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ITEM 1 LITERATURE REVIEW OF LEAD AND OTHER HEAVY METALS IN THE WOLLONGONG LOCAL GOVERNMENT AREA

The Lead and other Heavy Metals Working Group comprising representatives from the NSW Environment Protection Authority (EPA), NSW Health and Council have been coordinating a literature review of all existing published environmental information on this issue.

The literature review was undertaken to develop an evidence base to guide future decision making and identify any gaps in current knowledge. The literature review aims to inform the working group in developing strategies to address contamination issues, should the need be identified. Given the historical uses and available literature, the review was focussed on the Port Kembla area. The project is being led by the EPA and is funded from the Port Kembla Community Investment Fund (PKCIF).

A final report on the literature review undertaken by Uniquest has been received by the relevant agencies. The report concludes that there is opportunity for further investigation and analysis into cadmium in soils and health risk assessment on houses for a range of heavy metals within one kilometre of the former copper smelter at Port Kembla.

The literature review was released by the EPA on 9 August 2021 via the EPA's website and to the media. Residents in the Port Kembla area within the vicinity of the former smelter site were also advised in writing of this release.

In response to the report's recommendations, the EPA has committed to undertaking soil testing to address any data gaps. The EPA will also offer voluntary soil testing to residents. The NSW Health preferred approach is to use existing blood lead level surveillance programs to determine exposure and health risks from lead in the Wollongong area. Whilst the EPA is the lead agency for the review and subsequent testing program, Council will support engagement activities that may be undertaken.

The EPA is complementing the release of the literature review with a multi-lingual education campaign. It is recognised that this is an issue known to many longer-term residents, therefore the promotions are aimed at new residents to the area.

RECOMMENDATION

The information in this report be noted.

REPORT AUTHORISATIONS

Report of: Chris Stewart, Manager City Strategy
Authorised by: Linda Davis, Director Planning + Environment - Future City + Neighbourhoods

ATTACHMENTS

1 Extract Summary from Literature Review of the Levels of Lead and Other Heavy Metals in Soil and Roof Dust in Wollongong and Measures to Manage any Associated Health Risk - 29 June 2020

BACKGROUND

On 3 August 2015, Council considered a Notice of Motion regarding lead and heavy metal contamination from industry and its impact on public and environmental health. Council resolved to work with the EPA and NSW Health to prepare information for the community on this matter and consider a taskforce to review and propose actions.

A Lead and other Heavy Metals Working Group was established in late 2015 comprising representatives from the EPA, NSW Health and Council. The purpose of this group is to understand what has been done in the past and to determine what, if any, future actions are required to further address heavy metal contamination in the Wollongong Local Government Area, particularly where human health risks are identified.

Legacy contamination resulting from Wollongong's industrial history has been extensively studied in the past. Based on these studies, no major remediation programs were previously proposed.

At its meeting on 29 May 2017, Council considered a report on 'Contamination and DCP Chapter Updates: for Exhibition' and resolved (in part) -

2 *Note that an independent review of information relating to lead and other heavy metals will be undertaken and the review and recommendations will be reported to a future meeting of Council.*

In 2018, the EPA, in consultation with the working group, engaged Uniquest (University of Queensland) to undertake the literature review. Uniquest were approached as preferred supplier due to their experience in undertaking work for the EPA Lead Expert Working Group regarding lead exposure management for the suburbs surrounding the former Pasminco lead smelter (Newcastle area). The review was led by Associate Professor Noller PhD who has had significant experience in the field of environmental chemistry and industrial toxicology for the past 40 years.

In accordance with the project brief the scope of works for the literature review was to -

1 *Seek information from the Port Kembla Pollution Meeting, Port Kembla Harbour Environment Group and other relevant stakeholders that may be available that should be considered under (2) below.*

2 *Undertake a comprehensive independent review and analysis of information in relation to the Wollongong LGA and –*

- *The levels and distribution of heavy metals in soils and roof dust*
- *Lead in air*
- *Blood lead levels*
- *Any associated strategies / measures to manage human exposure and prevent / minimise human health risks*

This review should include a detailed commentary and analysis of -

- *The information against relevant, contemporary national and international Australia guidelines. Australian guidelines include the National Health & Medical Research Council and National Environment Protection Council*
- *The rationale for the guidelines used to interpret information*
- *The extent and limitations of the data and information available*

3 *Provide an Independent Review Report with recommendations concerning the abovementioned tasks.*

The scope of the literature review did not include the commissioning of new sampling, testing or data.

Since the engagement of Uniquest the project has experienced some delay, notably due to resource diversion to deal with the COVID-19 pandemic. A final report has been received from Uniquest and its content and recommendations are discussed below.

PROPOSAL

The final report entitled - *Literature review of the levels of lead and other heavy metals in soil and roof dust in Wollongong and measures to manage any associated health risks* (Attachment 1) encompassed analysis of the following types of documents -

- Scientific papers published in peer reviewed journals (predominantly on soil, dust and blood lead levels, as well as mapping locally and measurement methods globally and review of the Working Group)
- Thesis studies from UoW
- Presentations from community meetings

- Standards and regulatory guidance documents (including Fact Sheets) for NSW, the Australian government and overseas
- Company technical reports on environmental studies on the Port Kembla sites to meet regulatory requirements
- Government initiated technical studies / reports on the local area and specific materials
- Lead and other Heavy Metal Contamination documents.

The collected data was compared against relevant, contemporary national and international guidelines. These include the National Health & Medical Research Council and National Environment Protection Council guidelines that are listed in the *NSW Contaminated Land Management Act 1997* (CLM Act), together with aspects of sampling and reporting for site contamination and managing contaminated land.

The report concludes that levels of total lead, and possibly cadmium, in soils may be above recognised Health Investigation Levels (HILs) for residential land uses in sites previously sampled close to the former copper smelter site (generally less than 1 km).

The presence of heavy metals including arsenic, lead, copper and cadmium in house (roof) dust were also reported in previous studies. These levels can vary depending on the age, location and construction of the house. The highest levels were within generally 1km of the former copper smelter. There are no standards (HILs) that allow the levels of these metals to be assessed.

Recommendations of literature review report

The literature review report makes the following recommendations -

1 Undertake measurement of both total and bioaccessible (gastro-intestinal - sieved at < 250µm) assay concentration of cadmium in soils <1km from the former smelter location to establish site specific data for more accurate comparison with the HIL A criteria.

2 Develop a methodology that will enable performing a health risk assessment on houses within 1km of the former copper smelter by screening using of floor wipe concentrations together with soil and house dust for total and bioaccessible (gastro-intestinal-sieved at < 250µm) assay for arsenic, cadmium and lead concentrations that can be inputted to the IEUBK model to predict blood lead of children and dose calculations for arsenic and cadmium.

In response to recommendation 1, the EPA has advised that they will undertake soil testing to address any data gaps. The EPA will also offer voluntary soil testing to residents.

In relation to recommendation 2, NSW Health's preferred approach is to use existing blood lead level surveillance programs to determine exposure and health risks as opposed to creating a health risk exposure model.

Surrender of Port Kembla Copper Environment Protection Licence

The former Port Kembla copper smelter site is currently regulated by the EPA under Environment Protection Licence (EPL 1753). Smelting and refining operations at the site ceased in 2003 with demolition works undertaken in 2014. Port Kembla Copper (PKC) operated the smelter between 2000-2003 and continue to operate a wastewater treatment plant (WTP) for the treatment of surface waters generated onsite during rainfall.

Separate to the literature review, the EPA has advised that PKC is seeking to surrender its EPL for the site. As part of a licence surrender process, the EPA is requesting that PKC address all reasonably foreseeable environmental risks associated with the former smelter including any ongoing environmental impacts. PKC is undertaking a range of onsite/offsite investigatory work to help inform any management strategies that may be required, including additional soil and indoor dust quality investigations that are proposed to commence shortly subject to Covid restrictions. At the request of the EPA, PKC has also engaged a Contaminated Site Auditor accredited under the CLM Act to provide independent advice.

This process is being led by PKC and the EPA. Council's role in this process is minimal.

Next steps

The EPA is complementing the release of the literature review with a multi-lingual education campaign. A factsheet on 'living safely with lead' has been send to Port Kembla residents, in addition to comprehensive information being made available on the EPA website. This will be promoted to the community over the next few months.

Whilst the EPA is lead agency for the review and subsequent testing program, Council will support engagement activities that may be undertaken as appropriate.

CONSULTATION AND COMMUNICATION

EPA prepared a communications strategy to guide their consultation and communication actions. To date these actions have included -

- dedicated webpage on the EPA website
- proactive media release, alerting residents to the report and the need to be lead-safe when gardening or renovating website updates
- letter-box drop in the area, to let residents know about the study and to remind them of the need to be lead-safe when gardening or renovating

A community drop-in to answer questions from the community staffed by EPA and Council was originally intended, as well as meetings with the Port Kembla Pollution Meeting and Port Kembla Harbour Environment Group and other relevant stakeholders to discuss the project. Due to the current COVID-19 restrictions, face to face engagement has not been able to progress.

PLANNING AND POLICY IMPACT

This report contributes to the delivery of Our Wollongong 2028 goal 5 "We have a healthy community in a liveable city". It specifically delivers on the following:

Community Strategic Plan	Delivery Program 2018-2022	Operational Plan 2020-21
Strategy	**4 Year Action**	**Annual Deliverables**
5.1.1 We work in partnership to build on opportunities to strengthen vulnerable communities	5.1.1.2 Continue to undertake social, land use and environmental planning activities that assists in service planning	Assist the NSW Environment Protection Authority (EPA) to undertake the Wollongong Local Government Area land contamination literature review

RISK MANAGEMENT

Any findings from the soil testing to be undertaken by the EPA or investigations by PKC will need to be considered in the context of relevant notations on the section 10.7 Planning Certificates for affected properties.

The results of soil testing on Council lands will need to be reviewed and risk management and/or remediation options explored as determined appropriate.

FINANCIAL IMPLICATIONS

Currently there are no financial implications related to the literature review, costs for the consultant to undertake the work have been funded from the PKCIF.

The investigations and analysis as per the recommendations in the report provided by the consultant will require funding, should they proceed. It is the view of Council staff that funding for this work should be borne by the polluter or at the state level because heavy metal deposition resulted from industry that was and is regulated by the EPA.

Any remediation or risk management works on Council land, in response to the findings from the PKC investigation, will require funding, coordination and resourcing. Staff are unable to predict the nature, scale and/or cost of these works at this stage.

CONCLUSION

The final report on the *Literature review of the levels of lead and other heavy metals in soil and roof dust in Wollongong and measures to manage any associated health risks* has been received by the Lead and other Heavy Metals Working Group. The report consolidates all previous studies on the presence of lead and other heavy metals in the region. The report concludes that there is opportunity for further investigation and analysis into cadmium in soils and health risk assessment on houses for a range of heavy metals within one kilometre of the former copper smelter at Port Kembla.

In response to the report the EPA has committed to undertake soil testing to address any data gaps and offer voluntary soil testing to residents. The NSW Health preferred approach is to use existing blood lead level surveillance programs to determine exposure and health risks from lead in the Wollongong area.

Further to the Council resolution made on 29 May 2017, it is recommended that Council note receipt of this report and findings of the literature review.

NSW Environment Protection Authority

Project No: C03750-001
29 June 2020

Prepared by: Professor Barry Noller

Literature review of the levels of lead and other heavy metals in soil and roof dust in Wollongong and measures to manage any associated health risks

1. Summary

The NSW Environment Protection Authority (EPA) has sought the services of a consultant to undertake a literature review and prepare a report on the key legacy contamination issues in the Port Kembla area from lead, other heavy metals (cadmium, copper and zinc), and arsenic in soil and associated human exposure.

Information has been generated from the Working Group but no meeting has yet been held with the Port Kembla Pollution Meeting, Port Kembla Harbour Environment Group and other relevant stakeholders due to the unprecedented COVID-19 related events. All reports, papers and internet listed in Schedule A were examined as were several papers and reports from past and recent literature.

The comprehensive independent review and analysis of information was undertaken in relation to the Wollongong LGA on levels and distribution of heavy metals and arsenic in soils and roof dust, lead in air, blood lead levels (BLLs) and associated strategies/measures to manage human exposure and prevent/minimise human health risks.

The review has considered the available information and data for the Port Kembla area. The data is compared against relevant, contemporary national Australia and international guidelines. These include the National Health & Medical Research Council and National Environment Protection Council guidelines that are listed in the NSW Contaminated Land Management Act 1997 (CLM Act) (listed in Appendix C of this report), together with aspects of sampling and reporting for site contamination and managing contaminated land.

The rationale for the guidelines used to interpret information has been achieved by following the current NEPM practices for soil and air, the NHMRC, the enHealth Human Risk assessment methodology, ANZECC/ARMCANZ (2000)/ANZG (2018) for water and sediment and making reference to FSANZ food guidelines. Some application of overseas guidelines was appropriate in the absence of suitable Australian guidelines, including the USEPA house clearance standards (2001) and the German air pollution control regulation TA LUFT (TA LUFT, 1990, 1999) and New Zealand guidelines (2001). Best practice is achieved if the health risk assessment approach of enHealth (2012) is followed with guidance of NEPM (NEPC 2013) and the NHMRC (2016) by using their standardised procedures, including those of Standards Australia. In the absence of Australian guidelines or standards, those from overseas are used.

This independent review report makes the following conclusions:

Soil

- The highest arsenic copper and zinc total concentrations do not exceed HIL A when plotted vs. distance from the copper smelter.
- Total lead concentration exceeds HIL A when <1km from the smelter but testing with a proper bioaccessibility (gastro-intestinal) assay is likely to confirm the finding that 0.1M Hydrochloric acid extractable lead concentration could show no exceedances of HIL A for all samples excluding the highest slag sample S58.
- Based on some of 22 samples total cadmium concentration above detection limit exceeding HIL A, further investigation of cadmium in soil, as collected by Jafari (2009) is warranted and should include both total and bioaccessible cadmium to enable a complete health risk assessment to be undertaken.

House dust

- House dust samples collected from houses between 1992 and 1997 as accumulated roof dust, ceiling, wall vent and crack dust, floor and carpet dust, shelves and window sills showed highest concentrations of lead and arsenic in house dusts between 0.3 and 1.0km from the copper smelter (Willison, 1993). Although lead in house dust is recognised as one of the best predictors of childhood exposure to lead poisoning, it remains least understood as no data set exists from Port Kembla.

There is no data available measured via a health risk based guideline to identify if dust in houses within 1km of the former copper smelter at Port Kembla is a potential health risk, or from lead paint.

- The houses within 1km of the former copper smelter need to be screened by using of floor wipe concentrations together with soil and house dust for total and bioaccessible lead concentrations that can be inputted to the IEUBK model to predict blood lead of children.

Lead in air

- Monitoring of lead in air particulates is of limited importance for health risk assessment as the fraction collected as PM_{10} (10 µm diameter) that enter the bronchial tubes only constitutes 5% of exposure dose. The apparent importance of monitoring airborne PM_{10} for lead is outweighed by the need to have data which explains contribution to dose from the ingestion exposure pathways.

Blood lead levels

- Since the copper smelter operations have ceased it is unlikely that fall-out dust deposition is likely to reach significant levels as occurred during the operational phase at Port Kembla. However, reconstitution and remobilisation of historical dust deposition in soil through undertaking earthworks or renovation of older houses may occur.
- Since 1994, there has been no community BLL survey at Port Kembla. Since 2016, the NHMRC recommended that if BLL is greater than 5µg/dL, the source of exposure should be investigated and reduced, particularly if the person is a child or pregnant woman. Investigating the source of exposure where BLLs are greater than 5µg/dL will reduce the risk to individuals, particularly children (NHMRC, 2016).
- The US EPA IEUBK model is considered suitable at Tier 2 for assessing risks from lead and can be applied for predicting blood lead on children who are exposed to lead from soil and house dust (Section 3.6.4; NEPC 2013, Schedule B4).

Any associated strategies/measures to manage human exposure and prevent/minimise human health risks

Key details of relevance to the Port Kembla case were identified as follows:

- Reduction of lead in air and BLL is a basis for closure on site. A lead budget gives an estimate of total lead in the environment to map the fate.
  - Remediation is based on removal of lead and/or prevent its dispersion and re-entrainment in air.
  - Assessing effects on people require guidelines that are based on human health risk assessment.
  - There is a common observation that highest surface soil within 2km of smelter and accompanies highest child BLL.
- Utilisation of appropriate techniques at houses including indoor lead flux and passive wipe methods in houses and measurement of bioaccessibility in soil and dust for hazard assessment including dose response, and BLL for exposure assessment, enables effective application of health risk assessment.
- Lack of capability to identify sources of lead is dependent on insufficient range of analytical techniques being used.
- House study for health risk assessment together with IEUBK model to predict BLL of children requires site specific soil and dust levels using.

The extent and limitations of the data and information available

Appropriateness of guidelines and lack thereof

- House dust assessment lacks an appropriate health risk based method that can be applied routinely at locations like Port Kembla. In the absence of validated guidelines, estimates based on exposure are required to identify if the surface wipe criteria are valid to assess the health risk from dust in houses.

Analytical methods

- House dust health risk assessment stands out as an area requiring further development of methodology, particularly for arsenic and cadmium.

Limited data collection and routine monitoring

- The data limitation for the environmental and health studies conducted at the Wollongong LGA in the 1990s or earlier reflects the importance of maintaining a level of monitoring that will enable health risk assessment to be performed.

Insufficient selectivity of analytical techniques

- Synchrotron X-ray absorption (XAS) analysis, in contrast to lead isotope ratios, shows resolution of lead source at Mt Isa based on compound composition differences in environmental samples. This approach will assist in undertaking more accurate human health risk assessment.

Recommendations

The following recommendations from this independent review report are made:

1. Undertake measurement of both total and bioaccessible (gastro-intestinal- sieved at < 250µm) assay concentration of cadmium in soils <1km from the former smelter location to establish site specific data for more accurate comparison with the HIL A criteria.
2. Develop a methodology that will enable performing a health risk assessment on houses within 1km of the former copper smelter by screening using of floor wipe concentrations together with soil and house dust for total and bioaccessible (gastro-intestinal-sieved at < 250µm) assay for arsenic, cadmium and lead concentrations that can be inputted to the IEUBK model to predict blood lead of children and dose calculations for arsenic and cadmium.