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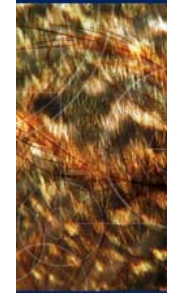
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Radiation Source Loss case study

Doug Pringle
Manager,
Health and
Safety



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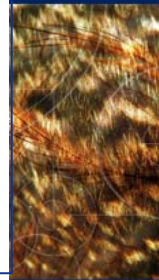
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Established 1963, Palmerston North

- **Ex Massey Agricultural College**
- **Veterinary School**
- **Biological sciences strengths**

Physics as a discipline – emerging

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1993 Albany campus established – Auckland

1996 Palmerston North – merger with

College of Education

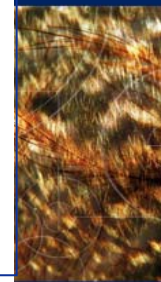
1999 Wellington – merger with

Wellington Polytechnic

Strategic research alliances

- **Landcare**
- **DSIR (Grasslands)**
- **MaF**
- **Fonterra (formally Dairy Research Institute)**

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Radiation use and venues

Sealed sources

Biological sciences (reference sources)

Pure sciences

Unsealed sources

Biological sciences

Veterinary diagnosis, treatment, research

Apparatus

Pure sciences

Biosciences

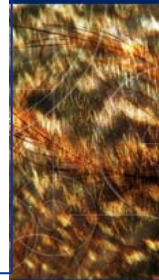
Veterinary

Technology and engineering

Soil sciences

Geography

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Regulatory environment

- Radiation protection act 1986
- Radiation protection regulations 1982

Owners task – appoint responsible person to safeguard hazard

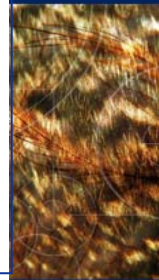
THE LICENCEE

Licensee – responsible for all else

A natural person

- Radiation safety officers – optional

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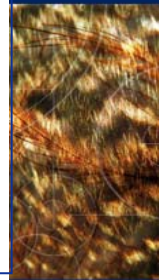
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Australasian Contrast

Radiation Safety Officers

NT - required	– licensee appoints
QLD - required	– licensee appoints
TAS - required	– licensee appoints
WA - required	– owner appoints
NSW - can be directed	– EPA
NZ - optional	– licensee appoints
VIC – optional	– management licensee

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Radiation management @ Massey

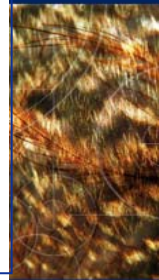
Pre 1996 A single licensee

- all purchases
- all records
- one licence fee

> 1996 Multiple licences

- closer to the bench
- more revenue for the regulator
- devolved “licences = expert users”

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2004 Misplaced source

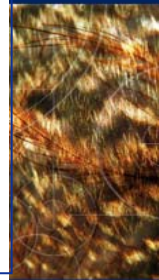
- regulatory attention, concern
- radiation becomes a safety issue
(no resources supplied)

**2003 Principal licensee attempt
rejected by licensees**

**Radiation safety plan established
2005/2007**

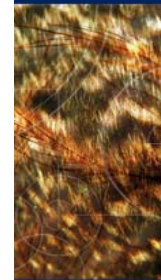
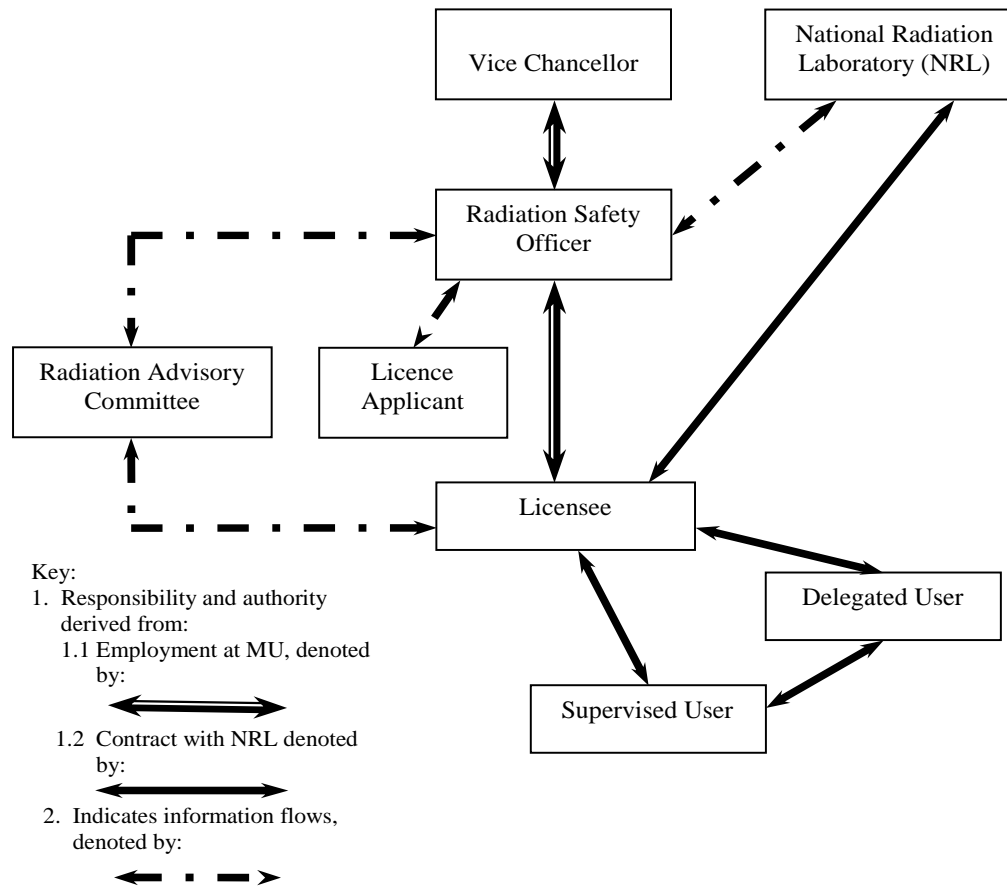
**Appoint radiation safety officer (audit)
2008**

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Radiation safety plan





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Radiation management @ Massey

In summary

Evolving expectation by regulator

Evolving management

Licensee resistance

Discipline issues

Strategic alliances resulting in

multiple ownership

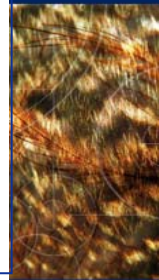
multiple locations

inter organisational licensees

Opportunistic acquisition

Legacy sources and disposal issues

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Lost source - history



Wallac Liquid Scintillation counter

- 1985 purchased by Mu
- 1994 relocated to CRI (CRI licensee)
- located with similar counter owned by CRI
- ~ 2002 breaks down and not repaired by Mu
- 2004 CRI want bench space

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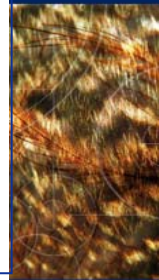
LS History cont'd

2005 - transferred to Mu licence (opportunistic acquisition)

- **error by regulator – transfers two scintillation counter to Mu licensee**
- **also leaves both counters on CRI licence**
- **both licensees continue to sign as caring for two counters**

May 2005 - moved to a large plant room @ Mu for storage

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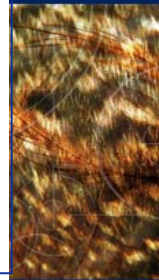
History cont'd

February 2007 - Estates want plant room cleared of scientific apparatus

- counter listed as requiring special disposal
- licensee “forgets” it is on his licence
- agrees to removal
- technical staff arrange to remove to “stores”
- truck driver decides counter is too heavy to move to stores and thinks (amnesia occurs) it is placed in recycling

July 2007 - Radiation audit – licensee cannot locate counter

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The hazard

Reference radiation source within counter

Eu-152 - gamma and beta emitter

$T_{1/2} = 13.5$ years

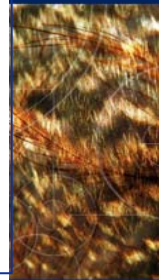
440 kBq in 1988

2007 (19 years) Activity = 165 kBq

Physical size – “BB” pellet

Loss notified to regulator (NRL)

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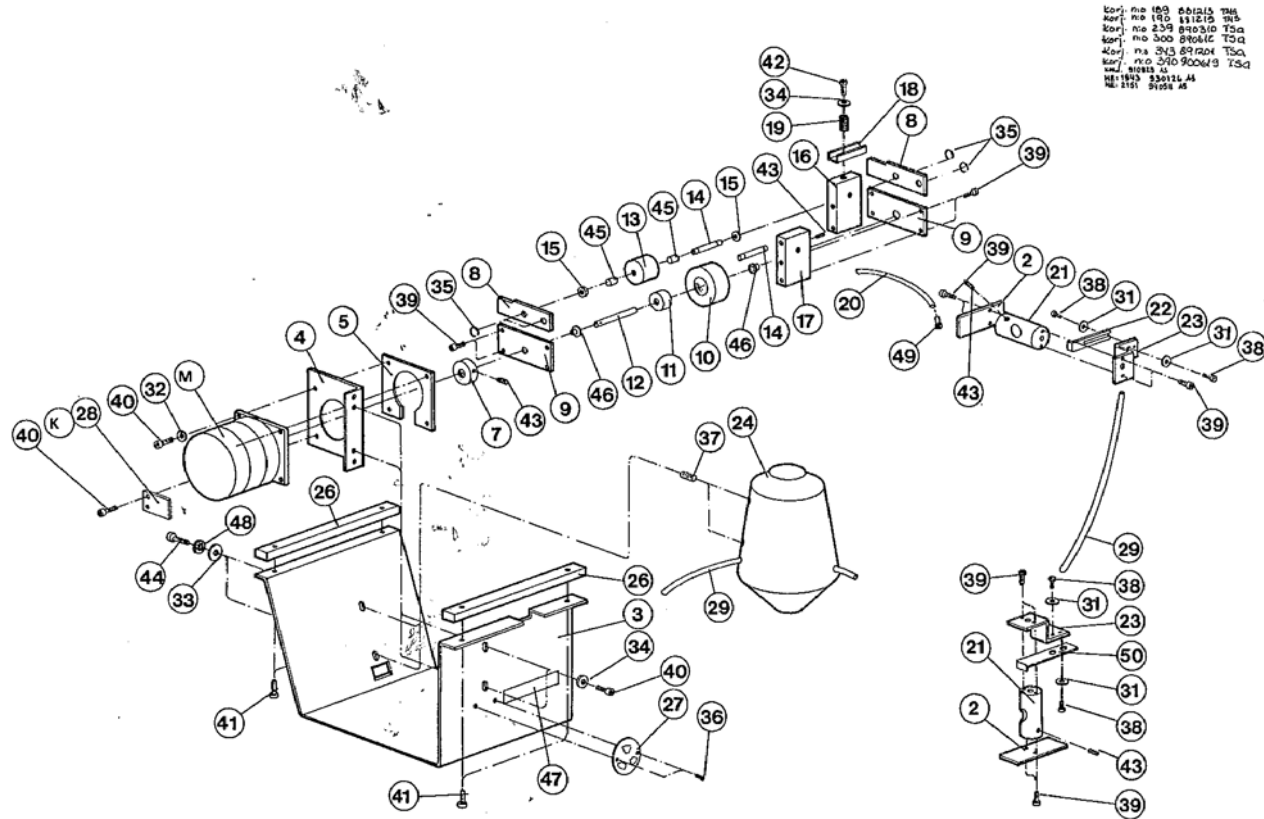




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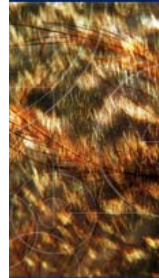
Wallac 140 series



10 25 5273

Part: 881115 Pto
Tark: 881115 M6
Hyx: 881115 20

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The investigation – internal

Physical search of stores and recycle centre

Interview of staff

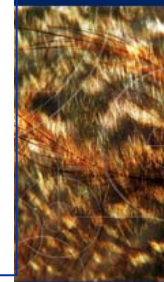
- licensee
- technical staff
- transport staff
- vacation time student helpers

Email transactions

Technician log books and hand notes

Recycle centre transactions

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1. *Risk assessment*

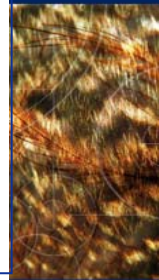
If dropped in recycle centre

- assume 3 m from worker
- 8 hr exposure
- 31 days to reach max dose permissible to public
- 636 days to reach max annual dose for radiation worker

Conclusion

Max dose for public could be exceeded but health effects unlikely

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2. Risk assessment

If recycled into ferric metal

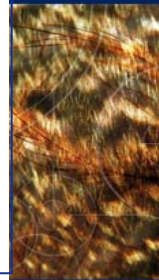
- source would melt (MP= 830 °C)
- needs 330 dilution to make permitted disposal
- ie 1.65 kg metal

If recycled into Aluminium or Lead

- source would remain whole, but shielded

Smelters in NZ do not survey material for radiation!!!!!!

Conclusion: Probably not hazardous





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3. Risk assessment

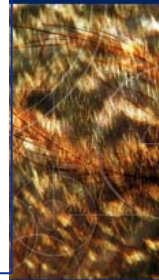
If in rubbish stream

- Assume loader operator 1 metre from unshielded source
- Would reach permitted public exposure after 3.5 working days
- Tip disposal is permitted (if supervised)

Conclusion:

Unlikely to be hazardous

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Official Investigation

October 2007

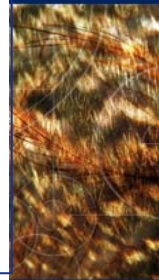
Regulator concludes:

“Route cause is safety system failure”

“ safety systems do not support a safety culture”

Requirement to put safety system in place

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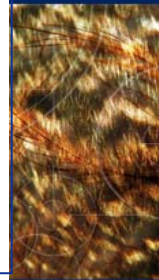
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University response

November 2007

- Point out loss was failure by licensee
- As NRL have failed to take matter up with licence, failure dealt with as an employment matter
- Plan implemented
- Appoint radiation safety officer

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Internal actions

Licensee:

formally disciplined for non compliance

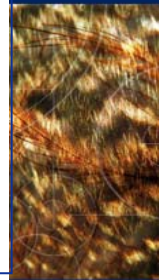
Technical staff:

warning letter for incorrect transshipment

Truck driver:

not clear, but has been stood down from driving

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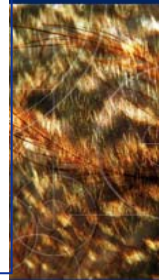
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11 months later

January 2009

- Regulator reviews file and writes warning letter to licensee

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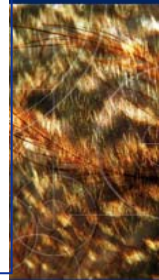
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Lessons

- Significant hazards warrant routine checks and balances eternal to teaching and research staff
 - If you are not measuring it, then it is not managed
- Regulators have an agenda and may not act within their legislation
- Records of transactions essential with significant hazards
- Official records need to be checked for errors

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