

NRL

National Radiation Laboratory

Radiation Incident Responders' Handbook (New Zealand)

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March 2009

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1 The Radiation Incident Response Plan

1.1 Introduction

Radioactive sources are used for a wide variety of purposes in industry, medicine, research and education. Each year there are thousands of transport movements of radioactive materials associated with these activities.

The Radiation Incident Response Plan (RIRP) exists to provide protection for the public and emergency services in the event of incidents arising from the use and transport of such radioactive materials in cases where no specific plans are available or existing plans fail to operate effectively. These may, for example, involve transport accidents and the discovery of real or suspect radioactive materials in public places.

The plan has been formulated around the provision of radiological protection advice to the emergency services. Respondents provide this expert advice on a voluntary basis and free of charge.

1.2 Principles

The Radiation Incident Response Plan is an emergency plan for dealing with radiological incidents that may occur at any time and in any part of New Zealand.

The key principles of the plan are:

- Early provision of advice to the emergency services.
- Guaranteed response.
- Provision of a framework for media support.
- Ownership of “clean up” actions .

1.3 Scope

The scope of the plan covers:

- The whole of New Zealand.
- Radiological incidents in public places.
- Incidents involving the transport of radioactive material.
- Radiological incidents on premises not already covered by existing contingency plans.

1.4 Purpose

The purpose of the plan is to provide expert assistance to the emergency services following a radiological incident. This is achieved by:

- Providing early information and advice to the emergency services at the scene of the event.
- Establishing a 24-hour national notification and response capability.
- Responding to the event with technical support within a target time.
- Establishing clear responsibility for “clean up” of the event.
- Establishing communication route for expert advice and technical support.
- Establishing a framework for media support.
- Establishing standards for responders.

1.5 Notification

Any radiological incident reported to the emergency services will be referred to the nearest regional Emergency Service Communications and Control Centre. They will notify the National Radiation Laboratory (NRL) and the nearest level 2 responder (*see* Section 1.6 below) via the emergency contact numbers.

The Emergency Controller, the NRL Duty Incident Officer and level 2 responder will establish and maintain communications throughout the incident.

1.6 Response

There are 3 levels of response:

LEVEL 1: Provision of general radiological protection advice from the National Radiation Laboratory to the Emergency Controller.

LEVEL 2: Provision of radiological advice/support at the incident scene by the nearest available responder.

LEVEL 3: “Clean up” by “owner” or other party identified as responsible for the radioactive material involved in the incident.

1.7 Standards

- Every responding organisation (level 1 and 2) to be accessible at all times on a specified emergency contact number.
- Target time for provision of general radiological advice over telephone to emergency services (level 1 response): 30 minutes from notification.
- Target time for provision of a level 2 responder at the incident scene: 2 hours from notification.
- Responding organisation technical representative to have mobile telephone and at least basic instrumentation.
- Technical representative to be a suitably qualified and experienced person. Responders under the plan to be authorised by the NRL.
- Responder to carry means of identification to show to emergency services at the incident scene.
- Responding organisations to participate in regular training courses and emergency exercises.

1.8 Media

The lead emergency service at the scene will normally coordinate the media response. The NRL and the level 2 responder at the scene may provide technical input. The “owner” or other identified responsible party will provide a media response to company issues.

2 Guidelines for responders

2.1 General advice to emergency services responding to a radiological incident

If there are life-threatening injuries send casualties to hospital without delay.

CAUTION

Female workers who may be pregnant or nursing should not participate in emergency operations.

If it is suspected that radioactive contamination has been released:

- Keep appliances and crews upwind.
- Cordon area. (Refer to Appendix 1, Instruction 1)
- Set up a single entry and exit point to incident area.
- Extinguish fires.
- Refer to any placards, markings, documentation for information and/or advice.
- If dust/smoke and/or other airborne contamination are suspected:
 - Use available respiratory protection equipment and avoid the smoke near its source. Cover mouth with a mask or handkerchief, if respiratory protection is not available.
 - Avoid inadvertent ingestion, keep hands away from mouth, do not smoke, eat or drink.
 - Keep your skin covered, wear gloves.
- When treating or transporting contaminated persons prevent inadvertent ingestion by using normal barrier methods (standard precautions) such as surgical gloves and masks. Keep hands away from mouth. Wash hands regularly.
- Ensure your name and activities performed are recorded — for possible follow-up and dose reconstruction.
- Get monitored for radioactive contamination and if not immediately possible, shower and change clothing as soon as possible.

Basic Principles of Radiation Protection:

To minimise radiation exposure, apply the following principles:

TIME – keep exposure time to a minimum.

DISTANCE – maximise distance from a radiation source.

SHIELDING – where possible, use shielding to reduce radiation dose rates.

2.2 Additional advice for Level 2 responders

Prior to leaving for the incident scene

- Obtain briefing from the NRL Duty Incident Officer and/or the Emergency Controller
- Collect your responders' kit (see Appendix 5)
- Advise the Emergency Controller of your expected time of arrival

On arrival at the scene of the incident, the level 2 Responder will:

- Establish and maintain an incident log.
- Advise the NRL Duty Incident Officer of arrival as soon as practicable.
- Identify yourself to the Emergency Controller.
- Take part in multi-agency meetings providing technical (radiological) advice/support, familiarise yourself with any access control procedures that may have been put in place.
- Ensure protective clothing and an electronic personal dosimeter is worn before access is made to the cordoned area.

NOTE: you must first seek permission from the Emergency Controller to access this area.

- Consider the need to increase or decrease the size of cordon. (Refer to Appendix 1, Instruction 1.)
- Measure the radiation dose rates in the vicinity of the suspected source of radiation. Examine any packages for leakage and check for local contamination.
- Limit the spread of contamination and institute decontamination measures, including the monitoring of personnel involved in the incident, as required.
- Give frequent situation reports to the NRL Duty Incident Officer and the Emergency Controller.
- For a protracted incident request additional support from the Emergency Controller.

Appendix 1

Specific advice for responders

Instruction 1. Establishment of cordoned area (safety perimeter)

Situation	Initial cordoned area (safety perimeter)
Outside – if monitoring equipment is unavailable	
Intact package	Immediate area around the package
Situation unknown or an unshielded or damaged radioactive source or package	30 m radius
Fire, explosion or suspected RDD ¹ involving a potentially dangerous source	300 m radius
Inside a building – if monitoring equipment is unavailable	
Intact package	Immediate area around the package
Situation unknown or an unshielded or damaged radioactive source or package	The room affected and adjacent areas (including floors above and below)
Fire, explosion or suspected RDD involving a potentially dangerous source	Entire building and appropriate outside distance indicated above
If monitoring equipment is available	
Radiation dose rate of 100 $\mu\text{Sv/h}$ ^{2,3} (0.1 mSv/h)	Radius of the area where these levels are measured.

¹ RDD = radiological dispersal device (eg, dirty bomb).

² The radiation dose rate is measured 1 m above ground level.

³ Surface contamination levels as advised by NRL:

- up to 1000 Bq/cm² beta/gamma deposition
- up to 100 Bq/cm² alpha deposition

Instruction 2. Dose limitation for responders

Table 2A

If monitoring equipment:-	
unavailable	available
Perform only life saving actions within 1 metre of suspected dangerous radioactive materials/device ⁴	If the dose rate is greater than 100 mSv/h <ul style="list-style-type: none"> • Perform only life saving actions. • Limit total time to less than 30 minutes. • Do not proceed into an area with dose rate of greater than 1 Sv/h (1000 mSv/h) unless authorised by the Emergency Controller (taking advice from the NRL Duty Incident Officer)
Minimise time ⁵ within 10 metres of suspected dangerous radioactive materials/device	Minimise time within area if dose rate is greater than 10 mSv/h.

Table 2B

Additional dose guidance if electronic personal dosimeters are also being worn	
Tasks	Do not exceed unless approved by the Emergency Controller in consultation with the NRL Duty Incident Officer
Life saving actions, such as: <ul style="list-style-type: none"> • rescue from immediate threats to life; • provision of first aid for life threatening injuries; • prevention/mitigation of conditions that could be life threatening. 	1000 mSv
All other actions⁵	50 mSv

⁴ Dangerous source means a Category 1, 2 or 3 source as described in Appendix 6
⁵ Refer to Table 2C

Table 2C

Approximate time needed to reach the 50 mSv emergency dose constraint*								
		Distance from the radioactive source to where you want to stand (m)						
		1	3	5	10	30	100	300
Cordon perimeter (m)*	1	> 1 day	> 1 day	> 1 day	> 1 day	> 1 day	> 1 day	> 1 day
	3	> 1 day	> 1 day	> 1 day	> 1 day	> 1 day	> 1 day	> 1 day
	5	20 hours	> 1 day	> 1 day	> 1 day	> 1 day	> 1 day	> 1 day
	10	5 hours	> 1 day	> 1 day	> 1 day	> 1 day	> 1 day	> 1 day
	30	30 min	5 hours	14 hours	> 1 day	> 1 day	> 1 day	> 1 day
	100	3 min	30 min	1 hour	5 hours	> 1 day	> 1 day	> 1 day
	300	20 sec	3 min	8 min	30 min	5 hours	> 1 day	> 1 day

Eg: If the cordon has been set at 30 m, then you could stand at 1 m for 30 minutes before reaching the emergency dose constraint.

* Assumes 0.1 mSv/h at the cordon perimeter based on radiological monitoring by the level 2 responder. (If you need to advance prior to the radiological monitoring, use cordon areas according to Instruction 1.)

Table 2D

Risks associated with various dose levels	
Dose	Description of risk
1 mSv	None sick, no deaths, no symptoms, negligible cancer risk
2 mSv	None sick, no deaths, no symptoms, negligible cancer risk (average annual radiation dose to members of the NZ public)
5 mSv	None sick, no deaths, no symptoms, negligible cancer risk
100 mSv	None sick, 1 in 200 cancer risk
200 mSv	None sick, 1 in 100 cancer risk
1000 mSv	Few sick, no early deaths, 1 in 20 cancer risk
2000 mSv	Most sick, no early deaths, 1 in 10 cancer risk
5000 mSv	All sick, 50% early deaths, 1 in 4 cancer risk
10 000 mSv	All sick, 100% early deaths

Instruction 3. Decontamination of the public and responders

CAUTION

Transport or treatment of seriously injured victims should not be delayed for decontamination. Their outer clothing should be removed, they should be wrapped in a blanket and tagged as possibly contaminated.

Personal survey measurements	
<3 times mean background	>3 times mean background
No decontamination required	Indicate need for decontamination <ul style="list-style-type: none">- not to eat, drink or smoke and to keep hands away from mouth- to remove outer clothing and to place the clothing in bags with a tag identifying owner- to wash or shower with soap and water

When to apply the Instruction: At the scene of an emergency if there is an indication that people (not requiring immediate medical treatment or transport) may be contaminated.

Instruction 4. Monitoring and decontamination of vehicles and important equipment/items

Vehicle/equipment/item survey measurements	
< 3 times means background	> 3 times mean background
<ul style="list-style-type: none">• Release the vehicle/equipment for normal use	<ul style="list-style-type: none">• Decontaminate using fire hoses, scrub brushes and detergents.• Re-survey the contaminated areas• Tag indicating need for monitoring and decontamination before release to normal use• Return to emergency use

Appendix 2

Sample forms – media response

Sample Initial Statement for:

When no specific information is available

Date: [date of issue]

Time: [time of issue]

[Release Number]

[Organisation name] confirms that it has received a report of [nature of emergency]. According to the information received at this time, the [emergency] occurred at [time and location]. Reports indicate that [any confirmed numbers of injured or dead] and that [any initial measures] measures are being taken to protect [the public or specify as appropriate]. The [specify plan as appropriate] emergency plan has now been activated [and we have activated our public information centre].

[Organisation name] is coordinating its activities with responders now at the scene and other involved agencies [specify as appropriate]. We will be providing further information as soon as it becomes available. [Provide details on timing of any updates or briefings] The next [briefing/update] will take place at [location and/or time].

For further information:

Name [name of contact for the media]

Title [title of media contact]

Organisation

Telephone

Mobile

Email

Website

Sample initial statement for:

Radiological emergency involving Radiological Dispersal Devices (eg, dirty bombs)

Date: [date of issue]

Time: [time of issue]

[Release Number]

[Organisation name] confirms that there is a radiological emergency [nature of emergency]. According to the information received at this time, the [emergency] occurred at [time and location]. Reports indicate that [any confirmed numbers of injured or dead] and that [any initial measures] measures are being taken to protect [the public or specify as appropriate]. The [specify plan as appropriate] emergency plan has now been activated [and we have activated our public information centre].

The public is advised on the following:

- those who left the scene without being assessed by the [specify] should change their clothing, shower (if possible), wash hands before eating and go to [specify] to be assessed and get instructions;
- anyone who transported victim(s) must go to [specify the place] for individual monitoring and monitoring of vehicles for contamination.

[If an airborne release is suspected] The public within about 1 km of [specify local description – roads, districts – that will be understandable to the public] should:

- remain inside during the release (because of smoke);
- do not eat any food or water that may have been contaminated (eg, vegetables grown outside or rainwater) until informed otherwise;
- make sure that children are not playing on the ground;
- wash hands before eating until monitoring of food is performed [announcement of the results will follow];
- avoid dusty areas or activities that will make dust;
- do not be concerned about those evacuated (they are not dangerous to be near);
- do not go to the scene to volunteer or to help. If assistance is needed, announcements will be made.

Those evacuated, monitored or concerned can receive additional information on their health and welfare in [specify the place]. If you have a health concern go to [specify a location away from the local hospital where monitoring will be performed and question answered].

Medical practitioners should be alert for patients that have symptoms of radiation exposure (burns with no apparent cause – the person does not remember being burned).

If you have any questions please call [give a hot line number where a large number of calls will not interfere with the response].

We will be providing further information as soon as it becomes available. [Provide details on timing of any updates or briefings]. The next [briefing/update] will take place at [location and/or time].

For further information:

Name [name of contact for the media]

Title [title of media contact]

Organisation

Telephone

Mobile

Email

Website

Sample initial statement for:

Transport emergency involving the release of radioactive material

Date: [date of issue]

Time: [time of issue]

[Release Number]

[Organisation name] confirms that there is a radiological emergency [nature of emergency]. According to the information received at this time, the [emergency] occurred at [time and location]. Reports indicate that [any confirmed numbers of injured or dead] and that [any initial measures] measures are being taken to protect [the public or specify as appropriate]. The [specify plan as appropriate] emergency plan has now been activated [and we have activated our public information centre].

The public is advised on the following:

- those who left the scene without being assessed by the [specify] should change their clothing, shower (if possible), wash hands before eating and go to [specify] to be assessed and get instructions;
- anyone who transported victim(s) must go to [specify the place] for individual monitoring and monitoring of vehicles for contamination.

Those evacuated, monitored or concerned can receive additional information on their health and welfare in [specify the place]. If you have a health concern go to [specify a location away from the local hospital where monitoring will be performed and question answered].

Medical practitioners should be alert for patients that have symptoms of radiation exposure (burns with no apparent cause – the person does not remember being burned).

If you have any questions please call [give a hot line number where a large number of calls will not interfere with the response].

We will be providing further information as soon as it becomes available. [Provide details on timing of any updates or briefings]. The next [briefing/update] will take place at [location and/or time].

For further information:

Name [name of contact for the media]

Title [title of media contact]

Organisation

Telephone

Mobile

Email

Website

Sample initial statement for:

Lost or stolen dangerous source

Date: [date of issue]

Time: [time of issue]

[Release Number]

[Organisation name] confirms that a dangerous radioactive item was lost/stolen [specify]. According to the information received at this time, it was lost/stolen [specify] at [time and location]. The [specify the governmental organisation leading the response] is [specify initial measures, eg, conducting a search] and is asking the public for help in finding this dangerous item. The [specify plan as appropriate] emergency plan has now been activated [and we have activated our public information centre].

The item looks like [describe and provide picture or drawing if possible].

The public is advised on the following:

- this item is very dangerous and if found should not be touched and everyone should keep at least 10 metres away from it;
- those who may have seen the item should immediately report on it to the [specify];
- if you touched or have been near the item you should contact [specify a number where a large number of calls will not interfere with the response].

Medical practitioners should be alert for patients that have symptoms of radiation exposure (burns with no apparent cause – the person does not remember being burned).

Scrap metal dealers and buyers of used items should be alert for any items meeting the description above.

If you believe you have information that may be helpful, please call [give a hot line number where a large number of calls will not interfere with the response].

We will be providing further information as soon as it becomes available. [Provide details on timing of any updates or briefings.] The next [briefing/update] will take place at [location and/or time].

For further information:

Name [name of contact for the media]

Title [title of media contact]

Organisation

Telephone

Mobile

Email

Website

Sample initial statement for:

Dangerous material is discovered in a public place that could have involved public exposure (eg, public place, customs or post office)

Date: [date of issue]

Time: [time of issue]

[Release Number]

[Organisation name] confirms that the dangerous radioactive material was discovered at [specify]. According to the information received at this time, the material was discovered at [time and location]. Reports indicate that [any confirmed numbers of injured] and that [any initial measures] measures are being taken to protect [the public or specify as appropriate]. The [specify plan as appropriate] emergency plan has now been activated [and we have activated our public information centre].

The public is advised on the following:

- those who may have been near to where the material was found within the past [specify time interval] and/or may have been near to it while it was being carried/shipped [specify details] should contact [specify] to be assessed and get instructions.

Medical practitioners should be alert for patients that present symptoms of radiation exposure (burns with no apparent cause – the person does not remember being burned).

If you believe you have information that may be helpful or questions, please call [give a hot line number where a large number of calls will not interfere with the response].

We will be providing further information as soon as it becomes available. [Provide details on timing of any updates or briefings.] The next [briefing/update] will take place at [location and/or time].

For further information:

Name [name of contact for the media]

Title [title of media contact]

Organisation

Telephone

Mobile

Email

Website

Appendix 3

Transport of radioactive materials

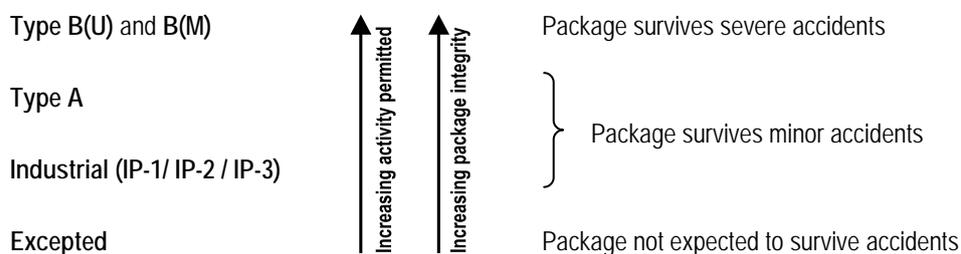
Transport Category labelling

Transport Index (TI)	Maximum radiation levels at 1 m from source	Maximum radiation level at any point on external surface	Transport Category Label
0	0	Not more than 0.005 mSv/h	
More than 0 but not more than 1	>0 - <0.01 mSv/h	More than 0.005 mSv/h but not more than 0.5 mSv/h	
More than 1 but not more than 10	0.01 – 0.1 mSv/h	More than 0.5 mSv/h but not more than 2 mSv/h	

United Nations numbers and Proper Shipping names

UN No.	Proper Shipping Name
2910	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE – LIMITED QUANTITY OF MATERIAL
2911	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE – INSTRUMENTS or RADIOACTIVE MATERIAL, EXCEPTED PACKAGE – ARTICLES
2909	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE – ARTICLES MANUFACTURED FROM DEPLETED URANIUM or RADIOACTIVE MATERIAL, EXCEPTED PACKAGE – ARTICLES MANUFACTURED FROM NATURAL URANIUM or RADIOACTIVE MATERIAL, EXCEPTED PACKAGE – ARTICLES MANUFACTURED FROM NATURAL THORIUM
2908	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE – EMPTY PACKAGING
2915	RADIOACTIVE MATERIAL, TYPE A PACKAGE
3332	RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM
2916	RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE
2912	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-I)
3321	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II)
3322	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III)
2913	RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I) or RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-II)
2917	RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE
3323	RADIOACTIVE MATERIAL, TYPE C PACKAGE
2919	RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT
2978	RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE
3324	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), FISSILE
3325	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), FISSILE
3326	RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I), FISSILE or RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-II), FISSILE
3327	RADIOACTIVE MATERIAL, TYPE A PACKAGE, FISSILE
3333	RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, FISSILE
3328	RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, FISSILE
3329	RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, FISSILE
3330	RADIOACTIVE MATERIAL, TYPE C PACKAGE, FISSILE
3331	RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, FISSILE
2977	RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, FISSILE

Package Types



Radiation reduction factors for some expedient shielding containers with a high energy gamma source at the centre

NOTE: NRL must be consulted before carrying out such actions as they may compromise final storage/transport arrangements.

	Water	Concrete	Earth
10 litre plastic bucket (180 mm min radius) filled with	1/2	1/6	1/3
44 gallon drum (290 mm radius) filled with	1/3	1/20	1/7
4 cubic metre Hi-side skip (1650 mm width) filled with	1/20	1/4000	1/300

Eg, if you put a radiation source that was reading 9 mSv/h where you were standing, in the centre of a plastic bucket filled with earth, then the radiation level where you are standing would be reduced to $9 \times (1/3) = 3$ mSv/h.

Appendix 4

Disposal of radioactive materials involved in radiological incidents

Participants in the plan may be required to advise on what should be done with the radioactive materials involved in an incident. Four different types of situation can be distinguished.

1 Transport Consignments

Responsibility for packages in transit should be indicated in the transport documentation. If packages involved in radiological incidents are found after inspection and radiological survey to be undamaged, they can be sent onwards in the care of those responsible. If packages have suffered damage, advice should be sought from the National Radiation Laboratory regarding safe storage until the responsible party can be contacted to arrange collection.

2 Unknown Ownership

If the owner of a radioactive source is unknown, the National Radiation Laboratory will advise on what should be done with the source, and will be interested in tracing its owner.

3 Environmental Contamination

A radiological incident involving significant environmental contamination will require a protracted response including attendance at the scene by an officer of the National Radiation Laboratory at the earliest opportunity. The NRL officer will advise on the disposal of any contaminated material removed from the scene of the incident.

4 Emergency Disposals

Whenever emergency decontamination is necessary in the course of providing assistance under the Radiation Incident Response Plan, the following procedure should be adopted:

As far as reasonably practicable, scattered radioactive material and contaminated surface materials, eg, soil, herbage, must be gathered and contained in order to minimise the amount of residual contamination that may be flushed into sewers and watercourses. The consent of the National Radiation Laboratory should be obtained before any flushing by water is undertaken.

Appendix 5

Level 2 responders' kit

This list includes specialist equipment, but not items that could reasonably be obtained through the police and emergency services:

- Radiation incident responders' handbook
- radiation and contamination monitoring instruments
- electronic personal dosimeter
- mobile phone
- filter papers and boxes of tissues
- tongs and tweezers
- lead shielding container (eg, 25 mm wall thickness)
- resealable plastic bags of all sizes, including strong sacks for removal of contaminated material
- notebooks, pencils, pens and waterproof markers
- high visibility waistcoats, extra large to fit over protective clothing
- rolls of PVC tape
- tape measure
- calculator
- maps of the region
- camera
- torch (with spare batteries and bulbs)

Appendix 6

Risk categories of radioactive sources

Category	Risk if not dispersed	Risk if dispersed
1	<p>Personally extremely dangerous: This amount of radioactive material, if not safely managed or securely protected would be likely to cause permanent injury to a person who handled it, or were otherwise in contact with it, for more than a few minutes. It would probably be fatal to be close to this amount of unshielded material for a period of a few minutes to an hour.</p>	<p>This amount of radioactive material, if dispersed by a fire or explosion, could possibly — but would be unlikely to — permanently injure or be life threatening to persons in the immediate vicinity. There would be little or no risk of immediate health effects to persons beyond a few hundred metres away, but contaminated areas would need to be cleaned up in accordance with international standards. The size of the area to be cleaned up would depend on many factors (including the size and type of the source, whether and how it had been dispersed, and the weather). For large sources the area to be cleaned up could be a square kilometre or more.</p> <p>It would be highly unlikely for a Category 1 source to contaminate a public water supply to dangerous levels, even if the radioactive material were highly soluble in water.</p>
2	<p>Personally very dangerous: This amount of radioactive material, if not safely managed or securely protected, could cause permanent injury to a person who handled it, or were otherwise in contact with it, for a short time (minutes to hours). It could possibly be fatal to be close to this amount of unshielded radioactive material for a period of hours to days.</p>	<p>This amount of radioactive material, if dispersed by a fire or explosion, could possibly — but would be very unlikely to — permanently injure or be life threatening to persons in the immediate vicinity. There would be little or no risk of immediate health effects to persons beyond a hundred metres or so away, but contaminated areas would need to be cleaned up in accordance with international standards. The size of the area to be cleaned up would depend on many factors (including the size and type of the source, whether and how it had been dispersed, and the weather), but would probably not exceed a square kilometre.</p> <p>It would be virtually impossible for a Category 2 source to contaminate a public water supply to dangerous levels, even if the radioactive material were highly soluble in water.</p>

3	<p>Personally dangerous: This amount of radioactive material, if not safely managed or securely protected, could cause permanent injury to a person who handled it, or were otherwise in contact with it, for some hours. It could possibly — although it is unlikely — be fatal to be close to this amount of unshielded radioactive material for a period of days to weeks.</p>	<p>This amount of radioactive material, if dispersed by a fire or explosion, could possibly — but is extremely unlikely to — permanently injure or be life threatening to persons in the immediate vicinity. There would be little or no risk of immediate health effects to persons beyond a few metres away, but contaminated areas would need to be cleaned up in accordance with international standards. The size of the area to be cleaned up would depend on many factors (including the size and type of source, whether and how it had been dispersed, and the weather), but would probably not exceed a small fraction of a square kilometre.</p> <p>It would be virtually impossible for a Category 3 source to contaminate a public water supply to dangerous levels, even if the radioactive material were highly soluble in water.</p>
4	<p>Unlikely to be dangerous: It is very unlikely that anyone would be permanently injured by this amount of radioactive material. However, this amount of unshielded radioactive material, if not safely managed or securely protected, could possibly — although it is unlikely — temporarily injure someone who handled it or were otherwise in contact with it, or who were close to it for a period of many weeks.</p>	<p>This amount of radioactive material, if dispersed by a fire or explosion, could not permanently injure persons.</p>
5	<p>Not dangerous: No one could be permanently injured by this amount of radioactive material.</p>	<p>This amount of radioactive material, if dispersed by a fire or explosion, could not permanently injure persons.</p>

Appendix 7

Examples of sources

(NOTE: Risk categories are described in Appendix 6)

Irradiator facilities (Risk Category 1) are relatively few in number, and contain very high activity sources to sterilise foodstuffs, medical products and supplies, and for other specialised applications. The sources used in performing the irradiation of the material vary in physical size, some being large or others being pencil-sized, and each facility will contain many such sources. The facilities that contain the irradiation sources are specially designed, often including thickly shielded walls, interlocks, and other protective equipment. Other irradiators are self-shielded and are used in research applications or for blood irradiation.



Blood/tissue irradiator

Co-60 Sterilisation and food preservation - Typical Activity: 37 000 TBq (1 MCi)

Cs-137 Self-shielded irradiators - Typical Activity: 560 TBq (15 kCi)

Co-60 Self-shielded irradiators - Typical Activity: 930 TBq (25 kCi)

Cs-137 Blood/tissue irradiators - Typical Activity: 260 TBq (7 kCi)

Co-60 Blood/tissue irradiators - Typical Activity: 89 TBq (2.4 kCi)

Teletherapy units (Risk Category 1) are commonly found in medical institutions, such as hospitals or clinics. The physical dimensions of the source are relatively small, with generally a cylindrical (few cm in diameter by several cm long) shape. The source is contained inside a large shielding device. Fixed multi-beam teletherapy units (Gamma Knife) focus gamma radiation from an array of over 200 Co-60 sources on brain lesions. The facilities within which the units are located are usually specifically designed and include thick shielded walls and have other protective equipment, due to the high activity source strength.

Figure 35 - Cobalt-60 Teletherapy Unit



Co-60 Multi-beam teletherapy (gamma knife) - Typical Activity: 260 TBq (7 kCi)

Co-60 Teletherapy - Typical Activity: 150 TBq (4 kCi)

Cs-137 Teletherapy - Typical Activity: 19 TBq (500 Ci)

Industrial radiography (Risk Category 2) sources and devices are generally small in terms of physical size, although the devices are usually heavy due to the shielding contained in them. The sources themselves are very small, less than 1 cm in diameter, and only a few cm long, and are attached to specially designed cables for their proper operation. The use of radiography sources and devices are very common, and their portability may make them susceptible to theft or loss. The small size of the source allows for unauthorised removal by an individual, and such a source may be placed into a pocket of a garment.

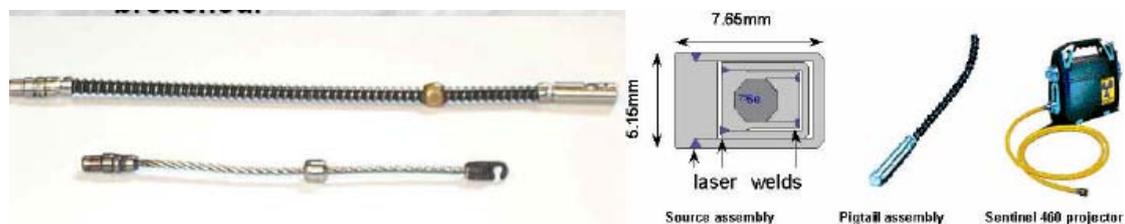
Co-60 Industrial radiography - Typical Activity: 2.2 TBq (60 Ci)

Ir-192 Industrial radiography - Typical Activity: 3.7 TBq (100 Ci)

Se-75 Industrial radiography - Typical Activity: 3 TBq (80 Ci)

Yb-169 Industrial radiography - Typical Activity: 190 GBq (5 Ci)

Tm-170 Industrial radiography - Typical Activity: 5.6 TBq (150 Ci)



Brachytherapy applications (various risk categories) are of three slightly different varieties. These are generally referred to as low dose rate (LDR) brachytherapy, medium dose rate (MDR) brachytherapy, and high dose rate (HDR) brachytherapy. These applications use sources that may be small physically (less than 1 cm in diameter, only a few cm long), and thus are susceptible to being lost or misplaced. HDR and MDR sources, and some LDR sources, may be in the form of a long wire attached to a device (a remote after-loading device). The after-loading device may be heavy, due to the shielding for the sources when not in use, and the device may be on wheels for transport within a facility. The remote after-loading device may also contain electrical and electronic components for its operation. Brachytherapy sources are located in hospitals, clinics and similar medical institutions, and such facilities may have a large number of sources.



High/medium dose rate applications (Risk Category 2)

Co-60 Brachytherapy – high/medium dose rate - Typical Activity: 370 GBq (10 Ci)

Cs-137 Brachytherapy – high/medium dose rate - Typical Activity: 110 GBq (3 Ci)

Ir-192 Brachytherapy – high/medium dose rate - Typical Activity: 220 GBq (6 Ci)

Low dose rate applications (Risk Category 4)

Cs-137 Brachytherapy – low dose rate - Typical Activity: 19 GBq (500 mCi)

Ra-226 Brachytherapy – low dose rate - Typical Activity: 560 MBq (15 mCi)

I-125 Brachytherapy – low dose rate - Typical Activity: 1.5 GBq (40 mCi)

Ir-192 Brachytherapy – low dose rate - Typical Activity: 19 GBq (500 mCi)

Au-198 Brachytherapy – low dose rate - Typical Activity: 3 GBq (80 mCi)

Cf-252 Brachytherapy – low dose rate - Typical Activity: 3.1 GBq (83 mCi)

Low dose rate – eye plaques and permanent implants applications (Risk Category 5)

Sr-90 Brachytherapy – low dose rate - eye plaques and permanent implants - Typical Activity: 930 MBq (25 mCi)

Ru/Rh-106 Brachytherapy – low dose rate - eye plaques and permanent implants - Typical Activity: 22 MBq (600 μ Ci)

Pd-103 Brachytherapy – low dose rate - eye plaques and permanent implants - Typical Activity: 1.1 GBq (30 mCi)

Industrial gauges are of various shapes and sizes, and are either fixed or portable. These devices are generally designed for many years of operation with little or no special maintenance. Industrial gauges are used for process control; for measurement of flow, volume, density, or material presence; and may be placed in locations unsuitable for continuous human presence (eg, in a blast furnace). Consequently, they often accumulate layers of dirt, grime, grease, oil and other material that may cover any warning labels that may have been present. Depending upon the specific application, industrial gauges may contain relatively small quantities of radioactive material, or may contain sources with activities approaching 1 TBq. The devices generally are not large, but may be located some distance from the radiation detector, which may have electrical or electronic components located within the detector. A facility may have a large number of these gauges. The locations of such devices or sources within a facility may not be recognised, since the devices may be connected to process control equipment. This lack of recognition may result in a loss of control if the facility decides to modernise or terminate operations.

Some examples of gauges are described below.

Level gauges (Risk Category 3)

Cs-137 level gauge – Typical Activity: 190 GBq (5 Ci)

Co-60 level gauge – Typical Activity: 190 GBq (5 Ci)



Conveyor gauges (Risk Category 3)

Cs-137 conveyor gauge – Typical Activity: 110 GBq (3 Ci)
Cf-252 conveyor gauge – Typical Activity: 1.4 GBq (37 mCi)

Blast furnace gauges (Risk Category 3)

Co-60 blast furnace gauge – Typical Activity: 37 GBq (1 Ci)

Dredger gauges (Risk Category 3)

Co-60 blast furnace gauge – Typical Activity: 28 GBq (750 mCi)
Cs-137 blast furnace gauge – Typical Activity: 74 GBq (2 Ci)

Spinning pipe gauges (Risk Category 3)

Cs-137 spinning pipe gauge – Typical Activity: 74 GBq (2 Ci)

Well logging (Risk Category 3) sources and devices are generally found in areas where exploration for minerals is occurring, such as coal, oil, natural gas. The sources are usually contained in long (1 - 2 m, typically) but thin (<10 cm in diameter) devices that also contain detectors and various electronic components. The actual size of the sources inside the devices is generally small.

The devices are heavy, due to the ruggedness needed for the environments in which they are to be used.



Am-241/Be well logging – Typical Activity: 740 GBq (20 Ci)
Cs-137 well logging – Typical Activity: 74 GBq (2 Ci)
Cf-252 well logging – Typical Activity: 1.1 GBq (30 mCi)

Thickness gauges (Risk Category 4)

Kr-85 thickness gauge -Typical Activity: 37 GBq (1 Ci)
Sr-90 thickness gauge -Typical Activity: 3.7 GBq (100 mCi)
Am-241 thickness gauge -Typical Activity: 22 GBq (600 mCi)
Pm-147 thickness gauge -Typical Activity: 1.9 GBq (50 mCi)
Cm-244 thickness gauge -Typical Activity: 15 GBq (400 mCi)

Fill-level gauges (Risk Category 4)

Am-241 fill level gauge -Typical Activity: 2.2 GBq (60 mCi)

Cs-137 fill level gauge -Typical Activity: 2.2 GBq (60 mCi)

Co-60 fill level gauge -Typical Activity: 870 MBq (24 mCi)



Nuclear density meters (Risk Category 4) Moisture/density devices are a type of industrial gauges that are small and portable. These devices contain the sources, detectors and electronic equipment necessary for the measurement. The source is physically small in size, typically a few cm long by a few cm in diameter, and may be located either completely within the device or at the end of a rod/handle assembly. The small size of the device makes it susceptible to loss of control or theft.



Am-241/Be moisture/density gauge -Typical Activity: 1.9 GBq (50 mCi)

Cs-137 moisture/density gauge -Typical Activity: 370 MBq (10 mCi)

Ra-226 moisture/density gauge -Typical Activity: 74 MBq (2 mCi)

Cf-252 moisture/density gauge -Typical Activity: 2.2 MBq (60 μ Ci)

Bone densitometry (Risk Category 4)

Cd-109 bone densitometry -Typical Activity: 740 MBq (20 mCi)

Gd-153 bone densitometry -Typical Activity: 37 GBq (1 Ci)

I-125 bone densitometry -Typical Activity: 19 GBq (500 mCi)

Am-241 bone densitometry -Typical Activity: 5 GBq (140 mCi)

Static eliminators (Risk Category 4) Alpha radiation's ability to strongly ionise is used to create a region of ionised air, ie, electrically conducting, above a product on which a static charge may build up and so provide a leakage path for the electric charge to dissipate.

Am-241 static eliminator -Typical Activity: 1.1 GBq (30 mCi)

Po-210 static eliminator -Typical Activity: 1.1 GBq (30 mCi)

Diagnostic isotope generators (Risk Category 3 - 4)

Generators contain a longer-lived radionuclide which decays to produce the shorter-lived radionuclide that is required.

Mo-99 technetium generator -Typical Activity: 37 GBq (1 Ci)



Medical unsealed (Various risk categories)

Medical unsealed category 4

I-131 source -Typical Activity: 3.7 GBq (100 mCi)

Medical unsealed category 5

P-32 source -Typical Activity: 22 GBq (600 mCi)



X-ray fluorescence analysers (Risk Category 5) These rely on secondary x-ray emission, ie, the emission of characteristic x-rays to determine the thickness of coatings.

Fe-55 x-ray fluorescence analyser -Typical Activity: 740 MBq (20 mCi)

Cd-109 x-ray fluorescence analyser -Typical Activity: 1.1 GBq (30 mCi)

Co-57 x-ray fluorescence analyser -Typical Activity: 930 MBq (25 mCi)

Electron capture detectors (Risk Category 5)

Ni-63 electron capture detector -Typical Activity: 370 MBq (10 mCi)

H-3 electron capture detector -Typical Activity: 9.3 GBq (250 mCi)

Lightning preventers (Risk Category 5)

Am-241 lightning preventer -Typical Activity: 48 MBq (1.3 mCi)

Ra-226 lightning preventer -Typical Activity: 1.1 MBq (30 μ Ci)

H-3 lightning preventer -Typical Activity: 7.4 GBq (200 mCi)

Mossbauer Spectrometry (Risk Category 5)

Co-57 mossbauer spectrometry -Typical Activity: 1.9 GBq (50 mCi)

Appendix 8

Common radionuclide data

Nuclide		Half-life	Prominent radiations and maximum energies (MeV)
Hydrogen-3	H-3	12.3 y	β^- 0.019
Beryllium-7	Be-7	53.3 d	γ 0.48
Carbon-14	C-14	5.7×10^3 y	β^- 0.156
Sodium-22	Na-22	2.6 y	β^+ 0.55, γ 1.28
Sodium-24	Na-24	15.0 h	β^- 1.4, γ 1.4, 2.8
Phosphorus-32	P-32	14.3 d	β^- 1.7
Sulphur-35	S-35	87.5 d	β^- 0.17
Chlorine-36	Cl-36	3.0×10^5 y	β^- 0.71
Potassium-42	K-42	12.4 h	β^- 3.6, γ 1.5
Calcium-45	Ca-45	163.0 d	β^- 0.26
Calcium-47*	Ca-47	4.5 d	β^- 0.69 (82%), 2.0 (18%) γ 1.3
Scandium-46	Sc-46	83.8 d	β^- 0.36, γ 1.0
Chromium-51	Cr-51	27.7 d	x 0.005, γ 0.3
Manganese-54	Mn-54	312.5 d	γ 0.8
Iron-55	Fe-55	2.7 y	x 0.006
Iron-59	Fe-59	45.1 d	β^- 0.4, γ 1.2
Cobalt-56	Co-56	78.8 d	β^+ 1.5, γ 1.3
Cobalt-57	Co-57	271.4 d	γ 0.13
Cobalt-58	Co-58	70.8 d	β^+ 0.5, γ 0.8
Cobalt-60	Co-60	5.3 y	β^- 0.3, γ 1.3
Nickel-63	Ni-63	100.0 y	β^- 0.066
Zinc-65	Zn-65	243.8 d	γ 1.1
Selenium-75	Se-75	119.8 d	γ 0.1-0.4
Bromine-82	Br-82	1.5 d	β^- 0.4, γ 0.5-1.5
Krypton-85	Kr-85	10.7 y	β^- 0.7
Rubidium-86	Rb-86	18.7 d	β^- 1.8, γ 1.1
Strontium-85*	Sr-85	64.8 d	γ 0.5
Strontium-89*	Sr-89	50.5 d	β^- 1.5
Strontium-90	Sr-90	29.1 y	β^- 0.5
Yttrium-88	Y-88	106.6 d	γ 1.8
Yttrium-90	Y-90	2.7 d	β^- 2.3
Yttrium-91	Y-91	58.5 d	β^- 1.5
Zirconium-95	Zr-95	64.0 d	β^- 0.4, γ 0.7

Niobium-95	Nb-95	35.2 d	β^- 0.16, γ 0.76
Molybdenum-99	Mo-99	2.8 d	β^- 1.2, γ 0.7
Technetium-99	Tc-99	2.1×10^5 y	β^- 0.3
Technetium-99m	Tc-99m	6.0 h	γ 0.14
Ruthenium-103*	Ru-103	39.4 d	β^- 0.2, γ 0.5
Ruthenium-106*	Ru-106	1.0 y	β^- 1.5-3.6, γ 0.5-2.9
Silver-110m*	Ag-110m	249.9 d	β^- 0.5, γ 0.6-1.5
Cadmium-109	Cd-109	1.3 y	x 0.02, γ 0.09
Indium-111	In-111	2.8 d	x 0.02, γ 0.2
Tin-113*	Sn-113	115.1 d	x 0.02, γ 0.4
Tin-119m*	Sn-119m	293.0 d	x 0.02
Antimony-124	Sb-124	60.2 d	β^- 0.1-2.3, γ 0.6
Antimony-125*	Sb-125	2.7 y	β^- 0.6, γ 0.6
Iodine-125	I-125	60.1 d	x , γ 0.03
Iodine-129	I-129	1.6×10^7 y	β^- 0.15, x 0.03
Iodine-131*	I-131	8.0 d	β^- 0.6, γ 0.4
Xenon-133	Xe-133	5.3 d	β^- 0.3, γ 0.08
Caesium-134	Cs-134	2.1 y	β^- 0.6, γ 0.7
Caesium-137*	Cs-137	30.0 y	β^- 0.5, γ 0.7
Barium-133	Ba-133	10.7 y	γ 0.3
Barium-140	Ba-140	12.7 y	β^- 1.0, γ 0.5
Lanthanum-140	La-140	1.7 d	β^- 1-2, γ 0.3-2.5
Cerium-139	Ce-139	137.7 d	γ 0.2
Cerium-141	Ce-141	32.5 d	β^- 0.5, γ 0.15
Cerium-144*	Ce-144	284.9 d	β^- 3, γ 1-2
Promethium-147	Pm-147	2.6 y	β^- 0.2
Samarium-151	Sm-151	89.9 y	β^- 0.6
Europium-152	Eu-152	13.3 y	β^- 0.7, γ 0.3-1.3
Gadolinium-153	Gd-153	242.0 d	x , γ 0.04-0.1
Terbium-160	Tb-160	72.3 d	β^- 0.5-1, γ 0.1-1.3
Thulium-170	Tm-170	128.6 d	β^- 1, x , γ 0.01-0.08
Ytterbium-169	Yb-169	32.0 d	x , γ 0.01-0.3
Tungsten-185	T-185	75.1 d	β^- 0.4
Iridium-192	Ir-192	74.0 d	β^- 0.7, γ 0.5
Gold-198	Au-198	2.7 d	β^- 1, γ 0.4
Gold-199	Au-199	3.1 d	β^- 0.4, γ 0.2
Mercury-203	Hg-203	46.6 d	β^- 0.2, γ 0.3
Thallium-204	Tl-204	3.8 y	β^- 0.8

Lead-210*	Pb-210	22.3 y	β^- 0.06, γ 0.05
Polonium-210	Po-210	138.4 d	α
Radium-226*	Ra-226	1.6×10^3 y	α , β^- 3, γ 0.2-2
Thorium-228*	Th-228	1.9 y	α , β^- 2, γ 0.1-3
Thorium-232*	Th-232	1.41×10^{10} y	α , β^- 2, γ 0.5-2
Uranium-238*	U-238	4.5×10^9 y	α , β^- 2, γ 0.1-2
Neptunium-237*	Np-237	2.1×10^6 y	α , γ 0.03-0.4
Plutonium-238	Pu-238	87.7 y	α
Plutonium-239	Pu-239	2.4×10^4 y	α , x 0.01-0.02
Americium-241	Am-241	432.0 y	α , γ 0.06
Curium-244	Cm-244	18.1 y	α
Californium-252*	Cf-252	2.6 y	α , n 2, γ

* Includes emissions from decay products that are likely to be present and are not shown in the table separately

 Decays to progeny shown.

Appendix 9

A guide to SI units in radiation protection

EXPOSURE

Roentgen (R), the charge produced in air by x or gamma rays. The SI unit is in terms of coulombs per kilogram of air (C kg^{-1}).

$$1 \text{ R} = 2.58 \times 10^{-4} \text{ C kg}^{-1} \quad 1 \text{ C kg}^{-1} = 3876 \text{ R}$$

KERMA

(Kinetic energy released in material)

The SI unit is the gray.

$$1 \text{ gray (Gy)} = 100 \text{ rad} \quad 1 \text{ rad} = 0.01 \text{ Gy}$$

An exposure of 1 R ($2.58 \times 10^{-4} \text{ C kg}^{-1}$) corresponds to an air kerma of about 0.87 rad (8.7 mGy) or a tissue kerma of about 0.97 rad (9.7 mGy).

RADIATION ABSORBED DOSE

The SI unit is the gray (Gy)

$$1 \text{ gray} = 100 \text{ rad} \quad 1 \text{ rad} = 0.01 \text{ Gy}$$

RADIATION DOSE EQUIVALENT

The SI unit is the sievert (Sv).

$$1 \text{ sievert (Sv)} = 100 \text{ rem} \quad 1 \text{ rem} = 0.01 \text{ Sv}$$

Background is typically $\leq 0.2 \mu\text{Sv/h}$

ACTIVITY

The SI unit of activity is the becquerel (Bq).

1 becquerel (Bq) = 1 disintegration per second

$$1 \text{ Bq} = 2.7 \times 10^{-11} \text{ curie (Ci)} \\ 1 \text{ Ci} = 3.7 \times 10^{10} \text{ Bq} = 37 \text{ GBq}$$

ADDITIONAL USEFUL CONVERSIONS

1 μCi	=	37 kBq
1 mCi	=	37 MBq
1 Bq	=	27 pCi
370 MBq	=	10 mCi
1 μSv	=	0.1 mrem

COMMON PREFIXES FOR SI UNITS

Submultiples			Multiples		
10^{-3}	milli	m	10^3	kilo	k
10^{-6}	micro	μ	10^6	mega	M
10^{-9}	nano	n	10^9	giga	G
10^{-12}	pico	p	10^{12}	tera	T

Appendix 10

Responding Organisations: Call-Out List

Level 1 Response

National Radiation Laboratory

Districts Covered: All

Participant:

National Radiation Laboratory
108 Victoria Street
PO Box 25-099
Christchurch

Tel: 03 366 5059

Emergency phone: 021 393 632 (Duty Incident Officer)

Level 2 Response

North Island

Northland

Districts Covered: Northland

Participant:

Primary and Community Health Services

Ground Floor

Dairy House

Porowini Avenue

PO Box 742

Whangarei 0140

Tel: 09 430 4100 (On Call HPO)

Auckland

Districts Covered: South Auckland, Central Auckland, North/West Auckland

Participant:

Cornwall Complex

Floor 2, Building 15

Greenlane Clinical Centre

Private Bag 92605

Symonds Street

Auckland 1150

Tel: 09 623 4600 (On Call HPO)

Waikato

Districts Covered: Waikato, Ruapehu (Northern part)

Participant:

Public Health Unit

Community Health

Hockin Building

Selwyn Street

PO Box 505

Hamilton 3240

Tel: Office Hours 07 838 2569

After Hours 021 999 521 (On Call HPO)

021 359 650 (MOH)

Whakatane

Districts Covered: Eastern Bay of Plenty

Participant:

Toi Te Ora Public Health
Corner Garaway St & Stewart St
PO Box 241
Whakatane 3158
Tel: 07 306 0999 (On Call HPO)

Tauranga

Districts Covered: Tauranga

Participant:

Toi Te Ora Public Health
1st Floor
510 Cameron Street
PO Box 2121
Tauranga 3140
Tel: Office Hours 07 571 8975
After Hours 021 241 4727 (On Call HPO)
Pager No. 026 111 980
07577 3317 (Direct line)

Rotorua

Districts Covered: Rotorua, Taupo

Participant:

Toi Te Ora Public Health
Third Floor
Hauora House
1143 Haupapa Street
PO Box 1858
Rotorua 3040
Tel: Office Hours 07 349 3520
After Hours 07 349 3522 (On Call HPO)

Gisborne

Districts Covered: Gisborne

Participant:

Public Health Unit
141 Bright Street
PO Box 119
Gisborne 4040
Tel: Office Hours 06 867 9119
After Hours 027 440 7239 (On Call HPO)

Taranaki

Districts Covered: Taranaki

Participant:

Health Protection Unit
Barrett Building
Tukapa Street
New Plymouth 4310

Tel: 06 753 7798 (On Call HPO)

Hawkes Bay

Districts Covered: Hawkes Bay and Chatham Islands

Participant:

Public Health Unit
Napier Health Centre
76 Wellesley Street
PO Box 447
Napier 4140

Tel: Office Hours 06 834 1815
After Hours 06 878 8109 (On Call HPO)

Mid Central

Districts Covered: Manawatu, Wanganui, Ruapehu

Participants:

Public Health Unit
Community Health Village
Palmerston North Hospital
PO Box 2056
Palmerston North

Tel: 06 350 9110 (On Call HPO)

Public Health Centre
238 Victoria Avenue
Wanganui 4500

Tel: Office Hours 06 348 1775
After Hours 06 348 1234 (On Call HPO)

Hutt Valley

Districts Covered: Wellington, Hutt, Wairarapa

Participants:

Institute of Geological and Nuclear Sciences

PO Box 31312

Lower Hutt 5040

Tel: Office Hours 04 570 4666 / 021 036 5695

After Hours: Page Dr Gavin Wallace via Hutt City Rural Fire Officer 04 801 0812

Regional Public Health

1st Floor

Pilmuir House

Hutt Hospital

Lower Hutt 5010

Tel: Office Hours 04 570 9002

After Hours 04 570 9007 (On Call HPO)

1st on call officer: cell phone 027 285 6035

2nd on call officer: cell phone 027 285 6034

Choice Health

Public Health Wairarapa

24 Chapel Street

PO Box 58

Masterton 5810

Tel: Office Hours 06 370 5020

After Hours 06 946 9800 (On Call HPO)

South Island**Nelson Marlborough**

Districts Covered: Nelson, Marlborough

Participants:

Nelson Public Health Unit

36 Franklyn Street

PO Box 647

Nelson 7040

Tel: Office Hours 03 546 1537

After Hours 03 546 1800 (On Call HPO)

Marlborough Public Health Unit
Wairau Hospital
Hospital Road
PO Box 46
Blenheim 7240

Tel: Office Hours 03 520 9914
After Hours 03 520 9999 (On Call HPO)

Canterbury

Districts Covered: Canterbury

Participants:

National Radiation Laboratory
108 Victoria Street
PO Box 25 099
Christchurch 8144

Tel: Office Hours 03 366 5059
After Hours 021 393 632 (Duty Incident Officer)

Crown Public Health Ltd
Datacom House
76 Chester Street East
PO Box 1475
Christchurch 8140

Tel: Office Hours / After Hours 03 379 9480
Pager No. 026 367 4231 (On Call HPO)

South Canterbury

Districts Covered: South Canterbury

Participant:

Crown Public Health Ltd
6B Sefton Street
Timaru 7910

Tel: Office Hours 03 688 6019
After Hours 027 497 5249

West Coast

Districts Covered: West Coast

Participant:

Crown Public Health Ltd
3 Tarapuhi Street
PO Box 443
Greymouth 7840

Tel: Office Hours 03 768 1160
After Hours 03 768 0499 (On Call HPO)

Dunedin

Districts Covered: Otago, Southland

Participant:

Public Health South
Health Protection Section
Level 2, Main Block, Wakari Hospital
Taieri Road
Dunedin 9010

PO Box 5144
Dunedin 9058

Tel: Office Hours 03 476 9800
After Hours Pager No. 03 474 7700, tracer 6371
Fax: 03 476 9858

Invercargill

Districts Covered: Southland

Participant:

Public Health South
Te Wakahauora
92 Spey Street
PO Box 1601
Invercargill 9840

Tel: Office Hours 03 211 0900
After Hours 0262 548125 (On Call HPO)