

VRA 2: What are the risks of causing new outbreaks of foot and mouth (FMD) by moving fallen stock from a road, premises, market, collection centre or slaughterhouse to an approved premises for disposal in the Restricted Zone?

1. SUMMARY OF OVERALL RISK

This risk assessment was compiled according to terms of reference provided by the Scottish Government regarding time of delivery, title of veterinary risk assessments (VRAs) and level of detail required. EPIC scientists created a generic framework suitable for the VRAs; collated and updated existing information on risks; filled gaps in the documents (including references where appropriate); and drafted new VRAs where necessary. These documents may require updating as new information becomes available or legislation develops, or if more in-depth assessment is necessary.

The purpose of this document is to qualitatively assess the risk of the specified activity in the face of an FMD outbreak in the UK. The assessment includes proposed actions to mitigate the risks associated with the specified activity, and which could form the basis of license conditions, should the activity be permitted. The summary of overall risk below assumes that the risk mitigation measures in Section 8 are implemented.

DEFINITIONS OF RISK LEVEL (OIE 2004, DEFRA 2011):

Negligible So rare that it does not merit consideration

Very low Very rare but cannot be excluded

Low Rare but could occur

Medium Occurs regularly

High Occurs very often

Very High: Events occur almost certainly

Overall risk: The risk of allowing the activity described is **LOW in the Restricted Zone.**

2. LEGISLATION, DEFINITIONS & ASSUMPTIONS

Statutory disease control requirements are applicable to livestock premises on suspicion and confirmation of FMD. When suspicion of disease cannot be ruled out, and diagnostic samples are taken, a Temporary Control Zone is put in place (TCZ) surrounding the suspect premises. On confirmation of disease, a national movement ban (NMB) is enforced by introducing a national Restricted Zone (RZ). A 3 km Protection Zone (PZ) and 10km Surveillance Zone (SZ) are implemented which place restrictions on movements and activities around infected premises to prevent spread of disease. Later in the outbreak, restrictions may be relaxed either through reducing the size of the RZ or through allowing some resumption of normal activities under licence within the RZ, SZ or PZ. In this VRA, RZ is used to refer to areas which are within the RZ, but do not also fall within the PZ or SZ.

For the purposes of this risk assessment, 'fallen stock' refers only to species susceptible to FMDV and 'location' refers to a premises, public road, market, slaughterhouse or collection centre. Some locations are subject to specific legislation:

Premises:

In the RZ, carcasses of susceptible animals (except of animals slaughtered for human consumption or suspect transmissible spongiform encephalopathy (TSE) cases for disposal) can only be moved from premises under the authority of a licence granted by an inspector (FMD (Scotland) order 2006, schedule 6, paragraph 4).

Markets:

In a RZ, gatherings of susceptible animals are only permitted under the authority of a licence granted by the Scottish Ministers (FMD (Scotland) Order 2006, schedule 6, paragraph 6), which is unlikely to be permitted until late in an outbreak once the risk of undetected infection has dropped. This VRA is likely to be relevant at the beginning of an outbreak when livestock are stuck in transit as a result of the NMB, and much later in the outbreak if markets are allowed to function under licence.

Slaughterhouses:

In a RZ, movement of carcasses or animal by-products from a slaughterhouse is allowed only for disposal, or under the authority of a licence granted by an inspector. The legislation specifies that the licence must include a condition prohibiting intermediate movement to any premises keeping susceptible animals, that anyone transporting animal by-products under the authority of a licence must do so in a drip-proof container or vehicle, and cleanse and disinfect the vehicle as soon as possible after unloading and in any event before re-use, and the occupier of premises to which any carcasses of animal product is moved must ensure that it is not brought into contact with, or fed to, any susceptible animal (FMD (Scotland) Order 2006, schedule 6 paragraph 3). Slaughterhouses in any Zone may receive animals under licence from a SZ or PZ.

Animal Collection Centres:

“Collection centre” means premises on the list approved from time to time by Scottish Ministers for the purpose of collecting susceptible animals for onward consignment to slaughter.

Approval of Animal-By Product Premises and Transporters:

Premises handling or disposing of fallen stock/animal by-products (ABP) require approval from the Scottish Government under Regulation (EC) No. 1069/2009, Commission Regulation (EU) 142/2011 and The Animal By-Products (Enforcement) (Scotland) Regulations 2011. Transporters operating independently of ABP approved premises require Registration with the Scottish Government.

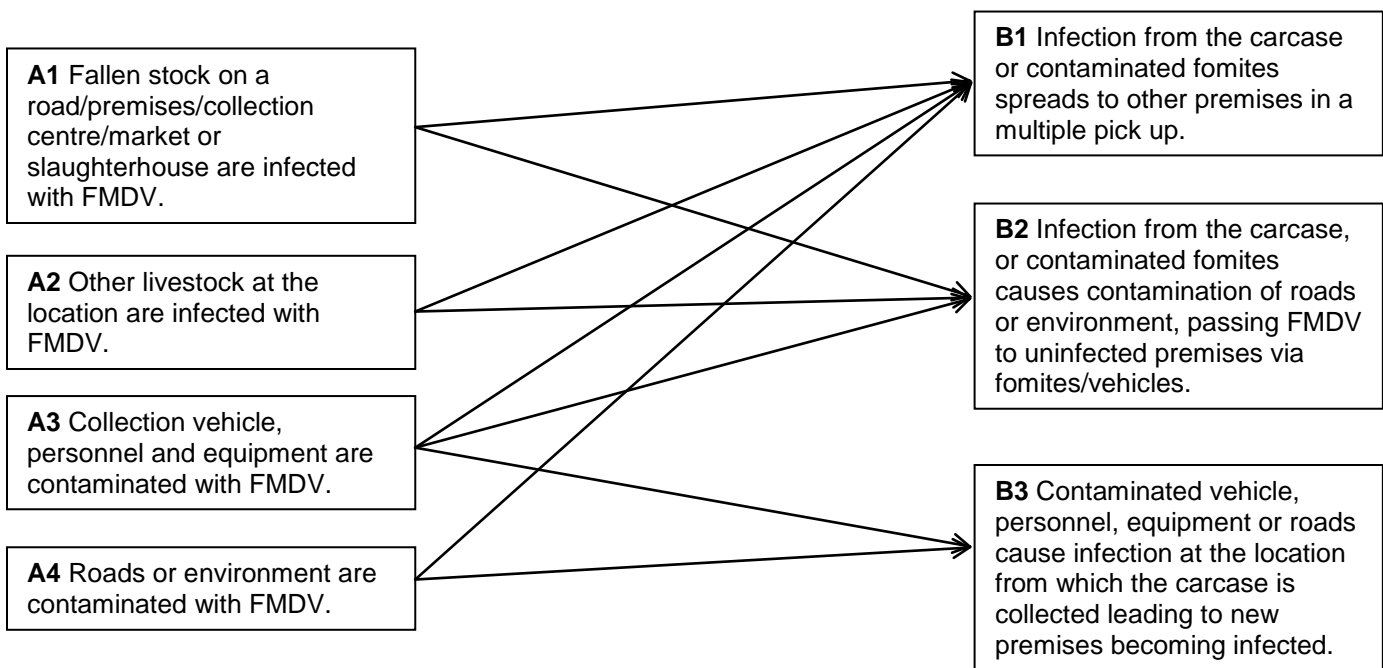
Disinfectants must be approved for use by the Diseases of Animals (Approved Disinfectants) (Scotland) Order 2008 as amended and used at the FMD Order dilution.

3. HAZARD IDENTIFICATION

(a) Hazard: FMD virus (FMDV)

(b) Specific Risk: When there is a suspected outbreak of FMD any movement of animals or carcasses increases the risk of further disease spread. There is a risk that collection of fallen stock from a premises/road/market/collection centres/slaughterhouses could lead to spread of FMDV to uninfected premises via fomites. However, fallen stock at these locations represent a public and livestock health threat and may increase the risk of disease transmission.

4. POTENTIAL RISK PATHWAYS



5. EXPOSURE ASSESSMENT

Factors which are likely to affect this probability of exposure are:	Comments and risk estimates if/where appropriate
Infection source: A1 Fallen stock (carcase) on a road, premises, collection centre, market, slaughterhouse is infected with FMDV	
<ul style="list-style-type: none"> Requires fallen stock with undetected or incubating FMD infection 	<ul style="list-style-type: none"> Animals may incubate FMD for 2 to 14 days before the appearance of clinical signs (Sanson 1994), depending on initial dose, route of infection and virus strain. Infected livestock may excrete FMDV for several days before the appearance of clinical signs, potentially leading to transmission or contamination prior to disease detection, particularly in cattle and pigs (Alexanderson <i>et al.</i> 2003, Orsel <i>et al.</i> 2009). FMD in sheep can be difficult to detect clinically as not all animals show clinical signs, and clinical signs are usually mild and short lived (Hughes <i>et al.</i> 2002). Whilst FMD does not often cause mortality in adult animals, infection may be present in animals that die from other causes.
Likelihood that animal is infected depends on: <ul style="list-style-type: none"> Location that the fallen stock is collected from 	<ul style="list-style-type: none"> Risk that animal is infected is higher at locations containing animals from multiple premises – markets, slaughterhouses and collection centres, as transmission may have occurred before the animal died. The risk from individual premises or roads is lower.
<ul style="list-style-type: none"> Origin of carcase (location and risk level of home premises) 	<ul style="list-style-type: none"> Movement of fallen stock from premises where FMD has been detected (“infected premises”) would not be permitted. However, FMD may be present at a location but not yet detected.

	<ul style="list-style-type: none"> • The highest risk is presented by animals at the location that have come from undetected premises with FMD, or from premises within the PZ or SZ where undetected infection is most likely to be present. • Risk of a premises being infected is highest if it is adjacent or close to premises with FMD. Once a NMB is in place, most transmission occurs by local spread (<3k from premises with FMD) (Gibbens <i>et al.</i> 2001, Keeling <i>et al.</i> 2001, Haydon <i>et al.</i> 2003). • Risk of airborne transmission decreases rapidly with distance from premises with FMD and is only likely to occur over significant distances if many infected animals (especially pigs) are present (Donaldson and Alexanderson 2001). • In a RZ, there are no detected infected premises. There is a risk of as yet undetected premises with FMD but overall the risk of local transmission is very low.
<ul style="list-style-type: none"> • Extent and timing of movements of susceptible animals from areas where FMD is present 	<ul style="list-style-type: none"> • Requires movements of infected animals before the NMB, or movements of animals with undisclosed infection by licence. • Likelihood of movements having taken place is influenced by type of premises, for example finishing units are likely to move animals in on a regular basis, where as closed high security units would represent the lowest risk. • In a RZ transmission is most likely to result from movement of animals with undetected infection before the NMB. • Identifying the number and nature of livestock movements from areas where FMD has been detected using livestock movement databases and tracings would allow better quantification of the risk.
<ul style="list-style-type: none"> • Proximity of location to premises with FMD 	<ul style="list-style-type: none"> • Close proximity of the location to premises with FMD increases the risk that animals may have undetected FMD. • In addition there is increased risk of indirect transmission via roads, vehicles, personnel, equipment or air borne infection.
<ul style="list-style-type: none"> • Movements of animals prior to arrival at location 	<ul style="list-style-type: none"> • Animals which have moved recently prior to coming to the location, particularly from a market, present a high risk of having been exposed to FMDV. • Statutory standstills should ensure that animals have not been moved within the previous 13 days in Scotland (20 days for pigs), which reduces this risk to very low assuming full compliance. Animals could also have moved from England, where the statutory standstills are 6 days for cattle, sheep and goats. • Animals consigned to a slaughterhouse, or to an animal collection centre for slaughter animals, are exempt from statutory standstills. They or other animals on the holding of origin may have moved recently. • Inspection of all susceptible animals on the premises prior to movement is a prerequisite for issue of a license to a slaughterhouse, market or animal collection centre.
<ul style="list-style-type: none"> • Stage of outbreak 	<ul style="list-style-type: none"> • Early in the outbreak there is increased risk of undetected infection and lack of information on movements.
<ul style="list-style-type: none"> • Likelihood of detection and transmission is influenced by FMDV strain 	<ul style="list-style-type: none"> • There are 7 serotypes of FMDV: O, A, C, SAT1, SAT2, SAT3 and Asia 1. The different serotypes (and different strains within each serotype) have different

	<p>characteristics for example in terms of host species susceptibility, length of incubation period, ease of detecting clinical signs and likelihood of air borne transmission (Kitching and Hughes 2002, Gloster <i>et al.</i> 2008). Much UK research is based on the 2001 outbreak, which was caused by serotype O, strain PanAsia. However future outbreaks may involve other serotypes/strains and therefore present different epidemiological situations. On confirmation of FMDV, the serotype and strain would be identified by The Pirbright Institute. This information would help to inform estimates of risk.</p>
<ul style="list-style-type: none"> Amount and viability of FMDV on carcase, if it is infected 	<ul style="list-style-type: none"> Total viral burden varies with stage of clinical disease and is greatest around the time that clinical signs appear. Virus concentrations are greatest in vesicular fluid (Sellers 1971), on day 2-3 after the onset of clinical signs. By day 4-5 virus titre is reduced. Animals with clinical signs are likely to have been detected so the likelihood of fallen stock for collection having clinical signs is low. FMDV can be detected up to 3 days before the appearance of clinical signs (reviewed by Alexanderson <i>et al.</i> 2003). This means there is a risk of potential transmission before the appearance of clinical signs (though much smaller than if clinical signs are present, when virus production and transmission peaks). Before clinical signs develop, the main sources of virus are saliva, nasal and lachrymal fluid, milk and expired breath (Alexanderson <i>et al.</i> 2003). FMDV is easily killed by approved disinfectants. Disinfection of the carcase reduces viral contamination. Bagging and sealing the head of fallen stock after disinfection of the carcase may reduce the risk of virus contamination from an animal with incubating or undetected infection. However, bagging heads can be physically demanding, and puts personnel in close contact with the carcase, increasing the likelihood of contamination of their protective clothing with FMDV. It can be difficult to stop bags falling off and the risk of potentially FMDV contaminated plastic blowing away onto livestock premises has to be balanced against any benefit. FMDV is very sensitive to pH and becomes uninfected if the pH drops below 6. Muscle pH drops sufficiently following death to inactivate FMDV in muscle tissue within 24-48 hours. However, FMDV can remain viable in tissues such as bone marrow, lymph nodes and blood for weeks to months (Cottral 1969). Low temperature (4°C) and relative humidity greater than 60% allow good survival of virus (Donaldson 1972, Bartley <i>et al.</i> 2002).
<p>Infection source: A2 Other livestock at the location are infected with FMDV (this does not pertain to fallen stock on the road)</p>	
<ul style="list-style-type: none"> Proximity to premises with FMD, stage of outbreak, strain differences 	<ul style="list-style-type: none"> See A1.
<ul style="list-style-type: none"> Number and species of animals at location 	<ul style="list-style-type: none"> Larger numbers of animals increase the risk that some may be infected, and increases the number that would be exposed if infection were present. Cattle and pigs produce more virus, and present a higher risk of disease transmission during the incubation period.

	<ul style="list-style-type: none"> • However, whilst virus production in sheep is lower, disease in sheep can be difficult to detect (Hughes <i>et al.</i> 2002), meaning that the disease can often spread more widely before detection.
<ul style="list-style-type: none"> • Origin or geographical spread of animals at location 	<ul style="list-style-type: none"> • There is a higher risk of infection in animals at markets, slaughterhouses and collection centres where animals are likely to have come from multiple premises. • If animals originate from areas where FMD is present, or from a wide geographical area, there is more risk of bringing infection. • Slaughterhouse in any zone may receive animals under licence from a SZ or PZ so even in a RZ animals may have originated from areas where FMD is present.
<ul style="list-style-type: none"> • Degree of mixing of animals at location 	<ul style="list-style-type: none"> • More mixing means animal is more likely to have been exposed to FMDV. Mixing for prolonged periods of time increases chance of transmission occurring.
<ul style="list-style-type: none"> • Amount of time spent at location 	<ul style="list-style-type: none"> • Increases time at risk of exposure to disease.
<ul style="list-style-type: none"> • Geographic spread of destination premises for remaining livestock on location 	<ul style="list-style-type: none"> • Animals from markets may be disseminated over a wide area and over significant distances. If FMD is present the impact may be severe. • The risks are less significant in slaughterhouses and animal collection centres dedicated to slaughter animals as animals are promptly slaughtered. Slaughter halts virus production. Risks of onward spread become limited primarily to animal by-products and any fallen stock collected where risks should be well managed.
<p>Infection source: A3 Collection vehicle, personnel and equipment are contaminated with FMDV</p>	
<ul style="list-style-type: none"> • Presence of infected livestock at premises of despatch of transport 	<ul style="list-style-type: none"> • Presence of livestock introduces risk of vehicle, personnel or equipment being contaminated on leaving the premises if undetected infection present. Livestock are not commonly present on premises used for processing or disposal of animal by-products so this risk is very low.
<ul style="list-style-type: none"> • Movement history of vehicle 	<ul style="list-style-type: none"> • Any previous movements close to areas where FMD is present increase risk. Movements to multiple slaughterhouses or premises increase risk.
<ul style="list-style-type: none"> • Failure to appropriately cleanse and disinfect vehicle, personnel and equipment prior to leaving each premises visited, including disposal premises 	<ul style="list-style-type: none"> • FMDV is very sensitive to suitable disinfectants and good biosecurity will reduce risk of virus transfer to roads via fomites such as personnel, vehicles and equipment.
<p>Infection source: A4 Roads and environment are contaminated with FMDV</p>	
<ul style="list-style-type: none"> • Proximity to premises with FMD, stage of outbreak, strain differences 	<ul style="list-style-type: none"> • See A1.
<ul style="list-style-type: none"> • Biosecurity of local premises, cleansing and disinfection procedures in place 	<ul style="list-style-type: none"> • FMDV is very sensitive to approved disinfectants and good biosecurity will reduce risk of virus transfer to roads via fomites such as personnel, vehicles and equipment.
<ul style="list-style-type: none"> • Survival of FMDV on road 	<ul style="list-style-type: none"> • FMDV can survive on average for 2 to 3 months in bovine faeces at 4°C. Survival duration increases with decreasing temperatures and presence of organic material and varies with virus strain (reviewed by Bartley <i>et al.</i> 2002).
<p>Risk of transmission: B1 Infection from the carcass or contaminated fomites spreads to other premises in a multiple pick up</p>	
<ul style="list-style-type: none"> • Number of stops, multiple pick ups 	<ul style="list-style-type: none"> • Increasing number of stops increases risk of transmission between premises.
<ul style="list-style-type: none"> • Collection vehicle, personnel or equipment in contact with susceptible livestock 	<ul style="list-style-type: none"> • Risk will be higher if vehicle or personnel are in contact with other susceptible livestock at the location and could be reduced by ensuring carcasses can be collected without contact with susceptible livestock, for example at the perimeter of premises or at market entrances.

<ul style="list-style-type: none"> • Unsuitable vehicles, failure to thoroughly cleanse and disinfect vehicle, personnel and equipment prior to leaving each premises visited, including disposal premises. 	<ul style="list-style-type: none"> • If vehicles are not suitable, (i.e. lined with impervious easily cleaned material, leakproof, equipped with an adequate sized tank to collect all blood and liquids released from carcasses, and enclosed/covered by an impervious cover), there is an increased risk of contamination. • FMDV is very sensitive to approved disinfectants and good biosecurity will reduce risk of virus transfer to roads via fomites such as personnel, vehicles and equipment.
<p>Risk of transmission: B2 Infection from the carcass, or contaminated fomites causes contamination of roads and environment, passing FMDV to uninfected premises</p>	
<ul style="list-style-type: none"> • Number of infected carcasses 	<ul style="list-style-type: none"> • Risks from carcasses where no infection was detected are low since even if FMDV is present, the viral load is likely to be very low.
<ul style="list-style-type: none"> • Cleansing and disinfection of vehicle, personnel, equipment 	<ul style="list-style-type: none"> • Appropriate cleansing and disinfection with approved disinfectants greatly reduces contamination of the vehicle. The risks associated with movement of infected material can be virtually eliminated by appropriate cleansing and disinfection. However, failure to conduct appropriate cleansing and disinfection remains a risk.
<ul style="list-style-type: none"> • Suitable vehicles 	<ul style="list-style-type: none"> • If vehicles are not suitable,(i.e. lined with impervious easily cleaned material, leakproof, equipped with an adequate sized tank to collect all blood and liquids released from carcasses, and enclosed/covered by an impervious cover), there is an increased risk of contamination
<ul style="list-style-type: none"> • Distance and time travelled, number of stops, 	<ul style="list-style-type: none"> • Increasing journey distance or time increases risk of contamination from vehicle. Increasing number of stops increases risk of contamination from both vehicle and personnel.
<ul style="list-style-type: none"> • Proximity and density of susceptible livestock to transport route 	<ul style="list-style-type: none"> • Increases risk that if any leakage of virus does occur, it will result in new outbreaks. • Risk reduced if transported direct to disposal premises where carcasses unloaded in an enclosed building with good biosecurity.
<ul style="list-style-type: none"> • Failure to fully empty the vehicle and undergo cleansing and disinfection of vehicle, personnel and equipment after transport 	<ul style="list-style-type: none"> • Increases risk of onward virus transmission.
<ul style="list-style-type: none"> • Personnel transporting or handling carcasses keep and care for susceptible livestock 	<ul style="list-style-type: none"> • Increased risk due to close contact with susceptible livestock
<p>Risk of transmission: B3 Contaminated vehicle, personnel, equipment or roads etc cause infection at the location from which the carcass is collected</p>	
<ul style="list-style-type: none"> • Number of stops, multiple pick ups 	<ul style="list-style-type: none"> • Increasing number of stops increases risk of transmission between premises.
<ul style="list-style-type: none"> • Collection vehicle, personnel or equipment in contact with susceptible livestock 	<ul style="list-style-type: none"> • See B2.
<ul style="list-style-type: none"> • Unsuitable vehicles 	<ul style="list-style-type: none"> • See B2.
<ul style="list-style-type: none"> • Failure to thoroughly cleanse and disinfect vehicle and personnel 	<ul style="list-style-type: none"> • See B2.

6. CONSEQUENCE ASSESSMENT

Spread of FMD to uninfected premises. Although the risk is likely to be low, introducing infection to a market situation could have serious consequences in terms of dissemination of disease over a wide geographical area. Potential for severe consequences for fallen stock at an animal collection centre or slaughterhouse is lower than for a market since all animals at these locations will be destined for immediate slaughter; wide geographical dissemination of infection is unlikely.

It is recognised that the knackery industry in Scotland is limited to a small number of businesses, some operating over a wide geographic area. Some carcasses are consigned for final disposal out with Scotland. Poor vehicle or biosecurity standards could potentially lead to widespread dissemination of FMDV to uninfected premises, in previously uninfected areas.

7. RISK MANAGEMENT OPTIONS

There are risks that permitting movements of fallen stock from premises, public roads, markets, animal collection centres and slaughterhouses for disposal as an exemption from Restricted Zone measures could lead to FMDV spreading to uninfected premises. The greatest risks are associated with animals with undetected infection, either because they are still in the incubation period, or because there are few clinical signs, as is often seen with sheep. The risks are higher in the early stages of an outbreak, when one incubation period has not passed since the last confirmed case, and information on animal and fomite movements has not yet been collated and followed up. The risk is also higher for collection of fallen stock from markets than for other locations due to the possibility of widespread dissemination of infection via a large number of susceptible livestock if contamination reached livestock at the market, and of higher risk of disease being present due to the mixing of livestock of different susceptibilities and exposure histories from different origin premises. However, markets (and slaughterhouses and collection centres) are unlikely to be operating until late in the outbreak, when the risk of undetected premises with FMD is low. Collection of fallen stock from premises and roads presents a lower risk, but is likely to be necessary even in the early stages of an outbreak, since in most cases on farm burial of fallen stock is not permitted. Operator compliance is important and risk increases with the use of unsuitable or leaking vehicles or insufficient cleansing and disinfection.

Potential risk management options are:

- (i) Do not allow movements of fallen stock.
- (ii) Allow movements with certain conditions:
 - (a) Ensure animals regularly checked for signs of FMD.
 - (b) Ensure adequate cleansing and disinfection with an approved disinfectant before and after pick up.
 - (c) Limit numbers of premises visited during pick-ups.
 - (d) Ensure vehicles are appropriate for transport (enclosed and no leakage).
 - (e) Ensure location, operation, structure and biosecurity of handling and disposal premises meets minimum standards to prevent dissemination of FMDV.

Since burial on premises is generally not permitted, removal of fallen stock is necessary for reasons of livestock and public health so option (i) is not feasible. Therefore collection of fallen stock from all locations (such as public roads, premises, collection centres, markets and slaughterhouses) should be permitted but conditions should be in place to reduce the risks of contamination.

Overall the risk is low in the RZ, provided mitigation measures are observed.

This risk level was assigned based on scientific literature available and expert opinion where appropriate by considering the risk pathways and the factors affecting each risk pathway, as listed in sections 4 and 5.

8. SUGGESTED RISK MITIGATION MEASURES

Subject to the following safeguards, collection of fallen stock from locations (such as public roads, premises, collection centres, markets and slaughterhouses) in a Restricted Zone represents a low risk, provided the following risk mitigation strategies are in place:

A. Prevent disease getting in to slaughterhouse

- (i) All livestock entering the slaughterhouse in a restricted zone will do so only under licence. Part of the criteria of this licence is pre-movement inspection of the livestock for FMD.

B. Before movement

- i) Transporters must be approved or registered under appropriate legislation.

- ii) Transporters must ensure only suitable, covered and leakproof vehicles of impervious construction are used, equipped with effective drainage and a sealed tank to collect all blood and liquids released from carcasses. Given variation in the standards of vehicles used, specific AHVLA approval of individual vehicles for use is recommended. Premises are not to allow vehicle on premises if obviously not suitable.
- iii) Ensure all personnel going on site at a location (such as premises, collection centre, market, slaughterhouse) are wearing clean, disinfected clothing and boots, that the vehicle has been cleansed and disinfected prior to arrival on premises, and that all equipment used is clean and disinfected. Approved disinfectants must be used at the correct concentration.
- iv) Stockmen should inspect livestock regularly to ensure there are no clinical signs suggestive of FMD. Inspection of livestock by a veterinary inspector will be a prerequisite for movements licensed to slaughterhouses and animal gatherings.
- v) Transporters should complete Commercial Documents before handling carcasses where possible, and leave a copy securely in a polythene bag, or other container provided on the location.
- vi) Carcasses to be collected should be collected at an access point on the perimeter of the premises, and be left in a covered leakproof container, or on hard standing.
- vii) Carcasses, with special attention to orifices, to be sprayed with an approved disinfectant prior to loading, and impermeable plastic placed and sealed over heads and feet (AHVLA may consider whether or not the later point is considered practical).
- viii) Driver of vehicle to indicate arrival prior to going on location.
- ix) Driver and vehicle to have no contact with susceptible livestock at location
- x) Personnel and vehicle to be appropriately cleansed and disinfected prior to leaving location. Sufficient supplies of water and approved disinfectant should be carried on the vehicle for this purpose.
- xi) Drivers of vehicles should not keep or care for susceptible animals.

C. During movement

- i) The route taken must be as short as possible and not come into contact with any livestock or susceptible livestock premises other than those arranged.
- ii) As few premises as possible should be visited on each journey. Market pick ups should be done on a single trip and should not form part of multiple pick ups.
- iii) Start with lowest risk location and move to highest risk in accordance with guidance at C (iii) below.
- iv) A contingency plan should be kept in case of accident or breakdown *en route*, to minimise any increases likelihood of spread of disease if it was present.

D. Multiple Visits

- i) Carcasses may be collected from more than one location in any one day provided all conditions are met.
- ii) Vehicles must be unloaded, appropriately cleansed and disinfected at approved premises at least once every 24 hours.
- iii) Collections must start with lowest risk premises and move to highest risk.
 - a. Transporter may collect carcasses in the RZ prior to collections in the SZ and PZ, in that order.
 - b. Pig premises should be last visit before transport to approved handling or disposal premises regardless of Zone.

E. After movement

- i) The intermediate handling and processing/disposal premises must be approved under appropriate legislation.
- ii) All handling and unloading/loading of carcasses must be done in enclosed buildings which are readily capable of cleansing and disinfection. The ability to comply with this and other mitigating factors should be confirmed by AHVLA for sites handling or disposing of carcasses from the SZ and PZ.
- iii) There must be no "live" livestock on the handling/disposal premises.
- iv) Personnel on handling/disposal premises must not keep or care for susceptible livestock
- v) Care and every effort must be made to keep "dirty" and possibly contaminated areas, vehicles and equipment separate to "clean" areas, vehicles and equipment.
- vi) All personnel leaving any "dirty" area or having used such vehicle or equipment must appropriately cleanse and disinfect, or change clothing, prior to entering a clean area, or leaving the premises. All vehicles and equipment leaving a dirty area must be appropriately cleansed and disinfected. Wheels and wheel arches of all vehicles leaving site must be appropriately disinfected. Approved disinfectants must be used at the correct concentration.
- vii) Disposal of carcasses must take place without undue delay at approved premises.

It is assumed that all relevant legislation normally applicable is followed, for example regarding livestock identification and recording of movements.

9. SOURCES OF EXPERT ADVICE

This VRA is based on VRA 2009 #6 held by the Scottish Government "What is the risk of causing new outbreaks of FMD by moving fallen stock off premises for disposal?"

10. AUTHORS

Compiled by: Harriet Auty, Lisa Boden (EPIC CEADO)	Date: 14/02/2012
Reviewed by: Dom Mellor (EPIC CEADO)	Date: 29/02/2012
Reviewed by: Martyn Blissitt (AH&WD, Scottish Government)	Date: 28/03/2012
Reviewed by: The FMD National Experts Group (NEG)	Date: 01/02/2013

11. REFERENCES

- Alexanderson S, Zhang Z, Donaldson AI, Garland AJM (2003) The pathogenesis and diagnosis of foot-and-mouth disease. *Journal of Comparative Pathology* 129, 1-36.
- Bartley LM, Donnelly CA, Anderson RM (2002) Review of foot-and-mouth disease virus survival in animal excretions and on fomites *Veterinary Record* 151, 22, pp667-669.
- Cottral GE (1969) Persistence of foot-and-mouth disease virus in animals, their products and the environment. *Office International des Epizooties Bulletin* 71, pp549-568.
- Defra, (2011) Qualitative analysis of the risk of introduction of Equine Infectious Anaemia (EIA) into Great Britain from an EIA endemic area through temporary movement of UK origin horses (Roberts, H. & Paterson, A.) Veterinary Science Team, 17 Smith Square, London, SW1P 3JR, United Kingdom. Version 1.0, Released 20 June 2011, p15.
- Donaldson AI (1972) The influence of relative humidity on the aerosol stability of different strains of foot-and-mouth disease virus suspended in saliva. *Journal of General Virology* 15, pp25-33.
- Donaldson AI, Alexanderson S (2001) Relative resistance of pigs to infection by natural aerosols of FMD virus. *Veterinary Record* 148, 19, pp600-602.
- Gibbens JC, Sharpe CE, Wilesmith JW, Mansley LM, Michalopoulou E, Ryan JBM, Hudson M (2001) Descriptive epidemiology of the 2001 foot-and-mouth disease epidemic in Great Britain: the first five months. *Veterinary Record* 149, 24, pp729-743.
- Gloster J, Doel C, Gubbins S, Paton DJ (2008) Foot-and-mouth disease: Measurements of aerosol emission from pigs as a function of virus strain and initial dose, *Veterinary Journal* 177, 3, pp374-380.
- Haydon DT, Chase-Topping ME, Shaw DJ, Matthews L, Friar JK, Wilesmith J, Woolhouse MEJ (2003) The construction and analysis of epidemic trees with reference to the 2001 UK foot-and-mouth outbreak. *Proceedings of the Royal Society of London Series B-Biological Sciences* 270, pp121-127.
- Hughes GJ, Mioulet V, Kitching RP, Woolhouse MEJ, Alexanderson S, Donaldson AI (2002) Foot-and-mouth disease virus infection of sheep: implications for diagnosis and control, *Veterinary Record*, 150, 23, pp724-727.
- Keeling MJ, Woolhouse MEJ, Shaw DJ, Matthews L, Chase-Topping M, Haydon D, Cornell SJ, Kappey J, Wilesmith J, Grenfell BT (2001) Dynamics of the 2001 UK foot and mouth epidemic: Stochastic dispersal in a heterogeneous landscape, *Science* 294, 5543, pp813-817.
- Kitching RP, Hughes GJ (2002) Clinical variation in foot and mouth disease: sheep and goats, *Revue Scientifique et Technique de l'Office International des Epizooties* 21, 3 pp505-512.
- OIE (2004) Handbook on Import Risk Analysis for Animals and Animal Products: Introduction and qualitative risk analysis, Vol.I. OIE Publications, Paris.
- Orsel K, Bouma A, Dekker A, Stegeman JA, de Jong MCM (2009) Foot and mouth disease virus transmission during the incubation period of the disease in piglets, lambs, calves, and dairy cows, *Preventive Veterinary Medicine* 88, 2, pp158-163.
- Sansen RL (1994) The epidemiology of foot-and-mouth disease: Implications for New Zealand, *New Zealand Veterinary Journal* 42, 2, pp41-53.
- Sellers RF (1971) Quantitative aspects of the spread of foot and mouth disease, *The Veterinary Bulletin* 41, pp431-439.

12. NOTES

None