ANUgreen
Strategies for Sustainability

2009-10 Environmental risk management report for the Australian National University

by Dr Su Wild River

Conducted using

CERAM
Comparative Environmental Risk Assessment Method

2009-10 Environmental Risk Assessment Report for the Australian National University

Incorporating results from 1998 to 2010.

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1. Executive Summary

The Australian National University (ANU) continues to steadily approach a 'best practice' goal of 20% residual risk across campus (using the Comparative Environmental Risk Assessment Method - CERAM). Residual risk was at 58% in 1998, and now stands at 25%.

ANU has been implementing a coherent program for environmental risk management since 1998. This has involved risk assessment, priority identification and action to improve both infrastructure and culture for environmental risk management.

This report gives results from environmental risk management efforts, focusing on actions taken in 2009-10. It is structured around the relevant sections of the ANU EMP, discussing risk reduction targets and achievements, infrastructure improvements, and minor pollution incidents.

In 2009, ANU launched a new Environmental Management Plan (EMP) in 2009. Environmental risk management strategies from the previous EMP were carried over. The new plan extends the previous approach with reference to:

- A chemical inventory system,
- A register of environmental events, incidents and ticketable offences,
- Investigations of suspected cases of reduced waste quality in Sullivan's Creek, and
- Enhanced public education campaigns through high quality signage on stormwater entry points.

Section 2 of this report provides background to Environmental Risk Management at ANU. Section 3 gives an overview of methods. Section 4 reports on environmental risk results using CERAM. Section 5 describes recent observed minor pollution incidents. Section 6 summarises results for other strategies. Section 7 contains photographs and short summaries of recent risk reduction actions.

There is one key recommendation presented in this report, aiming to continue the reductions of environmental risk across science buildings (as well as the School of Art).

Recommendation

For the University Executive to support the consistent and comprehensive application of the Chemical Inventory System through policy statements, practical resources and realistic timeframes (aiming to achieve Achieve 90% coverage by 2012 and 100% by 2015 as in ANU Environmental Management Plan 2009-2010 Strategy 3.4.5).

2. Background

Environmental risk management at The ANU is a collective effort. It involves:

- *The Environmental Risk Management Officer* - employed in Facilities and Services' ANUgreen Office to assess campus environmental risk and coordinate efforts to reduce risk through pollution prevention actions;
- *The Security Office* – providing 24 hour, first response to pollution incidents;
- *University Maintenance* – providing infrastructure, training and ongoing management of water supply systems, drains, electricity, exhaust systems, recycling facilities and other systems; and
- *Hazardous Waste Safety Committee* – reducing quantities and toxicity of laboratory chemicals and providing pollution prevention systems directly to

chemical users;

- *The Occupational Health and Safety Unit* – coordinating policies, procedures and training in the management of hazardous materials;
- *Risk Management and Audit Office* - established in late 2004, providing training, development and other services in risk management generally.

The sections of the ANU EMP 2009-2015 relevant to environmental risk management are reproduced in the table below.

Risk and Pollution Goal

Minimise the likelihood and consequences of all potential emissions from ANU.

Table 2.1. Risk and Pollution Strategies

#	Strategy	Indicators	Stakeholders (ANUgreen and…)	Timing
1	Continue annual environmental risk assessments and reporting using Comparative Environmental Risk Assessment Method, aiming to maintain a residual risk below 20%. *Enhance existing systems through self-assessments.*	Risk, incidents	Head Technical Officers and Building Managers especially in higher-risk buildings	Annually
2	Continue to ensure that suitable spill kits are available to clean any foreseeable spill at ANU	Risk, incidents, emergency Services	Occupational health and Safety Unit, Security Division, Head Technical officers, University Maintenance	Ongoing
3	Continue to oversee the planning and installation of pollution prevention equipment as needed for specific, identified sites. Train relevant staff and students in their use	Risk, participation, professional development	Occupational health and Safety Unit, Security Division, Head Technical officers, University Maintenance	As needed
4	Continue to investigate, manage or remove possible point sources of pollution from the ANU	Risk, incidents, emergency services	Occupational health and Safety Unit, Security Division, Head Technical officers, University Maintenance	As needed
5	*Implement chemical barcode system to track hazardous substances*	*Risk, hazardous materials, emergency services, incidents*	*Occupational Health and Safety Unit, Head Technical Officers, Hazardous Waste Planning Committee*	*Achieve 90% coverage by 2012 and 100% by 2015*
6	Incorporate environmental risk management into standard procedures and practices	Risk, contact, professional development, incidents, emergency services	Occupational Health and Safety Unit, Head Technical Officers	Ongoing
7	*Establish and maintain a register of environmental events, incidents and ticketable offences and review these to improve protection*	*Incidents, emergency services*	*Occupational Health and Safety Unit, Head Technical Officers, University Maintenance, Risk Management and Audit Office*	*Ongoing*
8	Continue monthly monitoring and public reporting of Sullivans Creek water quality	Contact, participation, risk, resilience, incidents	Volunteers	Monthly
9	*Investigate any suspected cases of water quality reductions through extra sampling and analysis when needed*	*Contact, participation, risk, resilience, project tme, incidents, emergency services*	*Volunteers, student interns*	*As needed – possibly once a year*
10	*Continue public information campaigns to prevent stormwater pollution, applying high quality signs to all drains*	*Contact, risk*	*University Maintenance*	*Install in 2009*
11	Continue to install and monitor sediment traps where needed	Risk, incidents, emergency services	University Maintenance, Technical Staff	As needed
12	Continue stormwater management and spill prevention training, and add other pollution prevention courses as needed, including for cleaners and science areas	Professional development, participation, risk.	Technical staff and students.	As needed.

3. Methods

ANU uses the Comparative Environmental Risk Assessment Method (CERAM) for these reports. CERAM works by considering the likelihood and consequences of pollution, given the environmental conditions and the controls that are in place at each environmental hazard. It distinguishes the inherent and residual risk of pollution incidents, and reports these using a semi-quantitative, logarithmic scale. Inherent risk is a measure of the likelihood and consequences of environmental harm occurring from a hazard if there were no controls in place. Residual risk measures the likelihood and consequences of environmental harm taking account of controls. Percent residual risk identifies the portion of a risk that remains unmanaged despite the controls that are in place.

Table 3.1 below gives definitions for likelihood and consequences of environmental harm that are used in CERAM assessments. Table 3.2 is the risk management matrix complete with qualitative and quantitative risk scores.

Table 3.1 Likelihood and Consequences of Environmental Impacts

Likelihood (How likely is the event to occur)		**Consequence (Significance of associated environmental impact)**	
Rating	**Definition**	**Rating**	**Definition**
A Chronic	The event is expected to occur in most circumstances	**5** Catastrophic	Disaster with potential to lead to collapse
B Frequent	The event probably will occur in most circumstances (e.g. weekly to monthly).	**4** Major	Critical event, which with proper management , will be endured
C Likely	The event should occur at some time ie. once in a while.	**3** Moderate	Significant event, can be managed under normal procedures
D Unlikely	The event could occur at some time	**2** Minor	Consequences can be readily absorbed but management effort is still required to minimise impacts
E Rarely	The event may occur only in exceptional circumstances.	**1** Insignificant	Not worth taking action over

Source: Standards Australia 1999. As adapted by Wild River.

Table 3.2 Environmental risk matrix

Likelihood	**Consequences**				
	1 Insignificant	**2 Minor**	**3 Moderate**	**4 Major**	**5 Catastrophic**
A Chronic	8 (M)	16 (M)	32 (H)	64 (VH)	128 (E)
B Frequent	4 (L)	8 (M)	16 (M)	32 (H)	64 (VH)
C Likely	2 (N)	4 (L)	8 (M)	16 (M)	32 (H)
D Unlikely	1 (N)	2 (L)	4 (L)	8 (M)	16 (M)
E Rare	0 (N)	1 (N)	2 (N)	4 (L)	8 (M)

Risk Assessment Rating -
(N) - negligible (L) -low (M) - moderate (H) - high (VH) - very high (E) - extreme
Source: Standards Australia 1999. As adapted by Wild River.

There are three main outputs from a CERAM assessment that enable rigorous, consistent and defensible assessment and priority-setting for pollution prevention actions. The first is the total value of the inherent risks. This gives a measure of overall pollution potential in a realistic worst-case scenario. Activities, hazards or impact areas with the highest total inherent risk need ongoing management attention regardless of how good the controls are, since major problems might result

if systems to prevent pollution from these ever failed. Individual hazards with inherent risks of 32 or more are generally considered to be high-risk (Brisbane City Council 2003).

The total residual risk is also important, as this is a measure of the actual risk of pollution, taking account of the controls that are in place. Activities or hazards with the highest residual risk are most likely to actually cause a pollution event. When the residual risk for a single activity is 16 or more, then improvements are called for. The appropriateness of this threshold is clear from Table 2 above. A residual risk of 16 means either that minor pollution is occurring chronically, moderate pollution frequently, major pollution is likely, and that a catastrophic event could occur at some time. An activity receiving this rating is not complying with environmental protection laws, and any responsible operator would seek to improve its performance.

A full description of the method is available in Chapter 5 of Wild-River and Healy 2006, *Guide to Environmental Risk Management.*

4. Approaching Environmental Risk Targets

The nature, scale and management of environmental hazards at The ANU are strongly related to five distinct building-types. They are:

- **Science** – including all buildings with laboratories and chemical stores;
- **Food** – including commercial food outlets and halls of residence;
- **Arts** – including the School of Art, Arts Centre;
- **Service** – including all Facilities and Services centres; and
- **Others** – including libraries, administrative areas, and office-style buildings.

Environmental receptors covered in this report are:

- **Water** – for aquatic ecosystems, drinking and agricultural water supply, recreation and industry;
- **Air** – qualities conducive to life, health and wellbeing, ecosystem values and prevention of an enhanced greenhouse effect;
- **Waste** – conserving natural resources, preserving uncontaminated sites and optimal disposal of hazardous materials;
- **Noise** – quietness in noise-sensitive areas and times; and
- **Soil** – the productive values of land and prevention of contamination.

The environmental risk target established by the EMP is to achieve a 20 per cent residual risk by the end of 2008. Per cent environmental risk is a measure of the proportion of environmental risk that remains unmanaged given current controls. To achieve this, an operation needs to average more than two separate environmental controls on all hazards. This is a best-practice target, with only 15 per cent of sites operating at a lower residual risk in the largest representative study to date (data from wild-river 1998). Per cent residual risk is calculated as:

$$\text{Per cent residual risk} = \frac{\text{Residual environmental risk}}{\text{Inherent environmental risk}} \times 100$$

4.1 Total environmental risk

Figure 4.1 shows ANU total and residual environmental risk between 1998 and 2010. The graph shows a gradual rise in the inherent risk profile of the campus. The rise is mainly due to the new buildings that have been added to the campus infrastructure during the last decade, many of which have introduced new potential environmental hazards.

The downward trend in residual risk has been increasing, especially in recent years. The big shifts are due to improvements to the pollution prevention infrastructure across campus, backed up by cultural shifts resulting from training and awareness campaigns. In 2009-10 the big risk reductions have been from the introduction of the Chemical Inventory System, and a shift into new science buildings, with better infrastructure and managements systems for managing risk (see Section 6)

Figure 4.1 ANU Total Environmental Risk

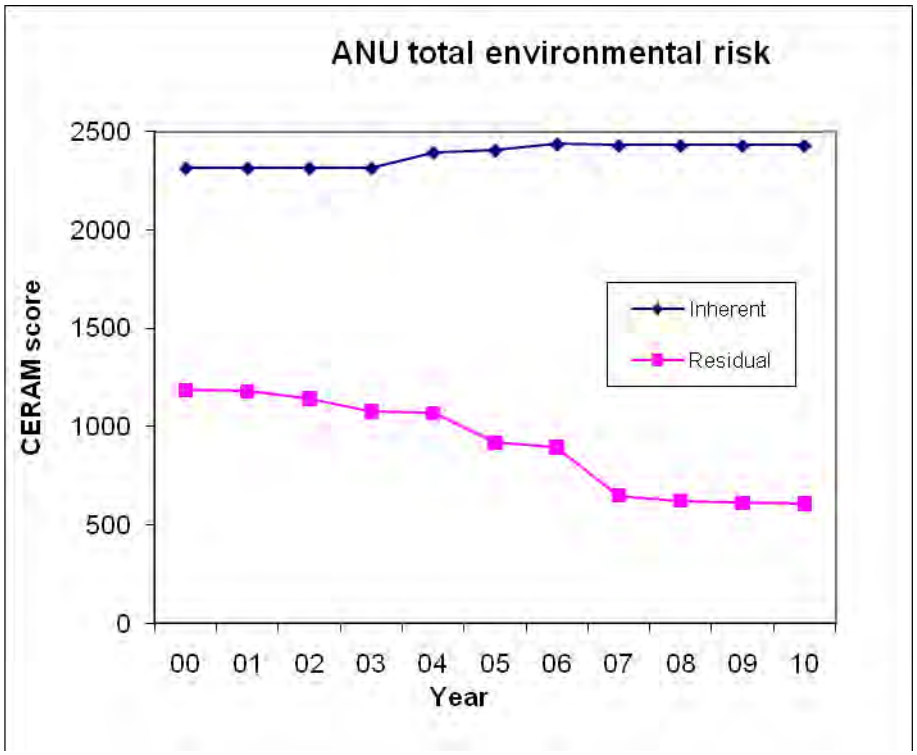
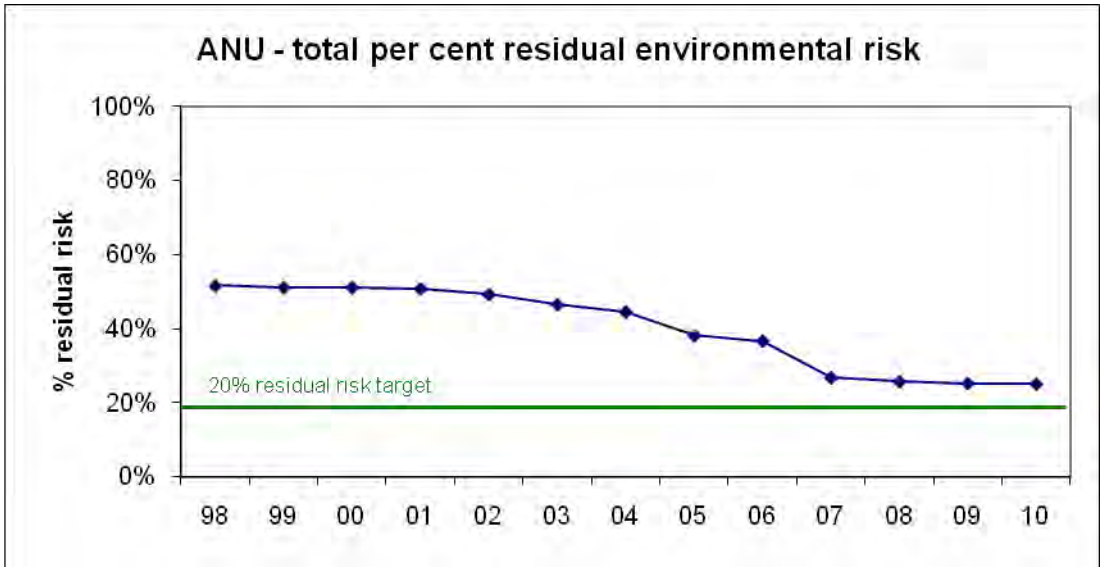


Figure 4.2 shows the per cent residual environmental risk across all of ANU. Residual risk was at 50 per cent in 1998, and now sits at 25 per cent. Although the ambitious target of a 20 per cent residual risk was not achieved, the continual improvement in residual risk compared with inherent is clear.

Figure 4.2 ANU Total Per Cent Residual Environmental Risk



4.2 Environmental risk by building-type

The following graphs (collectively Figure 4.3) show total and residual environmental risk by building-type across ANU. Some of the important points to be drawn from these graphs are:

- The risk profile is highest overall for the science buildings, followed by food, arts, service and others.
- Science buildings are also the group where inherent risk has risen most in recent years.
- The per cent residual risk was highest at food and other buildings, but in both cases is approaching the 20 per cent target.
- Per cent residual risk is still well above 20 per cent in both science and food buildings. In food buildings, residual risk is still at 35%. In science buildings, the ongoing roll-out of the Chemical Inventory System is steadily reducing residual risk which now stands at 23%.

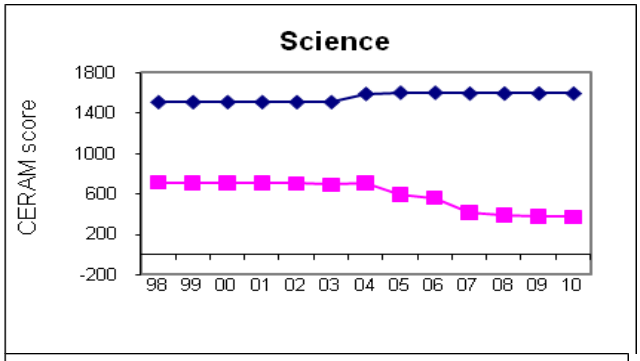
The key opportunity to reduce environmental risk in the highest-scoring science buildings is to ensure that the Chemical Inventory System is applied in a consistent manner across all of the ANU campus. This will maximize the university's capacity to centrally manage the ordering, storage and distribution of hazardous substances and will minimise the build-up of unwanted chemicals.

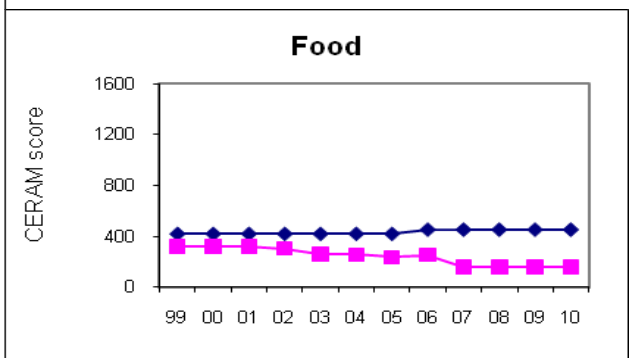
Recommendation

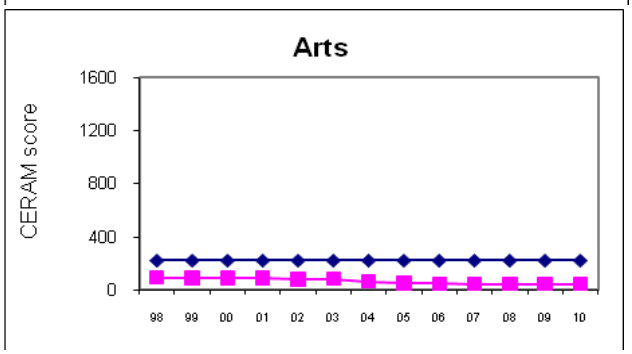
For the University Executive to support the consistent and comprehensive application of the Chemical Inventory System through policy statements, practical resources and realistic timeframes (aiming to achieve Achieve 90% coverage by 2012 and 100% by 2015 as in ANU Environmental Management Plan 2009-2010 Strategy 3.4.5).

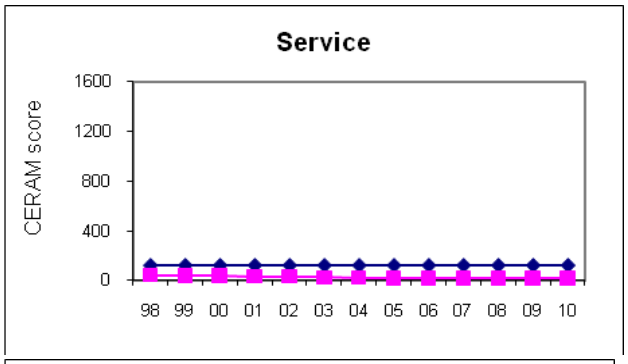
Figure 4.3 ANU Environmental Risk by Building Type

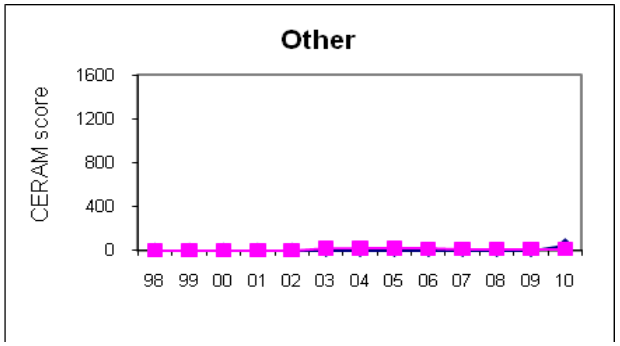
Total environmental risk



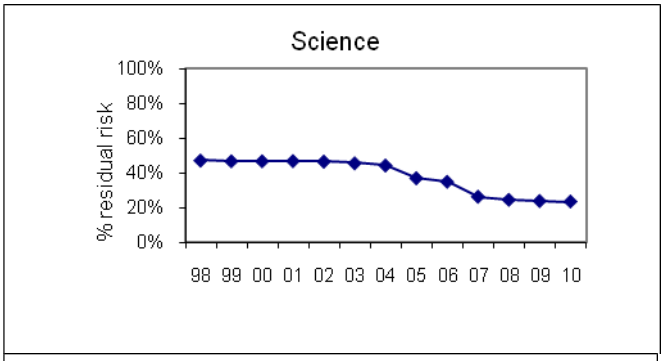


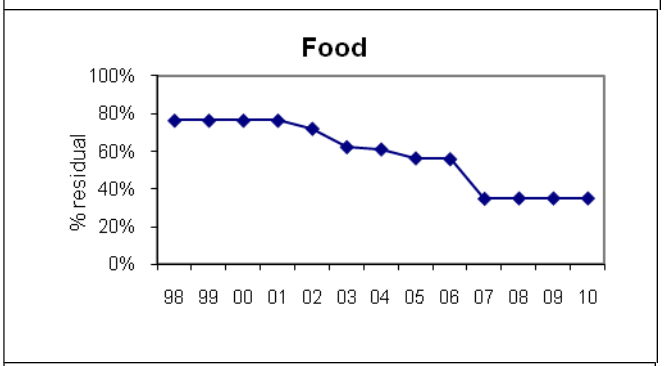


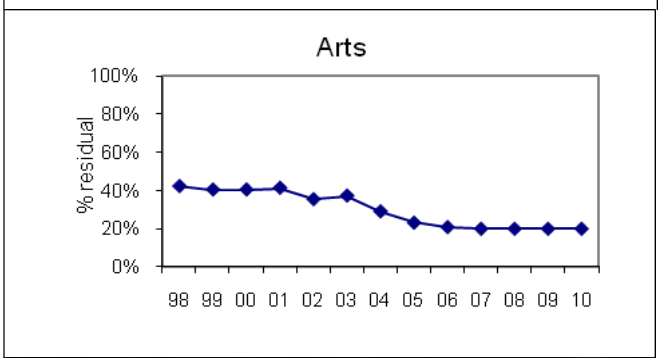


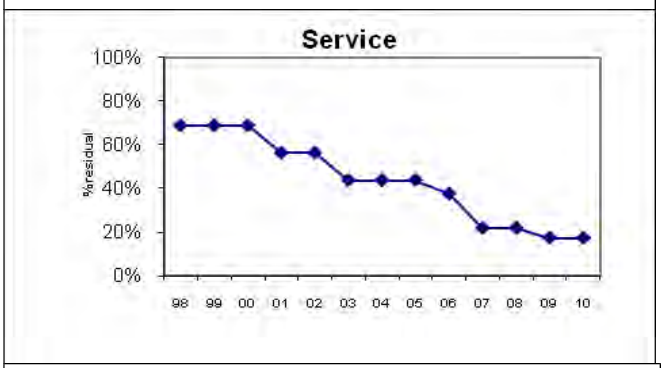


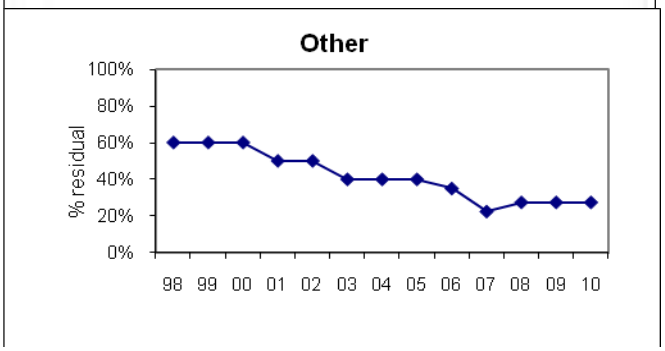
Per Cent Residual Environmental Risk











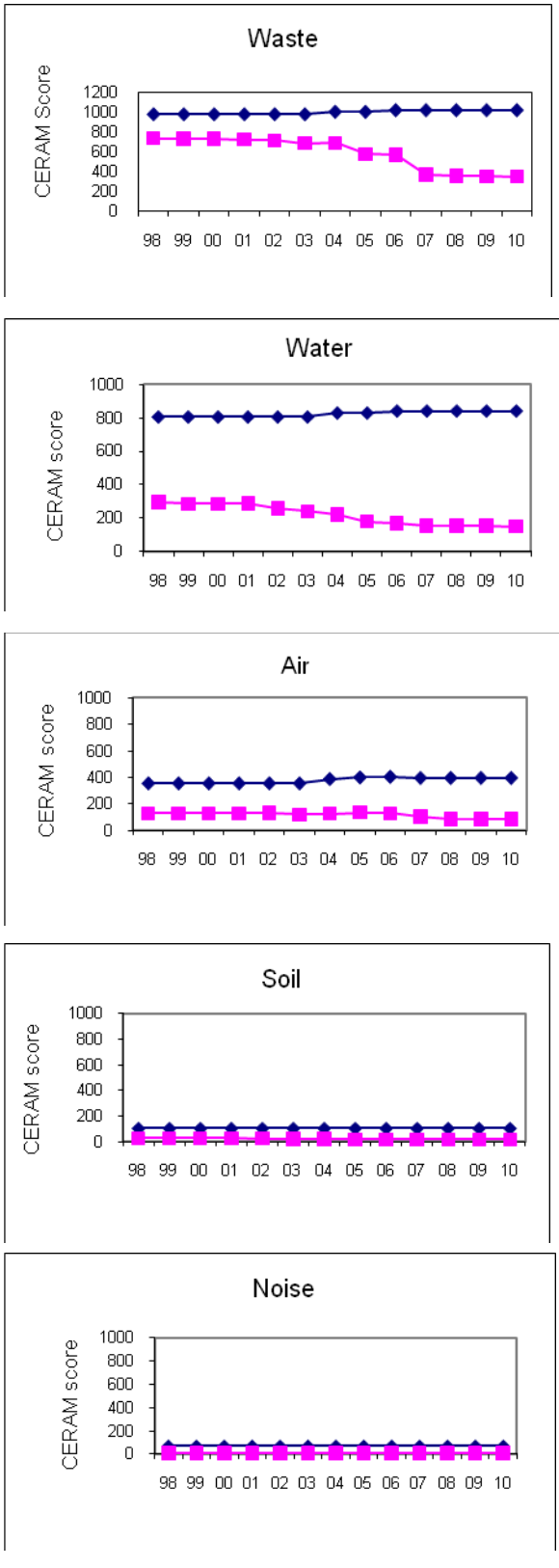
4.3 Environmental risk by impact area

The following graphs (collectively Figure 4.4) show total and residual environmental risk by receptor across ANU. Some of the important points to be drawn from these graphs are:

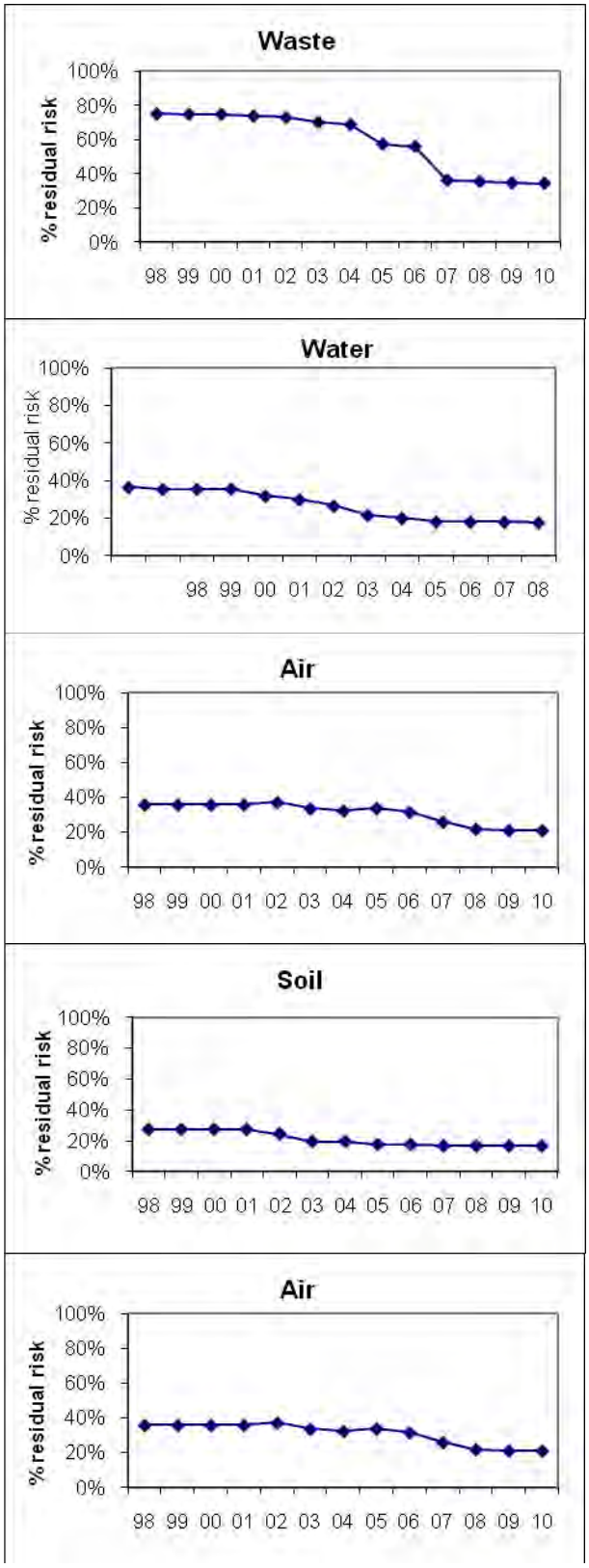
- The environmental risk profile of The ANU is dominated by hazards associated with water and waste.
- The residual risk of waste has declined dramatically in recent years, from 75 per cent in 2004 to 34 per cent in 2010. The implementation of the Chemical Inventory System, continual improvement in recycling systems, and recent introduction of organic waste recovery have been strong contributors to these improvements. Actions to reduce water waste in scientific laboratories have also had a big impact.
- The slight increase in water pollution risks recorded between 2004 and 2005 were due to maintenance problems – such as sediment traps not being regularly emptied, or wastes stored above stormwater drains. Ongoing training and awareness programs are needed to prevent such problems.

Figure 4.4 ANU Environmental Risk by Receptor

Total Environmental Risk



Per Cent Residual Environmental Risk



5.1 Avoiding Actions that Could Cause Infringements

As with previous years, the assessment looked for minor, 'ticketable' environmental

offences under the *ACT Environmental Protection Regulations 1997*, No. 36. Schedule 5 of the *Regulation* lists 'ticketable' offences that can incur on-the-spot fines. There are two levels of offence here. Type One is more serious, and relates to direct pollution of the stormwater system by paint, automotive fuels, oils or greases, cooking fats or oils, degreasers, detergents, or by animal, food or other wastes. Type Two offences are less serious, and relate to leaving any of the same substances unattended within 10 metres of a drain, if they are exposed to rain or runoff. Figure 5.1 shows the history of such offenses being observed at ANU over the last decade.

Figure 5.1. History of Observed Non-Compliance

5.2 Incidents

The incidents that were observed were sediment outfalls from the building projects. These were reported to site managers and resolved within minutes in each case. Figure 5.2 below shows one such incident, where a high sediment load was deposited in Sullivan's Creek, through the stormwater system, for a brief time. Figure 5.3 shows a drain entry point where sediment enters stormwater from construction.

Figure 5.2. Sediment load entering Sullivan's Creek through stormwater drain from construction site

Figure 5.3. Partial failure of stormwater drain protection at construction site.

6. Report on other risk management strategies from the 2009-2010 EMP

Table 6.1. Implementation of Risk and Pollution Strategies from ANU Environmental Management Plan 2009-15

#	Strategy	Report on progress
1	Continue annual environmental risk assessments and reporting using Comparative Environmental Risk Assessment Method, aiming to maintain a residual risk below 20%. *Enhance existing systems through self-assessments.*	This document presents the assessment and report for 2009-10.
2	Continue to ensure that suitable spill kits are available to clean any foreseeable spill at ANU	Updating, cleaning and refreshing has continued.
3	Continue to oversee the planning and installation of pollution prevention equipment as needed for specific, identified sites. Train relevant staff and students in their use	Liaison undertaken on facilities for new science precinct and facilities.
4	Continue to investigate, manage or remove possible point sources of pollution from the ANU	Ongoing – but few remaining to be resolved.
5	*Implement chemical barcode system to track hazardous substances*	*Being overseen by dedicated committee, led by senior technical officers at Research School of Chemistry, John Curtin School of Medical Research, Hazardous Waste Planning Committee. Concerns are ongoing about consistent, all-of campus roll-out to ensure maximum benefits.*
6	Incorporate environmental risk management into standard procedures and practices	Largely in place.
7	*Establish and maintain a register of environmental events, incidents and ticketable offences and review these to improve protection*	*Reviewing existing systems for incident reporting to identify any gaps.*
8	Continue monthly monitoring and public reporting of Sullivans Creek water quality	Ongoing though student internship project.

9	*Investigate any suspected cases of water quality reductions through extra sampling and analysis when needed*	*None noted in 2009-10. Student intern available with funding for this. Have had some liaison with Catchment Managers and academics to make sense of dissolved oxygen readings.*
10	*Continue public information campaigns to prevent stormwater pollution, applying high quality signs to all drains*	*High quality curb markers being installed lat 2010. Outcomes not included in this year's figures.*
11	Continue to install and monitor sediment traps where needed	Ongoing by plumbers.
12	Continue stormwater management and spill prevention training, and add other pollution prevention courses as needed, including for cleaners and science areas	No training provided in 2009-10.

7. Recent risk reduction actions

The following images show some of the ongoing improvements being made to ANU facilities which are helping to continually reduce residual risk.

Figure 7.1. Boom gates and other security features protect the new chemical store at Research School of Chemistry.

Figure 7.2. Spill kit in place, at secure bulk chemical and waste storage areas at Research School of Chemistry.

Figure 7.3. New artificial turf oval reduces water wastage.

Figure 7.4. The Heavy Ion Accelerator has been serviced to significantly reduce emissions of SF6 which previously occurred during servicing.

Figure 7.5. Storage of radioactive materials has been achieving new statutory standards.

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