Radiation Health use only

Queensland Government

Radiation Safety Act 1999

Approval No.: _____

I hereby advise that this radiation safety and protection plan, containing 12 pages, is approved for:

Possession Licensee:_____

_____ _____

Delegate of the Chief Executive Date

Radiation Safety and Protection Plan

Small Animal Plain Film
Veterinary Diagnostic Radiography

_____

Name (possession licensee)

_____ _____

Signature Date

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1. Introduction

For the purposes of this document, the possession licensee is identified on page 1 of this document.

It is a requirement of the *Radiation Safety Act 1999* that reasonable steps are taken to ensure that any person's health and safety are not adversely affected by exposure to radiation. This requirement of the Act will be met if all persons in this practice comply with this plan.

This plan will also:

- help ensure that the radiation doses to all persons involved in the practice are minimised.
- assist the possession licensee in attaining a satisfactory level of compliance with the *Radiation Safety Act 1999*.

2. Scope

This plan is specific to small animal plain film veterinary diagnostic radiography provided in small veterinary practices, and is limited to possession licensees operating from single premises. The acquisition, processing and storage of the images may be traditional film or digital imaging based.

All persons who are employed at this practice will comply with this plan. These persons will also comply with the following documents:

- *Radiation Safety Act 1999* and *Radiation Safety Regulation 2010*
- ARPANSA RPS 17, *Code of Practice and Safety Guide for Radiation Protection in Veterinary Medicine (2009)*

3. Hazard Assessment

Fixed and/or portable plain film X-ray units are used at this practice. X-ray units present a radiation hazard when they are being used.

Exposure to radiation is capable of causing injury or fatal illness to a person. This risk of injury or harm to health depends on the type of radiation and the extent of the exposure, and might only be observed after many years have elapsed. Consequently, the exposure of individuals to radiation must be either prevented or reduced to a level where the risk of adverse health effects is minimal.

It should be remembered that even low levels of radiation doses are still believed to be of some health risk.

Radiation doses to users, other employees and members of the public will depend on a number of factors such as the number of exposures, the exposure settings used and work practices.

The radiation doses to persons involved in small animal veterinary diagnostic radiography, using fixed or portable x-ray devices, are relatively low in comparison with those experienced by persons involved in some health related diagnostic procedures. However, radiation dose can become significant as a result of poor work practices (eg. if staff repeatedly hold animals without the use of adequate protective equipment) or if equipment does not comply with the necessary standards (eg. the X-ray beam is not properly collimated during an X-ray exposure).

It is important to take care with the exposure factors used in digital systems as it is possible to increase exposure to persons involved in small animal veterinary radiography by using higher levels of radiation than is clinically necessary whilst still obtaining diagnostic quality images through software based image post processing.

Digital radiography equipment can allow for significant overexposure without awareness by the operators involved. To minimise radiation overdose hazard, keeping a log of exposures and retake analysis is recommended by using the manufacturer's Exposure Index information.

Provided this plan is complied with, and the X-ray units and premises continue to meet Radiation Safety Standards NM003:2010 *Standard for Radiation Apparatus used to Carry out Diagnostic Radiography of Animals* and PR100:2010 *Standard for Premises - Ionising Radiation Sources*:

- the health risk to persons from the small animal plain film veterinary diagnostic radiography practice should be minimized to an acceptable level; and
- there is no requirement for personal radiation monitoring or personal alarm dosemeters.

4. Functions of the Radiation Safety Officer

This practice has a radiation safety officer (RSO) who has been appointed to:

- monitor radiation safety;
- report to the possession licensee about radiation safety; and
- maintain awareness of the radiation safety legislation and keep abreast of the trends in radiation safety.

The name of the RSO and contact details are displayed close to all X-ray equipment.

(a) On-going RSO duties

On an on-going basis, the RSO:

- provides, or arranges training about radiation hazards and safe working practices
- checks the X-ray equipment and premises to identify whether compliance with Radiation Safety Standards NM003:2010 *Standard for Radiation Apparatus used to Carry out Diagnostic Radiography of Animals* and PR100:2010 *Standard for Premises - Ionising Radiation Sources* has been compromised by damage to, or modification of, the X-ray equipment or premises
- maintains records of all X-ray equipment and the locations at which it is installed
- identifies ways of minimising radiation doses
- advises staff on safe working practices
- investigates radiation incidents

Additionally, the RSO reports to the possession licensee if some person:

- is involved in any radiation incident
- contravenes the requirements of this plan or ARPANSA RPS 17, *Code of Practice and Safety Guide for Radiation Protection in Veterinary Medicine (2009)*
- requires any action to be taken to achieve compliance with this plan or relevant Radiation Safety Standards

(b) Annual RSO duties

Each year, the RSO ensures the items below are checked, records the results of these checks in an appropriate log book and ensures that any identified problems are rectified as soon as possible:

- users and all other employees understand, and are complying with, this plan
- the details of each X-ray unit (including its current location) are accurately recorded and match the current inventory attached to the Possession Licence
- the Possession Licence is current

- all users of the X-ray equipment hold Use Licences
- all maintenance and operational checks, as required by this plan, are conducted within the stated timeframes and recorded, and that any relevant problems have been appropriately rectified
- all repairs or modifications to the X-ray equipment have been recorded
- personal protective equipment, as required by this plan, is undamaged and readily available
- compliance certificates for the X-ray equipment and premises have been obtained/renewed within the necessary time frames (three and five years respectively). Further information can be found at: *http://www.health.qld.gov.au/radiationhealth/legislation/compliance.asp*
- all records required by this radiation safety and protection plan are maintained and kept in a readily accessible location

Additionally, if the RSO is not the same person as the possession licensee, the RSO provides an annual written report to the possession licensee. This report will include, but not be limited to, the following:

- The results of the annual checks stipulated in section 4(b).
- Any contravention of this plan or Radiation Safety Standards NM003:2010 *Standard for Radiation Apparatus used to Carry out Diagnostic Radiography of Animals* and PR100: 2010 *Standard for Premises - Ionising Radiation Sources*.
- The results of a review of this plan to ensure its continued effectiveness against actual clinical practice.
- The effectiveness of, and extent of compliance with, this plan.
- Recommendations about any necessary changes to the plan.

5. Training

The RSO will provide, or arrange for the provision of, appropriate training to all persons. These employees must undertake and satisfactorily complete the following training when they start employment, and undergo annual refresher training thereafter. Participation at this training is recorded in the training log book.

(a) Training for all employees

A radiation safety training program is provided to all employees. This training program addresses the following:

- Details of this Radiation Safety and Protection Plan, including:
  - Radiation hazards specific to this practice
  - Specific responsibilities of each category of employee
  - Regulatory obligations

(b) Additional training for users

In addition to the above training for all employees, users will also be provided specific instructions on:

- ARPANSA RPS 17, *Code of Practice and Safety Guide for Radiation Protection in Veterinary Medicine (2009)*
- safe work practices, including minimising radiation dose to animals and users
- features of, and how to use, the X-ray equipment
- selection of the lowest exposure factors to achieve the required diagnostic information

(c) Additional training for persons involved in image acquisition

Users will also be provided with initial and refresher training in the following aspects of film processing or digital imaging systems:

- Use of film developer and processor
- Film and imaging screen handling

and/or

- Use of digital imaging systems
- Software and hardware post processing procedures for digital images
- Client and image database management

6. Safe Work Practices

Users must take reasonable steps to ensure that the radiation dose received by any person is as low as reasonably achievable. To achieve this, the following safe work practices must be adhered to at this practice.

(a) Use of X-ray equipment

General requirements

- Radiography should only be undertaken if justified, i.e., there is a reasonable indication for the procedure and it can be performed without undue radiation hazard to users and staff.
- All users of the X-ray equipment must hold Use Licences.
- All use licensees must comply with the conditions of the licence issued under the *Radiation Safety Act 1999*.
- Only Use Licensees who are authorised to use the equipment by the possession licensee have access to, and are allowed to use, the X-ray equipment.
- No person under the age of 16, will be directly involved in work with radiation.

Radiography in a dedicated X-ray room

- A person must not hold any part of the X-ray tube head during radiography.
- Under no circumstances must any person be exposed to the primary beam.
- A person must not hold the cassette or screen. Cassette/screen holders must be used whenever a cassette/screen cannot be supported on a table or on another support.
- A person must not be present in the room during radiography unless their presence is necessary for the conduct of the radiographic examination.
- The primary beam must be restricted to the area to be examined by means of the collimator.
- An animal must not be held during radiography unless, for clinical reasons, other means of immobilisation are not practicable. Immobilisation should be achieved by mechanical means, tranquilisation or anaesthesia whenever possible.
- The same individual should not be asked to hold animals repeatedly.
- An examination table incorporating appropriate radiation shielding will be used.
- If it is clinically necessary to hold an animal during X-ray examinations, only one person will be required. Additionally, the person:
    - (i) must not be under 16 years of age;
    - (ii) preferably, should not be pregnant; and
    - (iii) must wear personal protective equipment.
- The X-ray tube assembly must be rigidly supported by a dedicated stand which provides adequate stability.

- The fastest film/screen combination, which will ensure a diagnostic quality image, is used.
- Users must ensure that the appropriate exposure factors are used. Exposure settings for specific examinations are marked on the X-ray unit. Exposure techniques must not be adjusted to compensate for inadequate film processing.
- The lowest possible exposure settings should be used in digital systems because the image processing software is capable of producing diagnostic quality images even when using exposure factors lower than those used with film.
- When performing radiography, the user and assistants must remain behind a protective screen or, if there is no screen, wear personal protective clothing and position themselves as far as practicable from the X-ray tube assembly, the animal and the path of the primary X-ray beam.
- Doors to the x-ray room must be closed during the radiographic examination.

Reporting to the RSO

- Users are required to report any contravention of this radiation safety and protection plan to the RSO.
- Users are required to report any radiation incident to the RSO.

Personal protective equipment and safety devices

This practice provides the following personal protective equipment and safety devices:

- Lead aprons with lead equivalence of at least 0.25 mm are available for all persons involved in small animal veterinary radiography where they are required to hold an animal for the conduct of the examination. Lead aprons are to be stored unfolded to help prevent the formation of cracks.
- Lead sleeves and gloves with lead equivalence of at least 0.5 mm for all persons involved in small animal veterinary radiography where they are required to hold an animal for the conduct of the examination.
- An examination table with radiation shielding equivalent to 0.5 mm of lead on the side and 1.0 mm of lead on the top.
- Assorted sandbags and restraints for animal positioning.
- Tripods and stands for the x-ray head and cassette/screen holders.

(b) Register of exposures

- This practice keeps the following information about each exposure:
  - the name of the animal
  - the name of the owner
  - date the radiographic investigation is performed
  - particulars of the radiographic examination performed
  - the name of the user of the X-ray equipment
- Users must ensure that this information is recorded after each examination (including any rejects).
- Users must ensure that each image is appropriately labeled either physically or digitally to identify it with the correct client records. This is achieved by marking the radiograph or tagging the digital image with all the information detailed above.
- Users must incorporate the radiograph into the animal's records. For conventional film, the radiograph must be placed into an X-ray sleeve (or envelope), with the name of the animal and date of exposure written on the sleeve, and for digital images, the image must be linked to the animal's records.

7. Image Receptors and Film Processing

To ensure that radiographs are of consistent diagnostic quality, the following procedures must be adhered to by all persons involved in the practice.

(a) Digital imaging systems

- The image receptor must be of an appropriate size and compatible with the X-ray unit.
- The image receptor will be cleaned daily prior to use.

(b) Film sizes and applications

- Films that have passed the manufacturer's recommended expiry date must not be used
- Films must only be used for applications appropriate to their size
- Film must be 'E' speed or faster
- The correct Film-Screen combinations must be used to provide:
  - Reduced exposure factors and times
  - Reduced motion blur
  - Reduced repeat examinations

An information sheet on the selection of film and intensifying screens is available from Radiation Health's website: www.health.qld.gov.au/radiationhealth/documents/27886.pdf.

(c) Storage of unexposed films & film processing chemicals

- Unexposed X-ray films must be stored in accordance with manufacturer's recommendations, in a container away from excessive heat, humidity or chemical contamination (e.g. from film processing chemicals), and adequately shielded against ionizing radiation or in an area remote from any X-ray unit.
- Film processing chemicals must not be stored in the same refrigerator or cupboard as foodstuffs.
- Disposal of chemicals will be provided by an authorised disposal agent and will comply with local council regulations.

(d) Processing of films

- Manual processing of films must be in accordance with the manufacturer's recommendations and must satisfy the following requirements:
  - Temperature of developing solutions must be measured
  - An appropriate time-temperature chart must be used to determine processing time
  - The time of processing must be measured
- The concentrations of developing solutions must be in accordance with the manufacturer's specifications.
- Processing of films will be in accordance with Annex G, *Guide to Manual Processing of Radiographs*, ARPANSA RPS 17 *Safety Guide for Radiation Protection in Veterinary Medicine (2009)*.

8. Repair and Maintenance

Repair and maintenance is conducted on the X-ray equipment, film processors and digital imaging systems to ensure that images are produced with optimal diagnostic quality and that radiation doses continue to be minimised.

Records of all repair and maintenance conducted at this practice are kept in the equipment maintenance log book.

(a) X-ray equipment

All maintenance must be carried out in accordance with the schedule specified by the manufacturer. Maintenance and repairs must be conducted by a qualified service person. If the equipment is to be used (i.e. energised) during repair and maintenance, the radiation safety officer must ensure that the person holds a licence to use X-ray equipment for maintenance, repair or commissioning.

Following the repair of an X-ray unit, the radiation safety officer must ensure that the unit continues to comply with Radiation Safety Standard NM003:2010 *Standard for Radiation Apparatus used to Carry out Diagnostic Radiography of Animals*, this may necessitate having the equipment tested for compliance with this standard by an accredited person.

(b) Film processors

Automatic processor

All maintenance must be carried out in accordance with the schedule specified by the manufacturer. The procedures detailed in the manufacturer's operation manual must be followed. These procedures will be performed by an appropriately trained person authorised by the possession licensee.

Major processor repairs and routine service must be handled by a qualified service person.

Manual processing

Cleaning the processing and developing tanks, and replacing the chemicals at least every two weeks, will ensure consistent diagnostic quality images are produced.

The maintenance procedure is displayed in a prominent location adjacent to the processing equipment. This procedure will be performed by a person trained to perform this work and who has been authorised by the possession licensee.

9. Operational Checks

The operational checks detailed in the table below are to be performed by persons trained to carry out this work and have been authorised by the possession licensee. Any identified problems are to be reported to the radiation safety officer and the possession licensee. Problems will be rectified and, if necessary, equipment and premises will be re-certified against the relevant standards.

Results of all operational checks are to be recorded in the operational check log book.

Frequency	Operational Check
Weekly	Check the quality of a test film/digital image (e.g. first clinical image of the day) by comparing it with a reference radiograph
	Check quantity and quality of chemicals in processors, and replenish/replace as required by manufacturer's specification

Frequency	Operational Check
Monthly	Perform a retake/reject analysis to determine the reason for the retake or reject (which may include problems with the film, developing process, the X-ray unit or the user)
Six monthly	Check the condition of personal protective equipment and safety devices
	Check that exposure factors for specific examinations are readily available
	Check that the RSO details are displayed in a prominent location on or near all X-ray equipment and are correct
	Check that X-ray equipment warning signs are displayed on each control panel and are in good condition
	Check that the darkroom and/or processing box is free from light leaks and that safelights are adequate
	Check the cleanliness of the intensifying screen
	Check that the X-ray film is stored in accordance with this plan
	Check that the oldest X-ray film is used first
	Check that film is within the expiry date specified by the manufacturer
	Check that the fastest film and film/intensifying screen combination, which will ensure a diagnostic quality image, is used
	Check that the processor maintenance procedures are displayed in a prominent location adjacent to the film processor
	Check that instructions for mixing chemicals and processing films are available
	Check that a time/temperature chart, a timer and a thermometer are available for manual processing
	Check that the processor shows no sign of leakage or chemical build up, and the tanks, roller racks, crossovers and splash guards are free from grime
	Check that the replenishing tanks are at the correct level and show no sign of leakage

10. Records

The following records are maintained, and are kept in a readily accessible location:

- Current Possession Licence issued under the *Radiation Safety Act 1999*
- Current radiation safety and protection plan approved by the Chief Executive of Qld Health
- Annual reports by the radiation safety officer
- Approvals to acquire or relocate the X-ray equipment
- X-ray equipment disposal records
- Inventory and location of X-ray equipment
- Training log book
- Equipment maintenance log book
- Operational check log book
- Register of examinations performed
- Radiation safety audit reports
- Incident reports

11. General Regulatory Requirements

This section outlines the legislative requirements associated with the movement or change of ownership of X-ray equipment, and testing of the X-ray equipment and the premises in which it is used. It is the responsibility of the possession licensee to ensure the necessary approvals are granted prior to the following considerations.

(a) Acquisition

An X-ray unit must not be acquired unless that person has obtained an 'Approval to Acquire' that specific X-ray unit.

(b) Supply

Within Queensland

An X-ray unit must not be supplied (sold, lent, exchanged etc) to another person in Queensland, unless that person has obtained an 'Approval to Acquire' that specific X-ray unit.

Outside Queensland (relocation)

An X-ray unit must not be relocated (moved, sold, lent, exchanged etc) outside of Queensland, unless an 'Approval to Relocate' has been obtained for that specific X-ray unit. The Chief Executive of Queensland Health must be notified within 7 days after it's relocation.

(c) Disposal

To dispose of X-ray equipment, the X-ray unit must be rendered permanently incapable of producing X-rays. Following this, the possession licensee must give the Chief Executive of Queensland Health written notice of the disposal within 7 days of the disposal.

(d) Register of X-ray equipment

An inventory of X-ray equipment in possession of the possession licensee, including its current location, must be maintained by the possession licensee. The Radiation Health Unit should be notified about any change of location (room number change, physical address etc) of an X-ray unit.

(e) Compliance testing of X-ray equipment

Before initial use, and every three years thereafter, the X-ray equipment must be assessed, by an appropriately accredited person, for compliance with Queensland's Radiation Safety Standard NM003:2010 *Standard for Radiation Apparatus used to Carry Out Diagnostic Radiography of Animals*. Only equipment which has a certificate of compliance may be used.

(f) Compliance testing of premises

Before initial use, and every five years thereafter, each room where X-ray equipment is used must be assessed, by an appropriately accredited person, for compliance with Queensland's Radiation Safety Standard PR100: 2010 *Standard for Premises - Ionising Radiation Sources*. Only premises which have a certificate of compliance may be used.

Additionally, if there has been a change in the location of X-ray equipment (including its location within a room), workload or use of an adjacent room, the possession licensee must ensure that an appropriately accredited person performs an assessment of the premises for compliance with the relevant Radiation Safety Standard, before the equipment is used.

12. Incident Response and Reporting

A radiation incident is an incident adversely affecting, or likely to adversely affect, the health or safety of any person because of the emission of radiation. This includes any 'near misses'.

All radiation incidents are to be reported to the RSO. A written incident report is to be produced by the RSO and submitted through the possession licensee to the Radiation Health Unit within 7 days of the occurrence of an incident. This report will include:

- incident description including details of the X-ray equipment involved and its location.
- estimates of radiation exposure to individuals (if applicable).
- action taken.
- proposals to prevent a recurrence.

Additionally, if the incident includes any of the following events, the possession licensee must immediately notify the Chief Executive of Queensland Health, either orally or in writing. If the notification was provided orally, a written notification must be submitted within 7 days.

- The source is, or appears to have been, lost or stolen.
- Equipment that uses, measures or controls radiation emitted from the source malfunctions with the result, or likely result, that there is, or will be, an unintended emission of the radiation or a person is, or will be, unintentionally exposed to the radiation.

The following details the procedures that are to be followed in the event of the specified incident:

Procedures in the event of actual or suspected malfunction of the X-ray equipment causing an unintended exposure to any person

In this case, the following procedure must be observed:

- The user must switch off the X-ray unit as quickly as possible at the main supply.
- The user must take precautions to prevent the use of the X-ray unit by:
    - posting a sign which states that the X-ray unit must not be used
    - removing the key to the X-ray unit, or taking other appropriate action.
- The user must advise the RSO of the incident.
- The X-ray unit must not be used until it has been repaired (and if necessary compliance tested) and the possession licensee has authorized its use.
- The RSO must determine the radiation dose to each person involved in the incident.