children who play outside their homes. Due to the level of concern shown by the local community, we consider that the Vegesafe research program will provide useful support and information to the community.

Vegesafe is uniquely positioned to undertake such research and seeks financial assistance from the LMCC to carry out the initiative. The initiative would benefit from support from the LMCC (and the EPA), who are involved in re-evaluating the now completed Lead Abatement Strategy. The aims and objectives of the Vegesafe program fit well within the research priorities as determined by the Lake Macquarie Environmental Research Grants Committee, Item 15. In the Lake Macquarie City Council area, the influence of lead and its effects on the environment and the community are particularly relevant to Boolaroo residents given their proximity to the former PCCS.

Our proposal intends to provide the LMCC and local residents with education and advice on the current health of soils sampled from participants in the Boolaroo area. The research outcomes would provide the LMCC with an up to date assessment of the spatial extent of the current situation, the degree of contamination and allow for assessment of any potential risks to local residents. The outcomes of this research will allow the LMCC to better meet their duty of care obligations to residents in the local government area and allow for the relevant resources to be deployed to reduce future risks. The published results of the study will lend weight to future policy and strategy decisions by council due to their particular relevance to the Lake Macquarie LGA.

Benefit to Lake Macquarie

- This research will benefit the City of Lake Macquarie by informing the LMCC and local residents of the current level of heavy metals present in soils by establishing the degree of contamination by past smelting operations at the PCCS. It is anticipated that 1000 soil samples from 200 residences in the Boolaroo will provide a comprehensive and current picture of the extent of the current heavy metal soil contamination of the Boolaroo area.
- The selection of 10% of the soil samples for further analysis to laboratory standards will provide residents and the LMCC with an increased level of QA/QC, reinforcing the value of the sampling program.
- The research will foster a closer working relationship between residents in the Boolaroo area and the LMCC by addressing a common goal.
- This research will fulfill the community need of assurance that their garden soils are safe or can be made healthy, so they pose no risk to the health of their families.
- The research will provide stakeholders such as local residents, the LMCC (and the EPA), with a current, independent derived data set to aid in the application of protocols for effective action to address the existing problems, remediation strategies and the efficient delegation of resources.

Project timeline

It is anticipated that a one-year time frame would be required to complete project. This would allow for time for collection of samples, workshop advertisement and facilitation, meeting with the LMCC, preparation of sample for analysis, recording of data and submission of final report to LMCC. In terms of advertising, we would anticipate that the LMCC and the Newcastle Herald would assist with this process, especially in light of the recent debate around the efficacy of the Lead Abatement Strategy.

2015

- August – October
- Facilitation and advertising of community workshops for local Boolaroo residents
- August – December (or possibly 2016)
- The logging and preparation of the anticipated 1000 soil samples, from 200 residences for analysis
- Analysis of samples and recording of data
- Preparation of a portion of estimated 10% (100 samples) for further laboratory analysis and time taken for analysis process.

2016

- October – December
- Preparation of remaining portion of estimated 10% (100 samples) for further laboratory analysis and time taken for analysis.
- December – March
- Collation of all data for recording
- GIS map of sampling program outcomes
- Compilation of text and data for a peer-reviewed research paper

March – May

- Begin working on final report to LMCC
 - Submit finished research paper
- June / July
- Submit final report to LMCC

Budget

Item	Explanation	Estimated cost
Soil analysis (XRF). Hand held analysis which can be carried out on site.	Estimated 1000 samples from 200 residences with Macquarie University's hand held XRF screening soils for lead but also Arsenic, Cadmium, Chromium, Copper, Manganese, Nickel and Zinc. Costs incurred by preparation time for drying samples and machine usage at \$3 / sample.	\$3000
Soil analysis (laboratory, ICP-OES) at the National Measurement Institute for total acid extractable levels of metals.	Estimated 10% (100) of XRF analysed samples to undergo laboratory standard testing (ICP-OES) for arsenic, cadmium, lead and zinc concentrations. Samples require preparation by drying and sieving to 180 µm. Estimated cost of \$50 / sample.	\$5000
Soil analysis (Laboratory)- National Measurement Institute (NMI) bioavailable levels of metals.	50 of the samples tested for total acid extractable metals will be also subject to bioavailable analysis at cost of \$50 / sample.	\$2500
Travel expenses.	Anticipated travel between Sydney and Boolaroo for two workshops and presentation.	\$500
TOTAL (excl. GST)		\$11000

Insurance cover

All projects and research undertaken by Macquarie University staff or students are covered via our standard fieldwork protocols and liability insurance. Formal notification of cover can be provided in the event of our application being successful.

**PROFESSOR
MARK PATRICK TAYLOR**



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Nationality Australian

Date of birth 9th June 1966

KEY SKILLS AND INTERESTS

PhD in Environmental Science.

International experience in land-air-water pollution, human health and environmental risk assessment.

Former Commissioner of the NSW Land and Environment Court, > 50 court judgments and conciliation agreements in environment and planning matters.

More than 200 research articles, refereed conference papers, articles and reports.

Experienced environmental consultant and court expert witness.

Experienced mediator between self-litigants, community and professional advocates.

Experienced communicator of science, law and environment to community, natural resource organizations and media (television, radio, newspapers).

Successful track record in original multidisciplinary scientific research, teaching, project management and design.

Track record in winning research/consultancy income and contracts.

Keen interest in sport, as a means of personal fulfillment, development and social interaction.

QUALIFICATIONS

BSc (Hons) - University of Wales, Aberystwyth, July 1980, Geography with Geology.

PhD - University of Wales, Aberystwyth, July 1984
Title: 'Holocene Sedimentation in River Severn catchments.'

CAREER

October 2010 - Personal Chair, Professor of Environmental Science, Macquarie University, Australia.

August 2009 to October 2010 - Associate Professor, Environmental Science, Macquarie University, Australia.

August 2008 to August 2009 - Commissioner of the Land and Environment Court.

January 2008 to August 2008 - Associate Professor, Environmental Science, Macquarie University, Australia.

January 2004 to December 2007 - Senior Lecturer in Environmental Science, Macquarie University, Australia.

January 2001 to 2003 - Lecturer in Environmental Science, Macquarie University, Australia.

October 1999 to December 2000 - Post-Doctoral Research Fellow, Macquarie University.

October 1998 to October 1999 - Post-Doctoral Research Assistant, University of Oxford.

October 1994 to October 1997 - Post-Doctoral Research Fellow, University of Leeds.

October 1993 to September 1994 - Lecturer in Physical Geography, University of Portsmouth.

October 1992 to January 1993 - Temporary Lecturer, University of Wales, Aberystwyth.

October 1990 to October 1993 - NERC PhD Studentship, University of Wales, Aberystwyth.

PROFESSIONAL APPOINTMENTS

Appointed by NSW EPA to Expert working group - On Lead exposure management for suburbs around the former Pasmirco smelter site - Dec 2014 - ongoing.

Chair, Sediment & Water Technical Working Group for Water Quality Closure Criteria, Ranger Uranium Mine - for Gundjilmi Aboriginal Corporation and Energy Resources Australia, 2014 - ongoing.

Independent Science Advisor to the Gundjilmi Aboriginal Corporation and Energy Resources Australia Surface Water Group, Northern Territory - 2012 - 2014.

Centre for Legal Governance, Macquarie University - Leader of the Environmental Law stream - 2011 - 2013.

Public Health Research Network, Macquarie University - Steering Committee Member 2012-2014.

LEAD Group Inc. Elected Committee Member (Australia) - 2011 - ongoing.

Chair, Teaching and Learning Senate Committee, Macquarie University, 2010 - 2011.

LEAD Group Inc. Technical Advisory Board (Australia) - 2010 - ongoing.

Cooks River Urban Water Initiative - Project Reference Committee - February 2009 - 2012.

Acting Commissioner - Land and Environment Court, NSW - January 2007 - August 2008.

Ku-ring-gai Council - Sustainability Action Reference Group, 2007 - 2008.

Visiting Professor of Environmental Toxicology, University of California, Santa Cruz - April to July 2006.

Department of Natural Resources - Steering committee for the NHT Urban Decontamination Project, 2005 - 2006.

Ku-ring-gai Council (NSW) - Bushland and Catchments Committee, 2004 - 2007.

Ku-ring-gai Council - Community Grants Committee, 2005 - 2008.

Board of Studies NSW, Earth and Environmental Science Exam Committee, 2002-2004.

Visiting Fellow, Environmental Science, University

of Sydney, 1997.

Visiting Fellow, Physical Geography University of Natal, S. Africa, 1994.

PROFESSIONAL AWARDS & HONOURS

Green Lifestyle Awards 2014 - *VegeSafe* Program highly commended.

Founder of *VegeSafe* soil metal analysis community science participation program (<http://research.science.mq.edu.au/vegesafe/>).

Departmental prize winner (seven times) for Best Research Paper.

Invited to be Associate Editor for *Anthropocene*, a new Elsevier journal - 2012.

Vice Chancellor's Award (Macquarie University) for Programs that Enhance Learning 2011. Title: *Transitioning student learning to applied and professional practice in environmental science*.

Macquarie University Excellence in Research Award in Sustainability 2011. Title: *The Lingering Legacy of Lead in Australian Cities and Environments*.

Fellow of the Peter Cullen Water and Environment Trust 2010 (lifetime award).

Macquarie University Science and Engineering Research Awards 2010 - Highly Commended. Title: *Human and environmental health risks associated with metal mining in and around Mount Isa, Qld, Australia*.

Visiting Research Scholar - Department of Geosciences and Natural Resources, Western Carolina University, USA - June 2010.

Adjunct Professor, Department of Physical Geography, Macquarie University, November 2008-August 2009.

Australian Learning and Teaching Council Citation for Outstanding Contributions to Student Learning - August 2008.

Macquarie University Teaching Fellowship Award, January 2008.

Ku-ring-gai Citizen of the Year Award - for outstanding service to the Community, January 2007.

Excellence in Teaching Award - Macquarie University, December 2006.

PUBLICATION TRACK RECORD

COVERING: CONTAMINANTS, ENVIRONMENT, HUMAN HEALTH, WATER AND LAW

Professor Taylor has completed multiple research studies in relation to environment, water, contaminants, policy and law in Australia, Africa, Papua New Guinea and the UK. His career output to date includes > 90 refereed articles in peer reviewed international journals and conferences papers; > 200 other non-refereed journal and newspaper articles; book reviews, consultancy and expert witness research reports, and 47 NSW Land and Environment Court judgments covering environment and planning matters.

Further information: <http://web.science.mq.edu.au/directory/llisting/person.htm?id=mataylor>

Research output: Google Scholar link: <http://goo.gl/cPpk>

Articles in review/in press

- Hart, B. and Taylor, M.P. (submitted August 19th 2014). Resolving long-term issues related to surface water management and monitoring associated with the Ranger Uranium Mine, Northern Territory, Australia. *Australasian Journal of Environmental Management*.
- Harvey, P.J., Taylor, M.P., Handley, H. (submitted December 22nd 2014). Environmental contamination of soils from lead joints used in large water supply pipelines. *Water, Air & Soil Pollution*.
- Harvey, P.J., Taylor, M.P., Handley, H. (submitted December 4th 2014). Identification of the sources of metal (lead) contamination in drinking waters using lead isotopic compositions. *Environmental Science and Pollution Research*.
- Taylor, M.P. (submitted 12th January, 2015). Atmospherically deposited trace metals from bulk mineral concentrate port operations. *Science of the Total Environment*.
- Taylor, M.P., Zahran, S., Kristensen, L.J., Rouillon, M. (submitted December 15th 2014). Evaluating the efficacy of playground washing to reduce environmental metal exposures. *Environmental Pollution*.

JOURNAL PUBLICATIONS

2015

- Kristensen, L.J., Taylor, M.P., Morrison, A.L. 2015. Lead and zinc dust depositions from ore trains characterised using lead isotopic compositions. *Environmental Science: Processes & Impacts*. DOI: 10.1039/C4EM00572D.
- Taylor, M.P., Mackey, A.K., Munksgaard, N.C., and Hudson-Edwards, K.A. 2015. Misleading and incomplete environmental information: comments on manuscript - Zheng, J., Huynh, T., Gasparon, M., Ng, J. and Neller, B. 2013. Human health risk assessment of lead from mining activities at semi-arid locations in the context of total lead exposure. *Environmental Science and Pollution Research*, 20, 8404-8416; *Environmental Science and Pollution Research*, DOI: 10.1007/s11356-015-4100-z.

2014

- Csavina, J., Taylor, M.P., Félix, O., Rine, K.P., Sáez, A.E., Betterton, E.A. 2014. Size-resolved aerosol contaminants associated with copper and lead smelting emissions: Implications for emissions management and human health. *Science of the Total Environment*, 493, 750-756.
- Gore, D.B., Taylor, M.P., Pritchard, R.G., Fryirs, K.A. 2014. On-site teaching with XRF and XRD: training the next generation of industry and research professionals. *Powder Diffraction*, 29(S1), S8-S14. <http://dx.doi.org/10.1017/S0885718674000876>.
- Kristensen, L.J., Taylor, M.P., O'Gille, K., Hibdon, S.A., Flegal, A.R. 2014. Lead isotopic compositions of ash sourced from Australian bushfires. *Environmental Pollution*, 190, 159-165.
- Laidlaw, M.A.S., Zahran, S., Pingatore, N., Clague, J., Devlin, G., Taylor, M.P. 2014. Identifying and fingerprinting temporal lead sources in domestic homes. *Environmental Pollution*, 184, 238-246.
- Laidlaw, M.A.S., Zahran, S., Pingatore, N., Clague, J., Devlin, G., Taylor, M.P. 2014. Reply to comments on "Identification of lead sources in residential environments: Sydney Australia" by Laidlaw et al. (2014). *Environmental Pollution*, 192, 216-219.
- Oulton, L.J., Taylor, M.P., Hose, G.C., Brown, C. 2014. Sublethal toxicity of untreated and treated stormwater Zn concentrations on the foraging behaviour of *Paratya australiensis* (Decapoda: Atyidae). *Ecotoxicology*, 23, 1022-1029.
- Taylor, M.P., Davies, P.J., Kristensen, L.J., Csavina, J. 2014. Licenced to pollute but not to poison: the ineffectiveness of regulatory authorisations at protecting public health from atmospheric arsenic,

lead and other contaminants resulting from mining and smelting operations. *Aeolian Research*, 14, 35-52.

10. Taylor, M.P. and Isley, C. 2014. Measuring, monitoring and reporting but not intervening: Air Quality in Australian Mining and Smelting Areas. *Air Quality and Climate Change Journal*, 49 (2), 35-42.

11. Taylor, M.P., Mould, S., Kristensen, L.J., Rouillon, M. 2014. Environmental arsenic, cadmium and lead dust emissions from metal mine operations: Implications for environmental management, monitoring and human health. *Environmental Research*, 135, 296-303.

12. Taylor, M.P., Winder, C., Lamphear, B.P. 2014. Australia's leading public health body delays action on the revision of the public health goal for blood lead exposures. *Environment International*, 70, 113-117.

2013

- Chin, A., Fu, R., Harbor, J., Taylor, M.P., Vanacker, V. 2013. Editorial – Anthropocene: Human interactions with earth systems. *Anthropocene*, 1, 1-2.
- Dwyer, G.J. and Taylor, M.P. 2013. Moving from consideration to application: The uptake of principles of ecological sustainable development in environmental decision-making in New South Wales. *Environmental Planning and Law Journal*, 30, 185-219.
- Ives, C.D., Taylor, M.P., Hose, G., Nipperess, D. 2013. Effect of catchment urbanisation on ant diversity in remnant riparian corridors. *Landscape and Urban Planning*, 110(1), 155-163.
- Ives, C.D., Taylor, M.P., Davies, P.J. 2013. A setback for river and riparian ecosystems: A response to the NSW Office of Water 2012 policy on riparian corridors. *Environmental Planning and Law Journal*, 30, 121-131.
- Mackey A.K. and Taylor, M.P. 2013. Floodwater metal contaminants in an Australian dryland river: A baseline for assessing change downstream of a major lead-zinc-silver and copper mine. *Journal of Environmental Quality*, 42(2), 474-483.
- Taylor, M.P. and Little, J.A. 2013. Environmental impact of a major copper mine spill on a river and floodplain system. *Anthropocene*, 3, 36-50.
- Mackey, A.K., Taylor, M.P., Munksgaard, N.C., Hudson-Edwards, K.A., Burn-Nunes, L. 2013. Identification of environmental lead sources, pathways and forms in a mining and smelting town: Mount Isa, Australia. *Environmental Pollution*, 180, 304-311.
- Rouillon, M., Cora, D.B., Taylor, M.P. 2013. The nature and distribution of Cu, Zn, Hg, and Pb in urban soils of a regional city: Lithgow, Australia. *Applied Geochemistry*, 36, 83-91.
- Taylor, M.P., Camenzuli, D., Kristensen, L.J., Forbes, M., Zahran, S. 2013. Environmental lead exposure risks associated with children's outdoor playgrounds. *Environmental Pollution*, 178, 447-454.
- Taylor, M.P., Lamphear, B.P. and Winder, C. 2013. Eliminating childhood lead toxicity in Australia: a call to lower the intervention level (Letter). *Medical Journal of Australia*, 199(5): 323-324.
- Zahran, S., Laidlaw, M.A.S., McElmurry, S.P., Filippelli, G.M., Taylor, M.P. 2013. Linking source and effect: re-suspended soil lead, air lead and children's blood lead levels in Detroit, Michigan. *Environmental Science and Technology*, 47(6), 2839-2845.
- Zahran, S., Mielke, H.W., McElmurry, S.P., Filippelli, G.M., Laidlaw, M.A.S., Taylor, M.P. 2013. Determining the relative importance of soil sample locations to predict risk of child lead exposure. *Environment International*, 60, 7-14.

2012

- Csavina, J., Field, J., Taylor, M.P., Gao, S., Landázuri, A., Betterton, E.A., Sáez, A.E. 2012. A Review on the Importance of Metals and Metalloids in Atmospheric Dust and Aerosol from Mining Operations. *Science of the Total Environment*, 433, 56-73.
- Kristensen, L.J. and Taylor, M.P. 2012. Fields and Forests in Flames: Lead and Mercury Emissions from Wildfire Pyrogenic Activity. *Environmental Health Perspectives*, 120:a56-a57.
- Laidlaw, M.A.S., Zahran, S., Mielke, H., Taylor, M.P., Filippelli, G. 2012. Re-suspension of lead contaminated urban soil as a dominant source of atmospheric lead in Birmingham, Chicago, Detroit and Pittsburgh, USA. *Atmospheric Environment*, 49, 302-310.
- Mackey, A.K. and Taylor, M.P. 2012. Event-based water quality sampling method for application in remote rivers. *River Research and Applications*, 28 (8), 1105-1112.
- Taylor, M.P., Winder, C., Lamphear, B.P. 2012. Eliminating Childhood Lead Toxicity in Australia: A call to lower the intervention level. *Medical Journal of Australia*, 197 (9), 493.

2011

- Davies, P., Ives, C., Findlay, S., Taylor, M.P. 2011. Urban rivers and riparian systems – directions and recommendations for legislators, policy makers, developers and community users. *Environmental Planning and Law Journal*, 28(5), 313-331.

31. Findlay, S., Taylor, M.P., Davies, P., and Fletcher, A. 2011. Development and application of a rapid assessment tool for urban stream networks. *Water and Environment Journal*, 25 (1), 2-12.
32. Ives, G.C., Nipperess, D.A., Taylor M.P. 2011. Environmental and landscape factors influencing ant and plant diversity in suburban riparian corridors. *Landscape and Urban Planning*, 103(3-4), 373-382.
33. Ives, G.C., Hese, G.C., Nipperess, D.A., Taylor, M.P. 2011. The influence of riparian corridor width on ant and plant assemblages in northern Sydney, Australia. *Urban Ecosystems*, 14 (1), 1-16.
34. Mackay, A.K., Taylor, M.P., Hudson-Edwards, K.A. 2011. Water and sediment quality of dry season pools in a dryland inland river system: The upper Leichhardt River, Queensland, Australia. *Journal of Environmental Monitoring*, 13, 2050-2061.
35. Laidlaw, M.A.S. and Taylor M.P. 2011. Potential for Childhood Lead Poisoning in the Inner Cities of Australia Due to Exposure to Lead in Soil Dust. *Environmental Pollution*, 159(1), 1-9.
36. Taylor, M.P., Ives, G.C., Davies, P.J., Stokes, R. 2011. Troubled waters – An examination of the disconnect between river science and law. *Environmental Science and Technology*, 45(19), 8176-8179.
37. Taylor, M.P., Schmiering, C.A., Langhear, B.L., Jones, A.L. 2011. Lessons Learned on Lead Poisoning in Children: One-hundred years on from Turner's Declaration. *Journal of Paediatrics and Child Health*, 47(12), 849-856.
- 2010
38. Ives, C., Taylor, M.P., Nipperess, D.A., Davies, P. 2010. New directions in urban biodiversity conservation: The role of science and its interaction with local environmental policy. *Environmental Planning and Law Journal*, 27, 249 – 271.
39. Munksgaard, N.C., Taylor, M.P., and Mackay, A.K. 2010. Effortful: Recognising and responding to the obvious: the source of lead pollution at Mount Isa and the likely health impacts. *Medical Journal of Australia*, 193(3) 131-132.
40. Taylor, M.P., Hudson-Edwards, K.A., Mackay, A.K., Holz, E. 2010. Soil Cd, Cu, Pb and Zn contaminants around Mount Isa city, Queensland, Australia: potential sources and risks to human health. *Applied Geochemistry*, 25(6), 841-855.
41. Taylor, M.P. and Schmiering, C.A. 2010. The Public Minimization of the Risks Associated with Environmental Lead Exposure and Elevated Blood Lead Levels in Children, Mount Isa, Queensland, Australia. *Archives of Environmental and Occupational Health*, 65(1), 45-48.
42. Taylor, M.P. and Schmiering, C.A. 2010. Corrigendum to 'The Public Minimization of the Risks Associated With Environmental Lead Exposure and Elevated Blood Lead Levels in Children, Mount Isa, Queensland, Australia.' *Archives of Environmental and Occupational Health*, Volume 65, Number 1, pages 45-48. *Archives of Environmental and Occupational Health*, 65(2), 116.
- 2009
43. Kuyppers, T., Ling, M., Kilgore, D., Taylor, M.P. 2009. Reed bed versus slow sand filtration: a cost comparison. *Water*, 36(1), 34-38.
44. Taylor, M.P. and Ives, C. 2009. Legislative and policy challenges for the protection of biodiversity and bushland habitats: An evidence-based approach. *Environmental Planning and Law Journal*, 26(1), 35-48.
45. Taylor, M.P., Mackay, A.K., Kuyppers, T.L. and Hudson-Edwards, K.A. 2009. Mining and Urban Impacts on Semi-arid Freshwater Aquatic Systems: The Example of Mount Isa, Queensland. *Journal of Environmental Monitoring*, 11(5), 977-986.
- 2008
46. Hardwick, S., Stokes, H., Findlay, S., Taylor, M., Gillings, M. 2008. Quantification of class 1 integron abundance in natural environments using real time quantitative PCR. *FEMS Microbiology Letters*, 276(2), 207-212.
47. Hanley, C. and Taylor, M.P. 2008. Wetlands minimise algal growth in a horticultural centre. *Water*, 35(6), 98-103.
48. Swanson, K.M., Watson, E., Aello, R., Bera, M.T., Marshall, A., Taylor, M.P., Apte, S., Dietrich, W.E., 2008. Sediment load and floodplain deposition rates: Comparison of the Fly and Strickland Rivers, Papua New Guinea. *Journal of Geophysical Research*, 113, F01S03, doi:10.1029/2008JF000623.
49. Taylor, M.P. and Hudson-Edwards, K.A. 2008. The dispersal and storage of sediment-associated metals in an arid river system: the Leichhardt River, Mount Isa, Queensland. *Environmental Pollution*, 152(1), 193-204.

- 2007
50. Lamato, E., Stokes, R. and Taylor, M.P. 2007. Riverbanks and the Law: The arbitrary nature of river boundaries in New South Wales, Australia. *The Environmentalist*, 27(1), 131-142.
51. Taylor, M.P. 2007. Assessment of sediment metal concentrations downstream of the Rum Jungle Mine on the East Branch of the Fmmiss River, Northern Australia. *Journal of Geochemical Exploration*, 92(1), 55-72.
52. Taylor, M.P. 2007. The drivers of Immigration in contemporary society: unequal distribution of resources and opportunities. *Human Ecology*, 35(6), 776-776.
53. Viles, H.A., Taylor, M.P., Nicol, K., and Neumann, S. 2007. Evidence of dramatic hydroclimatic regime shifts from arid tufa depositional sequences in the Naukluft Mountains, Namibia. *Sedimentary Geology*, 195(1-2), 39-53.
- 2006
54. Carthew, K.D., Taylor, M.P. and Drysdale, R.N. 2006. An environmental model of fluvial tufas in the monsoonal tropics, Barkly karst, northern Australia. *Geomorphology*, 72(1-2), 78-100.
55. Findlay, S. and Taylor, M.P. 2006. Why rehabilitate urban river systems? *Area*, 38(3), 312-325.
56. Kuyppers, T., Mackey, A. and Taylor, M.P. 2006. Engineered reed beds for treatment of potable water. *Water*, 33(6), 52-57.
57. Taylor, M.P. 2006. Sydney's Water Woes. *Australasian Journal of Environmental Management*, 13(3), 138-141.
- 2005
58. Brierley, G.J., Brooks, A.P., Fryirs, K., Taylor, M.P. 2005. Did humid-temperate rivers in the Old and New Worlds respond differently to clearance of riparian vegetation and removal of coarse woody debris? *Progress in Physical Geography*, 29(1), 27-49.
59. Taylor, M.P. and Stokes, R. 2005. Up the Creek. What is wrong with the definition of a river in NSW? *Environmental and Planning Law Journal*, 22(3), 193-211.
60. Taylor, M.P. and Stokes, R. 2005. When is a river not a river? Considerations of the legal definition of a river for geomorphologists practicing in New South Wales, Australia. *Australian Geographer*, 38(2), 183-200.
- 2004
61. Taylor, M.P., Drysdale, R.N. and Carthew, K. 2004. The formation and environmental significance of calcite rafts in tropical tufa-depositing rivers of northern Australia. *Sedimentology*, 51(5), 1089-1101.
62. Thomson, J.R., Taylor, M.P. and Brierley, G.J. 2004. Are River Styles ecologically meaningful? A test of the ecological relevance of a geomorphic river characterisation scheme. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 14(1) 25-28.
- 2003
63. Carthew, K.D., Taylor, M.P. and Drysdale, R.N. 2003. Are current models of tufa sedimentary environments applicable to tropical systems? A case study from the Gregory River, northern Australia. *Sedimentary Geology*, 162, 199-218.
64. Drysdale, R.N., Carthew, K.D. and Taylor, M.P. 2003. Larval caddis-fly nets and retreats: a unique biostratigraphic paleocurrent indicator for fossil tufa deposits. *Sedimentary Geology*, 161(3-4), 207-215.
65. Gore, D. and Taylor, M.P. 2003. Discussion and Reply - Grooves and striations on the Stanthorpe Adamellite: evidence for a possible late Middle-Late Triaassic age glaciation. *Australian Journal of Earth Sciences*, 50, 467-470.
- 2002
66. Carthew, K., Taylor, M.P., Drysdale, R.N. 2002. Aquatic insect larval constructions in tropical limestone deposits (tufa): preservation of depositional environments. *General and Applied Entomology*, 31, 35-41.
67. Drysdale, R.N., Taylor, M.P. and Ithenfeld, C. 2002. Factors controlling the chemical evolution of travertine - depositing rivers of the Barkly karst, northern Australia. *Hydrological Processes*, 16, 2941-2962.
68. Taylor, M.P. and Kesterton, R.G.H. 2002. Heavy metal contamination of an arid river environment: Gruben River, Namibia. *Geomorphology*, 42, 311-327.
69. Viles, H.A., Taylor, M.P., Yates, T.J.S. and Massey, S.W. 2002. Soiling and decay of N.M.E.P. limestone tablets. *The Science of the Total Environment*, 292, 215-229.
70. Wilkins, S., Compton, R.G., Viles, H.A. and Taylor M.P. 2002. A new technique to evaluate and quantify the role of surface treatments in reducing the dissolution of calcareous building materials. *Studies in Conservation*, 47, 88-94.

71. Thomson, J.R., Taylor, M.P., Fryirs, K., and Brierley, G.J. 2001. A geomorphological framework for river characterisation and habitat assessment. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 11(5), 373-389.
72. Taylor, M.P. and Brewer, P.A. 2001. A study of Holocene floodplain particle size characteristics with special reference to palaeochannel infills from the upper Severn basin, Wales, UK. *Geological Journal*, 36(2), 143-157.
73. Wilkins, S., Compton, R.G., Taylor, M.P., and Viles, H.A. 2001. Channel flow cell studies of the inhibiting action of gypsum on the dissolution kinetics of calcite: a laboratory approach with implications for field monitoring. *Journal of Colloid and Interface Science*, 236(2), 354-361.

74. Taylor, M.P., Macklin, M.G. and Hudson-Edwards, K.A. 2000. River sedimentation and fluvial response to Holocene environmental change: examples from the Yorkshire Ouse Basin, Northern England. *The Holocene*, 10, 195-206.
75. Taylor, M.P., Thomson, J.R., Fryirs, K., Brierley, G.J. 2000. Habitat mapping using the River Styles™ methodology. *Ecological Management and Restoration*, 1, 223-226.
76. Taylor, M.P. and Viles, H.A. 2000a. A novel method of sampling and characterising deposited airborne particulates. *Progress in Environmental Science*, 2, 69-73.
77. Taylor, M.P. and Viles, H.A. 2000b. Improving the use of microscopy in the study of weathering: Sampling issues. *Zeitschrift für Geomorphologie, Supplement Band 120*, 145-158.

78. Hudson-Edwards, K.A., Macklin, M.G. and Taylor, M.P. 1999. 2000 years of sediment-borne heavy metal storage in the Yorkshire Ouse basin, NE England, U.K. *Hydrological Processes*, 13, 1087-1102.
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80. Brewer, P.A. and Taylor, M.P. 1997. Temporally controlled and spatially focused deposition of contaminated floodplain sediments. *Catena*, 30, 229-249.
81. Hudson-Edwards, K.A., Macklin, M.G. and Taylor, M.P. 1997. Historic Metal Mining Inputs to Tees River Sediment. *The Science of the Total Environment*, 194/195, 437-445.
82. Taylor, M.P. and Lewis, J. 1997. Non-synchronous response of adjacent upland floodplain systems to Holocene environmental change. *Geomorphology*, 18, 261-284.
83. Taylor, M.P. and Macklin, M.G. 1997. Holocene alluvial architecture and valley floor development on the River Swale, Catterick, North Yorkshire, U.K. *Proceedings of the Yorkshire Geological Society*, 51, 317-327.

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REFEREED CONFERENCE PUBLICATIONS

87. Davies, P.J., Ives, C.D., Taylor, M.P., Findlay, S.J. 2012. Does science contribute adequately to the decision-making frameworks used to protect urban rivers and riparian systems? In Grove, J.R. and Rutherford, I.D. (eds). *Proceedings of the 6th Australian Stream Mgt Conference, Managing for Extremes*, 6-8, 2012, Canberra, published by the River Basin Management Society, pp. 549-567.
88. Findlay, S.J., Jonasson, O.J., Davies, P.J., Taylor, M.P., Gore, D.G. 2012. Extracting base flow to substitute for potable water use - how much is too much for urban stream health? In Grove, J.R. and Rutherford, I.D. (eds). *Proceedings of the 6th Australian Stream Mgt Conference, Managing for Extremes*, 6-8, 2012, Canberra, published by the River Basin Management Society, pp. 68-75.

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90. Mackay, A. and Taylor, M.P. 2008. Water Chemistry and Potential Environmental Toxicology Risks Associated with Floodwaters Downstream of a Major Pb-Zn-Ag and Cu mine: Mount Isa, North-West, Queensland. *Water: Down Under 2008 Conference*, Adelaide, Australia (available on Cd).

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I have reviewed articles covering various aspects of environmental science including metal contamination in human and natural systems, fluvial geomorphology, river system ecology, and sedimentology, for a range of journals including: *American Society of Civil Engineers, Applied Geography, Australian Geographer, Catena, Earth Surface Processes and Landforms, Environmental Pollution, Environmental Science and Technology, Geomorphology, J of Environmental Management, J of Environmental Monitoring, J of Geochemical Exploration, J of Hazardous Materials, J of Quaternary Science, J of Water and Health, Science of the Total Environment, and Zeitschrift für Geomorphologie.*

LAND AND ENVIRONMENT COURT NSW COMMISSIONER DECISIONS (CLASSES 1-3)

During my tenure at the Court I completed more than 50 judgments and s 34 conciliation conferences (under the Land and Environment Court Act 1979) for the NSW Land and Environment Court. The decisions are listed below. All Commissioner's published decisions can be located at: <http://www.casefilev.nsw.gov.au/landenv/index.html>.

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142. *Attard v Ku-ring-gai Council* [2009] NSWLEC 1070 (10 March 2009)
143. *Dazzion Pty Ltd v Ku-ring-gai Council* [2009] NSWLEC 1147 (18 May 2009)
144. *Emdur v Waverley Council* [2009] NSWLEC 1101 (13 March 2009)
145. *Galasso v George* [2009] NSWLEC 1028 (27 January 2009)
146. *Green, Linda and Lesley v Tweed Shire Council* [2009] NSWLEC 1073 (2 March 2009)
147. *Howard v Port Stephens Council* [2009] NSWLEC 1209 (22 June 2009)
148. *Jerritt v Waverley Council* [2009] NSWLEC 1141 (6 May 2009)
149. *Kaldas v Ku-ring-gai Council* [2009] NSWLEC 1121 (17 April 2009)
150. *Moonlight Mushroom Pty Ltd v Tamara Shire Council* [2009] NSWLEC 1092 (27 March 2009)
151. *Multicraft Developments Pty Limited (Previously Tso Simon) v Helroyd City Council* [2009] NSWLEC 1186 (27 April 2009)
152. *Rose v Thurland and Maurice* [2009] NSWLEC 1031 (31 January 2009)
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156. *Rose v The Hills Shire Council* [2009] NSWLEC 1266 (7 August 2009)
157. *S J Connelly Pty Ltd v Byron Shire Council* [2009] NSWLEC 1068 (9 March 2009)
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160. *Short v Wollongong City Council* [2009] NSWLEC 1059 (17 March 2009)
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168. *Avator Property Developments v Ballina Shire Council* [2008] NSWLEC 1402 (14 October 2008)
169. *Black v Ku-ring-gai Council* [2008] NSWLEC 1501 (24 December 2008)
170. *BTG Planning v Blacktown City Council* [2008] NSWLEC 1500 (24 December 2008)
171. *Crighton Properties Pty Ltd v Kiama Municipal Council* [2008] NSWLEC 1497 (24 December 2008)
172. *David Katfis Consulting Pty Limited v Gosford City Council* [2008] NSWLEC 1365 (1 October 2008)
173. *Garswin Pty Ltd v North Sydney Council* [2008] NSWLEC 1435 (2 October 2008)
174. *Mackenzie v Ku-ring-gai Council* [2008] NSWLEC 1525 (8 September 2008)
175. *Macquarie Leisure Operations v Wollahra Municipal Council* [2008] NSWLEC 1436 (16 October 2008)
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177. *Owners Strata Plan 10210 v Zhang* [2008] NSWLEC 1499 (9 December 2008)
178. *Palmer and Anor v Mosman Municipal Council* [2008] NSWLEC 1509 (30 December 2008)
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220. Outhet, D. and Taylor, M.P. 2004. Joint Expert Witness Report by Dr David Outhet, Principal Geomorphologist, Centre for Natural Resources, DIPNR and Dr Mark Taylor, Senior Lecturer -

- Environmental Geomorphologist, Dept Physical Geography, Macquarie University. For the Land and Environment Court of New South Wales Dobbie v Water Administration Ministerial Corporation, Proceedings No. 10230/03, Lumley Creek Dam, Bungonia, NSW, \$11,500.
221. Taylor, M.P. and Martens, D. 2004. Joint Expert Witness Report on Geomorphology Issues between: Dr Mark Taylor (Miltonbrook's Expert) and Dr Daniel Martens (Council's Expert). For the Land and Environment Court of New South Wales Proceedings No. 10957 of 2003, Miltonbrook Managements Pty Ltd. v Shellharbour City Council. Tullimbah Village Residential Development, Albion Park, NSW. \$7,400.
222. Don Fox Planning Associates (fnc). Taylor, M.P. 2003. Draft discussion paper: Urban riparian corridors - categories, criteria and requirements. Prepared for Urban Development Institute of Australia. Project number 5487. \$3,200.
223. Taylor, M.P. and Dudgeon, C.R. 2003. A baseline geomorphological assessment of erosion on the banks of the Nepean River. Water Research Laboratory Technical Report 2003/15, unpublished report for Penrith Lakes Development Corporation Ltd. \$5,150.
224. Taylor, M.P. 2003. Provision of fluvial geomorphological advice to Robinsons GRC Ltd. and to Stocklands developers. Unpublished reports and notes for Commission of Enquiry re: the Sandon Point Development, Wollongong. \$15,390.
225. Taylor, M.P. 2002. Study of the impact of sediment released during dam construction on the Cowara-Dam Creek (Hastings River Catchment). Unpublished report for Port Macquarie Council. \$9,500.
226. Drysdale, R.N. and Taylor, M.P. 2001. Assessment of the kerat geomorphology and hydrology. Riverside, Hazon Valley, Tasmania. Assessment conducted for Forestry Tasmania during December 2001. \$41,500.
227. Taylor, M.P. 2001. Report for Paul Hines Solicitors - Jewells Enviro-Village, Corner of Pacific Highway and Meads Road, Belmont North, NSW - Recommendations for maintaining maximum soil and sediment cohesion within the drainage lines. Unpublished Consultancy Report, Macquarie Research Limited, Macquarie University. \$6,000.
228. Taylor, M.P. 2000. Emigrant Creek New South Wales - threshold values for sediment entrainment. Unpublished report for Keith Bishop Environmental Consulting. \$8,500.
229. Taylor, M.P. and Dudgeon, C.R. 2000. A geomorphological assessment of erosion on the banks of the Nepean River. Unpublished report for Penrith Lakes Corporation, New South Wales, Australia. UNSW, WRL Technical Report 00/08. \$4,200.
230. Hooka, J.M., Horton, B., Moore, J. and Taylor, M.P. 1994. The Upper River Severn (Coerws) Channel Study. Unpublished report for the Countryside Council for Wales. \$7,500.
231. Taylor, M.P. 1994. Alluvial sedimentation and environmental change at Caldicot Castle, South Wales. Unpublished report for Cadw (Welsh Heritage). \$3,000.
232. Taylor, M.P. and Lewitt, J. 1993. Alluvial stratigraphy and floodplain development at Walsbrook, University of Wales, Aberystwyth. Unpublished report for Chwyd-Powys Archaeological Trust. \$10,000.

RESEARCH GRANTS/FINANCIAL SUPPORT OBTAINED

Received Grant Funds

- Taylor, M.P., Gore, D.G. 2014. \$106,590 (made up of (incl GST) \$25,000 cash; \$68,000 equipment; \$15,500 analytical costs). Urban Contamination - Evaluating the Potential for the Application of Hand-held XRF in Soil Metal Assessment. Partners - Olympus Australia and National Measurement Institute.
- Nelson, P., Strezov, V., Taylor, M.P. 2013. \$69,950. Continuous mercury analyser for characterising mercury emission fluxes from new industrial processes and in the global environment. Macquarie University Research Infrastructure Block Grants (RIBG) Scheme, 2013.
- Potts, J., Helyar, J., Evans, D., Ives, C., Taylor, M.P., Donovan, A.K., Ely, D. 2013. \$155,000. When science meets art: an environmental portrait of the Shearwater River Valley. ARC Linkage 2013 LP130100265.
- Gore, D.G., Taylor, M.P., Fryirs, K., Pearson, N., Belousova, E., Handley, H., Sheedy, K., Chooat, M. 2012. \$59,146. A hand-held portable XRF analyser for non-invasive, field- and museum-based measurement of environmental geological, archaeological and cultural materials. Macquarie University Research Infrastructure Block Grants (RIBG) Scheme, 2013.
- Nelson, P., Strezov, V., Field, I., Taylor, M.P. 2011. \$30,811. Analytical microbalance for sampling of particulates in ambient air. Macquarie University Research Infrastructure Block Grants (RIBG) Scheme, 2012.
- Potts, J., Taylor, M.P., Helyar, J., Evans, D., Ives, C. 2011. \$60,000. Developing environmental images of Bundanoon. Australian Council Synapse ARC Linkage Grant.

- Taylor, M.P. 2010. \$2000. *The impacts of urbanisation on water quantity and quality*. Kuring-gal Council (Sydney) Water for Life Fund: co-funding for 2008 project to support Work Integrated Learning projects and research.
- Taylor, M.P. 2010. \$50,000. *Evaluating urban stream remediation techniques: Cooks River, Sydney*. NSW Environmental Trust. (NB – this grant was for additional co-funding for project below to provide necessary financial support for a fully-funded PhD project).
- Taylor, M.P. 2009. \$21,000. *Evaluating urban stream remediation techniques: Cooks River, Sydney*. Sydney Water.
- Taylor, M.P. 2009. \$30,000. *Evaluating urban stream remediation techniques: Cooks River, Sydney*. Sydney Metropolitan Catchment Management Authority.
- Nelson, P., Howitt, R., George, J., Anati, M., Taylor, M.P., Poulsen, M., Dowling, R., Taplin, R. 2008. \$154,798. *Climate Change Adaptation Skills for Professionals*. Australian Centre for Climate Change Adaptation. Australian Government, Department of the Environment and Water Resources, Australian Greenhouse Office.
- Taylor, M.P. 2008. \$3000. *The impacts of urbanisation on water quality and quality*. Kuring-gal Council (Sydney) Community Small Grant Scheme.
- Dadd, K., George, J. and Taylor, M.P. 2008. \$15,000. *Is there a place for structured work-integrated learning programs in Environmental and Life Sciences?* Macquarie University Teaching Fellowship Award.
- Gore, D.G., Farming, P., Fryirs, K., Goldys, E., Gulson, B., Hesse, P., Humphreys, G., Jamie, I., Lashman, M., Taylor, M.P., Van Dyke, K., Whitford, M. 2007. \$76,220. *X-ray Diffractometer equipment*. Macquarie University Research Infrastructure Block Grant.
- Taylor, M.P. 2006. \$46,000. Macquarie University External Collaborative Grant. *An evaluation of the ecological condition and biodiversity values of urban riparian bushland environments in Kuring-gal, Sydney*. (\$23,000 from Kuring-gal Council).
- Taylor, M.P. 2006. \$400,000 (plus ~\$50,000 of costs towards flights, accommodation analyses). *Management of riparian zones and water and sediment quality in the upper Letchford River catchment*. Mt Isa Water Board, Mt Isa, Queensland.
- Taylor, M.P. 2006. \$19,300. *Clear Water Lagoon – the efficiency of the reed-bed technology for water processing*. Mt Isa Water Board, Mt Isa, Queensland.
- Taylor, M.P. 2006. \$9000. *Ten year annual Undergraduate Environmental Science Prize – sponsored by CSR Pty. Ltd.*
- Taylor, M.P. 2005. \$1150. Macquarie International (Macquarie University) – support for GEOS369 Field Unit to New Zealand.
- Taylor, M.P. 2005. \$14,365. Macquarie University Research Development Grant. *Project title: An assessment of the environmental hazard and associated health risk of mining-derived metallic dusts in Mt Isa, Queensland.*
- Taylor, M.P. 2005. \$1750. ANSE Grant. *project number 05/1568. An assessment of the environmental hazard and associated health risk of mining-derived metallic riverine dusts in Mt Isa, Queensland.*
- Pitman, A. et al. (including Taylor, M.P.) 2004-2009. \$1.55 million. Australian Research Council. 5 years. *Project Title: The ARC Earth Systems Science Network.*
- Taylor, M.P. 2003. \$2610. ANSE Grant. *project number 878. ID 433. Project title: Metalliferous pollution of channel and floodplain sediments of the East branch of the Finnis River, Northern Territory – pollution dispersal.*
- Taylor, M.P. 2002. \$4,900. ANSE Grant. *project number 02/134, ID 332. Project title: The age and geomorphological evolution of the tufa deposits of the Gregory River, Riversleigh, northwest Queensland.*
- Taylor, M.P. 2002. \$2,200. ANSE Grant. *project number 02/133, ID 438. Project title: The distribution of heavy metals in and streams near Broken Hill - pollution signals from mine smelters.*
- Taylor, M.P. and Hudson-Edwards, K.E. 2002. \$19,966. MUECRGS. *The fate, transport, distribution and environmental hazard of heavy metals in arid alluvial systems – legacies of heavy metal mining.*
- Taylor, M.P. and Drysdale, R.N. 2001. \$4,300. Macquarie University Research Grant. *Project title: The geomorphology and sedimentology of the Quaternary freshwater tufa deposits at Riversleigh, NW Queensland.*
- Gore, D. and Taylor, M.P. 2000. \$7,900. Macquarie University Research Grant. *Project title: The distribution of heavy metals in and streams near Broken Hill - pollution signals from mine smelters.*
- Drysdale, R.N. and Taylor, M.P. 1999. \$11,000. Small ARC grant application. *Project title: The sedimentology, age and palaeoclimatic significance of modern and Quaternary freshwater carbonates (travertines) at Riversleigh, NW Queensland.*

- Taylor, M.P. 1988. Beryl Mayne Scientific Research Fund, \$300 towards the costs of field work. *Project title: Quaternary travertines of the Barkly Karst, northwest Queensland, Australia.*
- Taylor, M.P. 1988. British Geomorphological Research Group small grants scheme. £270 to cover costs of travel within Africa and the purchase of appropriate mineral and rock samples. *Project title: Spatial and temporal rates and processes of weathering in the Swakopmund Region, Namibia.*
- Taylor, M.P. 1989. Endowment Fund, School of Geography, University of Oxford. £350 contribution towards field work in Namibia. *Project title: Spatial and temporal rates and processes of weathering in the Swakopmund Region, Namibia.*
- Taylor, M.P. 1989. Percy Sladen Memorial Fund, £585 towards the costs of field work. *Project title: Quaternary travertines of the Barkly Karst, northwest Queensland, Australia.*
- Taylor, M.P. 1989. The Royal Society, £950 towards the costs of field work. *Project title: Quaternary travertines of the Barkly Karst, northwest Queensland, Australia.*
- Hudson-Edwards, K.A., Macklin, M.G. and Taylor, M.P. 1987. NERC Analytical Support Grant for 50 isotope analyses (in kind value of £4000) at the NERC Isotope Geosciences Laboratory, Keyworth, Nottingham. *Project Title: Holocene and historic environmental change in the Yorkshire Ouse, Tees and Tyne basins and its influence on sediment and chemical delivery to east coast estuaries and coastal zones.*

RESEARCH THESIS PROJECTS AND SUPERVISION

Doctor of Philosophy (PhD) and Masters by Research

Current students

- Chenyin, D. (2014 enrolled). *Environmental metal exposures and human health outcomes*. PhD Candidate, Environmental Science, PhD Candidate, Dept of Environmental Sciences, Faculty of Science and Engineering, Macquarie University [Primary supervisor].
- Heney, P.J. (2013 enrolled). *Investigating contamination of potable water supplies in NE Tasmania using copper, lead and zinc isotopic analyses*. PhD Candidate, Dept of Environmental Sciences, Faculty of Science and Engineering, Macquarie University. [Primary supervisor] [Co-supervisor].
- Isley, C.F. (2013 enrolled). *Investigation of air pollutant composition and levels in Suva Fiji: through use of inventory, monitoring and modelling; formulation of pollutant and emission reduction strategies*. PhD Candidate, Dept of Environmental Sciences, Faculty of Science and Engineering, Macquarie University [Co-supervisor].
- Kristensen, L. (2012 enrolled). *The use of lead isotopic compositions to trace causes and sources of environmental pollution*. PhD Candidate, Dept of Environmental Sciences, Faculty of Science and Engineering, Macquarie University [Primary supervisor].
- Oulton, L.J. (submitted September 2014). *Evaluation of the efficacy of stormwater treatment devices for reducing water borne ecological and human health risks*. PhD Candidate, Dept of Environmental Sciences, Faculty of Science and Engineering, Macquarie University [Primary supervisor].
- Rouillon, M. (2013 enrolled). *Investigation of the spatial environmental and human health risks associated with urban soil metal contamination*. PhD Candidate, Dept of Environmental Sciences, Faculty of Science and Engineering, Macquarie University [Primary supervisor].
- Wu, L. (2012 enrolled). *The recycling of industrial lead sources during bushfire events around Australia's major cities*. PhD Candidate, Dept of Environmental Sciences, Faculty of Science and Engineering, Macquarie University [Primary supervisor].
- Zhou, X. (2014 enrolled). *Measurement and environmental sources of contamination using honey bees and their products*. PhD Candidate, Dept of Environmental Sciences, Faculty of Science and Engineering, Macquarie University [Primary supervisor].

Completions

2014

Kilgore, D. 2014. Are lipid soluble metal complexes important in aquatic environments? PhD thesis, pp. 247. Environmental Science, Department of Environment and Geography, Faculty of Science, Macquarie University. [Co-supervisor]

Laidlaw, M.A.S. 2014. Environmental lead exposures in urban environments. PhD thesis by papers, pp. 203. Environmental Science, Department of Environment and Geography, Faculty of Science, Macquarie University. [Primary supervisor]. *Awarded a Vice-Chancellor's Commendation.*

2011

Davies, P.J. 2011. Managing urban water resources in Sydney - integrating science with the role of local government policy, planning and implementation. PhD thesis by research papers, pp. 451. Environmental Science, Faculty of Science, Macquarie University. [Primary supervisor].

Ives, C.D. 2011. Biodiversity of Urban Riparian Systems: Application of Ecological Data to the Design of Environmental Planning Instruments. PhD thesis by research papers, pp. 280. Environmental Science, Faculty of Science, Macquarie University. [Primary supervisor].

Mackay, A.K. 2011. Sources, Pathways and Relative Risks of Metal Contaminants in the Upper Leichhardt River Catchment and Mount Isa Urban Area. PhD thesis by research papers, pp. 339. Environmental Science, Faculty of Science, Macquarie University. [Primary supervisor].

2009

Kuybers, T. 2009. Insights into the ephemeral Leichhardt River-Lake Moondarra Water Supply Catchment. Unpublished Master of Philosophy thesis, pp. 122 (plus appendices). Environmental Science, Faculty of Science, Macquarie University. [Primary supervisor].

2007

Findlay, S. 2007. Natural Resource Management of Urban Streams, unpublished MSc (Honours) thesis Department of Physical Geography, Macquarie University, pp. 339. Grade - 1st Class Honours. [Primary supervisor].

2006

Low, C. 2006. Insights into heavy metal pathways in Willa Willalong Catchment, Broken Hill, NSW Australia, unpublished MSc Thesis, Macquarie University, pp. 140. [Associate supervisor with A/Professor Gore, Environmental Science, Macquarie University].

2005

Carthew, K. 2005. An environmental model of fluvial tufas of the monsoonal tropics, Northern Australia, unpublished PhD thesis by papers, Department of Physical Geography, Macquarie University, pp. 212. [Primary supervisor].

Winchester, S. 2005. Acid mine drainages by industrial waste co-disposal, unpublished PhD thesis, Department of Physical Geography, Macquarie University, pp. 387. [Co-supervised with Professor Gulson, GSE, Macquarie University].

Honours Research Students

2012

Dwyer, G.J. 2012. Moving from mere consideration to actual application of principles of ecologically sustainable development (ESD) in the environmental laws of New South Wales (NSW), Environmental Law, Macquarie Law School Macquarie University, pp. 44. Grade - 1st Class. [Co-supervised with Dr A. Zaman, Macquarie Law School].

Ruillon, M. 2012. The nature and distribution of Cu, Zn, Hg, and Pb in urban soils of a regional city: Lithgow, New South Wales. Honours candidate, Environmental Science, Faculty of Science, Macquarie University, pp. 106. Grade - 1st Class. [Co-supervised with A/Prof Gore].

2011

Camenzuli, D. 2011. Sources of contamination and short-term environmental responses to smelter emissions in Port Pirie, South Australia. Honours candidate, Environmental Science, Faculty of Science, Macquarie University, pp. 117. Grade - 1st Class. [Supervisor].

Kristensen, L. 2011. Pyrogenic remobilisation of historic leaded petrol emissions. Honours candidate, Environmental Science, Faculty of Science, Macquarie University, pp. 80. Grade - 1st Class [Supervisor].

2010

Little, J. 2010. Lady Annie Copper Mine, Queensland: The Environmental Impact of heavy metal contamination from the 2009 Mine Spill. Unpublished Honours Thesis, Environmental Science, Department of Environment and Geography, Macquarie University, pp. 108. Grade - 1st Class Honours. [Supervisor].

2007

Kilgore, D. 2007. Lipid soluble metal complexes in aquatic environments. Unpublished Honours Thesis, Department of Physical Geography, Macquarie University, pp. 151. Grade - 1st Class Honours. [Co-supervised with Dr Simon Apte, CSIRO, Lucas Heights].

2006

Watson, E. 2006. The use of mine-derived trace metal element signatures to study recent sedimentation on tropical floodplains. Unpublished Honours Thesis, Department of Physical Geography, Macquarie University, pp. 106. Grade - 1st Class Honours. [Co-supervised with Dr Simon Apte, CSIRO, Lucas Heights].

2005

Lamaro, E. 2005. Do we need legislative reform for protecting riparian resources and ensuring effective environmental management? Assessing the boundaries of rivers in NSW to ensure sustainable development. Unpublished Honours dissertation, Macquarie University, Sydney, 38pp. Grade - 1st Class Honours. [Co-supervised with Dr. R. Stokes, Business Law, Macquarie University.]

Robin, V. 2005. Tsunami or storm deposits: the depositional origin of large boulders along Sydney's coastline. Unpublished Honours dissertation, School of Geography and the Environment, University of Oxford, pp. 70. Grade: 2/1 Honours. [Co-supervised with Dr Heather Viles, University of Oxford].

2004

Morris, O. 2004. The role of physical and chemical transport mechanisms in the dispersal of heavy metals and arsenic in the seasonally-wet tropical East Branch of the Fimess River, Northern Territory, Australia. Unpublished Honours dissertation, Department of Environment Science, Lancaster University, pp. 62. Grade - 1st Class Honours. [Co-supervised with Professor Keith Bevan, Lancaster University].

2002

Steam, C. 2002. The distribution of heavy metals in acid alluvial streams surrounding Broken Hill, NSW. Unpublished Honours dissertation, School of Geography, University of Oxford pp. 80. Grade - 1st Class Honours. [Co-supervised with Dr Heather Viles, University of Oxford].

2000

Kesterton, R. 2000. Mining and metals: heavy metal distribution in an arid environment and implications for pollution history and stratigraphy. Unpublished Honours dissertation, School of Geography, University of Oxford, pp. 80. Grade - 1st Class Honours. [Co-supervised with Dr Heather Viles, University of Oxford].

PERSONAL ACHIEVEMENTS

Charity work

- 2008 - present - *pro bono* work for landowners and contaminant poisoned communities and individuals.
- 2002 - present - various fund raising activities for Cancer Council NSW.
- 2004 - Top ten finish in the Sydney Oxtram 100km Trailwalker event - raised \$1500 for Community Aid Abroad.
- 1987 - Organised a one-day coast to coast charity cycle ride in the UK - \$7000 raised for cancer charities.

Major Sports awards

- 2009 - World Masters Bronze Medalist: 800m.

Paul Harvey *B Env (Hons)*

Curriculum Vitae

10 Woolisia Place
Baulkham Hills, NSW 2153
Phone (02) 9639 4860 Mobile 0423 513 732
paul.harvey@mq.edu.au

- 2009 – Gold Medalist 800m, NSW Masters Track and Field Championships.
- 2003 and 2004 – Gold Medalist, 400 and 800m, Australian Masters Track and Field Championships.
- 2002-2005 – Gold Medalist, 400m and 800m, NSW Masters Track and Field Championships.
- 2002 – Silver medalist, 400 and 800m, Australian Masters Championships.
- 1998 – British League Cup Finalist – 800m.
- 1996 – World Corporate Games Champion 200m and 400m.
- 1991 – Sportsman of the Year, University of Wales, Aberystwyth.
- 1991 – British Universities 400m Champion.

Interests

- **Sport:** UTS Athletic Club, NSW, athletics, road running, gym work, road cycling.
- **Travel:** Extensive travel in Australia, North America, Cuba, Asia, Africa, and Europe.
- **Recreation:** Spending time with family; property maintenance (we have acreage); photography (when time); motorbike riding.

Environmental Scientist

Tertiary Studies

Macquarie University

Doctor of Philosophy

Environmental contamination and human health

2013 -

Honours (grade 1st Class):

An Assessment of the Dispersal and Filtration Mechanisms in a Headwater Valley Upland Swamp Using Tracer Elements in Sediment, Wentworth Falls, New South Wales.

2012

Bachelor of Environment (Environmental Earth Science)

GPA: 3.18 (out of 4 for Macquarie University)

2009 – 2011

Conference Presentations

- ELSEVIER Environmental Health, Boston MA, USA, 2013.
Trouble in the Pipeline: Lead contamination of grazing lands adjacent to the Hunter Valley's Chichester Trank Gravity Main Water supply system.
- Australian Conference of Undergraduate Research, Macquarie University, 2012.
Trouble in the Pipeline: Lead contamination of grazing lands adjacent to the Hunter Valley's Chichester Trank Gravity Main Water supply system.

Recent Publications

- Harvey, P., 2013. Less Lead in Our Bagsge. *ON LINE Opinion – Australia's e-Journal of social and political debate*. <http://www.onlineopinion.com.au/view.asp?article=15616>, (accessed 30th January 2015).
- Harvey, P.J., Taylor, M.P, Grant-Vest, S., Kristensen, L.J., Romillon, M., Wu, L., Handley, H.K (submitted January 2015). Lead exposure risk in a former lead smelting community: assessment of a lead abatement strategy. *Journal of Environmental Management*.
- Harvey, P., Taylor, M.P. and Handley, H. (In review). Environmental contamination of soils from lead joints used in large water supply pipelines. *Water, Air, & Soil Pollution*.
- Harvey, P., Taylor, M.P., Handley, H. (accepted, subject to minor edits). Identification of the sources of metal (lead) contamination in drinking waters using lead isotopic compositions. *Environmental Science and Pollution Research*.

Awards

- Green Lifestyle Awards 2014 - Vegesafe Program (team member) - highly commended

Paul Harvey

- Macquarie University Research Excellence Scholarship, 2013.
- Macquarie University Mobility (Travel) Scholarship, 2010.

Recent Fieldwork Experience

- Sydney CBD (January 2013)
 - Development of sampling protocol for heavy metals in dust study.
- Adelaide Hills (June 2013)
 - Post bushfire environmental assessment of agricultural and natural forest lands.
- Elizabeth Macarthur Agricultural Institute (October 2013)
 - Hawkesbury - Nepean Catchment Management Association wildlife and natural asset survey.
- Ringarooma River Catchment (November 2013)
 - Hydro- and geo-chemical assessment of a mine impacted fluvial environment.
- Bidjigal Reserve (2013)
 - Scientific advisor.
- Port Kembla NSW (2014)
 - Soil sampling for copper surrounding former smelter.
- Boolaroo NSW (2014)
 - Environmental contamination assessment of Pasmenco Cockle Creek Smelter.
- Broken Hill, Cobarr, Balfourst, Batemans Bay, Cobargo, Milton NSW (2014-2015)
 - Healthy Water research study.

Recent Employment History

Organisation Job Title	Macquarie University Demonstrator / Tutor	(April 2012 – November 2014)
Organisation Job Title	Bidjigal Reserve Trust Volunteer Environmental Health Officer	(December 2013 – present)
Organisation Job Title	Blue Mountains Council Volunteer River Health Assessment Officer	(July 2011)

Non - Industry Related Courses

- Australian Senior First Aid (Workplace Level 2) (May 2012)
- NSW Class C Unrestricted Drivers Licence
- NSW Boat Licence (August 2005)
- Level 1 Referees Theory Course, Hornsby- Kuring Gai Basketball Association (February 2005)
- Level 0 Referees Theory Course (April 2000)
- Duke of Edinburgh Award Scheme
- SSI Open Water Scuba Diving Certification

Interests

- Basketball
- Jazz Guitar

Paul Harvey

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Paul Harvey

References

The following referees may be contacted by telephone or email in support of my application:

- Sara Dupressoir – sara.dupressoir@landcareaustralia.com.au
- Peter Mahoney – peter.mahoney@mq.edu.au, 0433 378 016
- Wendy Goonan – Bidjigal Reserve Trust, secretary@bidjigal.org.au

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Résumé: Steven George

134 Toronto Avenue, Cromer NSW 2099 | Phone: 0433 560 951 |
email: steven.george@students.mq.edu.au

Summary

A Macquarie University graduate, highly skilled in both literature and field-based research, including collection of data, analysis, and reporting and passionate about issues concerning environmental pollution. Extensive experience working under pressure, stress, and ever-changing circumstances in an adaptable manner, in order to deliver successful outcomes. Demonstrated excellence in negotiation, collaboration and all aspects of communication. An individual who relishes challenges.

Education and related experience

2011 – 2014 Bachelor of Environment (major in Environmental Earth Science and minor in Environmental Management)

Key achievements

- Chosen as Macquarie University's representative at the 2014 Annual DREAM International Student Summer Program for the Empowerment of Humanity through Community Involvement at Universitas Gadjah Mada in Yogyakarta, Indonesia on August 9 to 23, 2014
- Chosen as one of three Macquarie University representatives at the 5th University Scholars Leadership Symposium to be held in Phnom Penh, Cambodia, on August 1 to 7, 2014
- Letter of commendation and appreciation from Manly Local Council upon completion of research conducted on the impact of beach raking to the migration of sand at Shelly Beach. The reports recommendations were fully adopted and implemented by the Council. (Refer to coverage on Macquarie University website.)
- Major report on Environmental Lead as a product of mining at Broken Hill, concentrating on lead contamination at schools, playgrounds and outside surfaces and soils in regular contact with children. Awarded a grade of HD, the final report identified possible sources of contamination and risks posed to children.
- Recipient of the Aeon Benfield Award for Natural Hazards for highest grade awarded in the unit ENVE237 (Macquarie University 2012).

Work Experience

2014 – Present Macquarie University – Research Assistant to Professor Mark Taylor - Dept of Environmental Sciences Faculty of Science and Engineering

- Field work – soil / dust sampling of heavy metal contaminated sites from industry
- Assisted in review of Warringah Council's Riparian Corridor Policy for Development Application approvals (2014)

Résumé: Steven George

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- Assisted in review of the NT Ranger (Uranium) underground mine EIS for ground and surface water impacts from mining operations (2014)
- Assisted in reviewing a report into the impacts of Lead (Pb) and Nickel (Ni) dust on Townsville (Qld) from port operations (2014)
- Data analysis and interpretation of environmental pollution research project including data write up and final report submissions
- Research assistant to Macquarie University's award-nominated 'VegeSafe' program
- Tender and Grant applications for the research funding of environmental pollution projects including costing estimates and research methodologies
- General Administration – liaison with research clients and partners, processing receipts and related activities

1990-2010

NSW Police Force - State Protection Group, Tactical Operations Unit: SWAT. Leading Senior Constable (and Acting Sergeant 2005 – 2010)

Key Achievements

- An officer with the Tactical Operations Unit of the NSW Police, operating effectively within an extremely tight knit and highly trained team of specialists responsible for the resolution of high risk, critical, siege, hostage and armed offender situations.
- Five personal and unit citations for bravery and service, NSW Police Force between 1999- 2010.
- Demonstrated excellence in working under extremely hazardous and stressful conditions where direct supervision is not possible. Skills gained include maturity, creativity and solution-focused approaches to problem solving in highly volatile circumstances.
- Recognised commitment to and enthusiasm for best practice as regards knowledge generation, sharing and application through regular training (both in learning from teaching and instruction of others).

Qualifications and Professional Development

- Certificate IV in Workplace Training and Assessment
- Facilitator and instructor of numerous training course packages
- Management and leadership training

Skills

- Effective communicator, including proven skills in conflict resolution, mediation, negotiation, collaboration and reporting
- Proficient and confident with online research and operations of the Microsoft Office suite including PowerPoint and the use of graphics.

Résumé: Steven George

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- Data collection, analysis, correlation and interpretation
- Literature review and critical analysis
- Experienced in interpretation, enforcement and translation of legislation and policy

Referees

Professor Mark Taylor – Department of Environment and Geography, Macquarie University, New South Wales.
P: (02) 9850 4221 E: mark.taylor@mq.edu.au

Dr Anne-Louise Semple - Academic Director of PACE - Faculty of Science, Macquarie University, New South Wales.
P: (02) 9850 8412 E: anne-louise.semple@mq.edu.au

Paul Day – Head of Security, Jetstar Airlines, Mascot, Sydney, Australia
P: 0466 152 821 E: paul.day@jetstar.com

Acting Inspector Rene Van Hoven – Tactical Operations Unit, State Protection Group, New South Wales Police Force.
Sydney Police Centre, Goulburn Street, Surry Hills 2010
P: (02) 9285 3444 M: 0448 091 159 E: vanhoven@police.nsw.gov.au

