Guidance 4

124 Use of the REPPIR risk framework allows the results for each hazard to be collated and the most serious hazards selected to give a suitable and sufficient range of source terms for further more detailed assessment of the consequences under regulation 5. Regulation 5 requires a standardised radiological consequence assessment in accordance with Schedule 3 to determine the recommended geographical extent for the detailed emergency planning zone and (where applicable) the outline planning zone.

125 An overview of the complete assessment process is given in the hazard evaluation and consequence assessment flow diagram (Appendix 2, Figure 8a–c) which indicates how the Regulations, ACOP, and sections of guidance apply. This diagram does not replace or amend any requirements within the regulations or ACOP but illustrates some of the considerations necessary, steps which may be taken, and likely outputs in order to achieve compliance.

Regulation 4(1)–(4)

(1) The operator of any premises to which these Regulations apply must make a written evaluation before any work with ionising radiation is carried out for the first time at those premises.

(2) The evaluation required under paragraph (1) must be sufficient to identify all hazards arising from the work undertaken which have the potential to cause a radiation emergency.

(3) Where the evaluation required under paragraph (1) does not reveal any hazards having the potential to cause a radiation emergency, reasons for such a conclusion should be set out in that evaluation.

(4) Where the evaluation required under paragraph (1) does reveal the potential for a radiation emergency to occur, the operator must take all reasonably practicable steps to—

(a) prevent the occurrence of a radiation emergency; and
(b) limit the consequences of any such emergency which does occur.

ACOP 4(1)–(4)

126 The hazard evaluation should determine:

(a) the potential consequences of each radiation emergency in terms of the effective dose (and where relevant, equivalent dose to the thyroid) to the most exposed persons outside the premises assuming no urgent protective actions are implemented, and
(b) the likelihood of the consequence occurring.

127 Evaluating a low likelihood for a radiation emergency to occur should not be used as a reason for discounting the hazard from having the potential to cause a radiation emergency. Operators should consider the possibilities for radiation emergencies with extremely low likelihoods but with significant or catastrophic consequences.

128 Where the hazard evaluation concludes there is no hazard with a potential to cause a radiation emergency there is no need to perform a consequence assessment under regulation 5. The justification for such a conclusion should be based on the limited radiological consequences of any hazard (which should be less than 1 mSv effective dose over the period of a year).

129 Where the hazard evaluation concludes there is a potential for one or more hazards to cause a radiation emergency the operator should collate the results of the hazard evaluation for input into the REPPIR risk framework (Appendix 2, Figure 7) to support the consequence assessment required under regulation 5.

Guidance 4(1)–(4)

Evaluating the consequences of each radiation emergency

141 Through the hazard evaluation, the operator will need to identify what the consequences would be if an identified radiation emergency occurred. For example, in the nuclear sector transient analysis or other analyses will normally be carried out, when appropriate, to provide an adequate understanding of the behaviour of the installation under fault conditions. The evaluation should determine the nature, form and quantity of radioactive material that would be released (the source term or terms*). These source terms should be retained as they directly feed the consequence assessment required by regulation 5(1) and Schedule 3.

* See Schedule 3 for full definition of a 'source term'.

142 For fault sequences that lead to a release of radioactive material or to exposure to direct radiation, an initial radiological consequence analysis should be performed to determine the effective dose (and where relevant, equivalent dose to the thyroid) to the most exposed persons outside the premises. The assessment should be performed on a suitably conservative and consistent basis to ensure all potential radiation emergencies are identified in a systematic manner. For a radioactive release it should be assumed that the person is directly downwind of an airborne release at the distance of greatest dose or as a result of exposure to direct radiation at the location off site which gives the greatest dose. No urgent protective actions should be assumed. Where an operator is looking to demonstrate there is no hazard with the potential to cause a radiation emergency in line with the requirements of regulations 3(2) and 4(3) the annual effective doses will need to be calculated and no long-term protective actions should be assumed. The ingestion dose over this period should therefore be considered.

143 The radiological consequence assessments may be taken directly from existing risk assessments for the 2017 Regulations or safety cases produced under NIA if they are suitable and sufficient and available for the purpose. These existing radiological consequence assessments can then be used to meet the requirements of regulation 4 to demonstrate either:

(a) that there is no hazard with a potential to cause a radiation emergency as required under regulation 4(3) due to the limited radiological consequences of any hazard being less than 1 mSv effective dose over the period of a year; or

(b) that all reasonably practicable steps have been taken to prevent the occurrence of a radiation emergency and to limit its consequences under regulation 4(4) and to compare the effective dose against the impact table (Appendix 2, Table 1). The impact in terms of effective dose is then input into the REPPIR risk framework (Appendix 2, Figure 7) as referenced in ACOP for regulation 4 together with the associated likelihood for the radiation emergency (see paragraphs 160–163). This will determine the representative range of radiation emergencies to be used, and the associated source terms to be input into the more detailed radiological consequence assessment required under regulation 5(1) and Schedule 3. This information will in turn be used to determine the recommended distances for detailed emergency planning and outline planning where applicable.

144 The hazard evaluation should consider the potential for events that could affect several installations and activities concurrently, as well as consideration of the interactions between the installations and activities, such as through either a common cause or a domino effect. Thus, depending on the nature of the premises in question, the evaluation may identify a number of different events ranging from individual failures on a single installation (leading to single-source term) to multiple failures resulting from, for example, seismic events which damage several facilities (leading to several different source terms).

145 The hazard evaluation should also identify non-radiation related hazards to people on-site and off-site that are associated with the installation or activity and that may impair the effectiveness of or change the protective action to be taken. This may include the potential for hazards associated with explosion, fire, chemical releases, severe weather, and persons self-evacuating.

Guidance 7(6)

228 All operators must send the details of the assessment to the relevant regulator (see regulation 2) within 28 days of sending the consequences report to the local authority. The operator may choose to combine the details of assessment with the hazard evaluation prepared under regulation 4(7). In the case of defence nuclear sites, where the technical information specified in the ACOP for regulation 7(6) is sensitive nuclear material specifically associated with a nuclear warship or nuclear weapon, the details of the assessment may instead be shared with DNSR who will provide assurance to ONR on the adequacy of the assessment.

229 The details of the assessment should, where relevant, contain the details required from (a) to (f) in paragraph 227 above. The reports submitted should contain sufficient information and cross-references for the relevant regulator to be able to confirm the conclusions reached.

230 The documentation should also have been subject to appropriate quality control procedures before issue. As noted in the guidance for regulation 4(6), where the requirements complied with under the 2017 Regulations or NIA satisfy equivalent requirements under REPPIR it will not be necessary to duplicate information. Instead the relevant documents may be cross-referenced in the details of the assessment documentation.

Regulation 8 Detailed emergency planning zones

Regulation 8(1)

(1) The local authority must determine the detailed emergency planning zone on the basis of the operator's recommendation made under (paragraph 2) of Schedule 4 and may extend that area in consideration of—

(a) local geographic, demographic and practical implementation issues;
(b) the need to avoid, where practicable, the bisection of local communities; and
(c) the inclusion of vulnerable groups immediately adjacent to the area proposed by the operator.

ACOP 8(1)

231 The detailed emergency planning zone must be based on the minimum geographical extent proposed by the operator in the consequences report and should:

(a) be of sufficient extent to enable an adequate response to a range of emergencies; and
(b) reflect the benefits and detriments of protective action by considering an appropriate balance between:
(i) dose averted; and
(ii) the impact of implementing protective actions in a radiation emergency across too wide an area.

232 In defining the boundary of a detailed emergency planning zone, geographic features should be used for ease of implementing the local authority's off-site emergency plan. Physical features such as roads, rivers, railways or footpaths should be considered as well as political or postcode boundaries, particularly where these features and concepts correspond with other local authority emergency planning arrangements.

Schedule 3 Assessment of consequences requirements

Regulation 5(1)

Schedule 3(1)–(2)

(1) The following requirements must be complied with in the assessment of consequences required by regulation 5.

(2) The assessment must be based on a suitable and sufficient range of source terms representing the range of potential emergencies which might arise from the work with ionising radiation.

Guidance Schedule 3(1)–(2)

673 Schedule 3 defines the requirements that must be complied with when performing the assessment of consequences required by regulation 5. The first of these requirements is that the assessment must be based on a suitable and sufficient range of source terms representing the range of potential emergencies which might arise from the work with ionising radiation. The suitable and sufficient source terms are those identified by the operator on the basis of expert judgement and evaluation when following the guidance provided in the ACOP for regulation 5. For each of these source terms, an off-site consequence assessment must be performed consistent with the requirements of Schedule 3.

674 When assessing the off-site consequences of potential radiation emergencies from their premises, operators need to estimate the likely exposures to members of the public and emergency workers that may result from such events so that doses can be restricted and the need for extent and content of emergency plans (regulations 10 and 11) can be established. Assessments of this kind are complex and operators should consult their RPA and, where appropriate, a radiological consequence assessment specialist.

675 As discussed in the guidance for regulation 4, in complex cases the evaluation may lead to many source terms that for the purposes of practical analysis may be grouped together. This can be achieved through the use of one or more representative but bounding source terms according to common characteristics such as similar initiating events, common facilities or equipment, or common consequences. The differing characteristics to be considered by the operator should also include different time frames associated with a release, and differing combinations and quantities of radionuclides involved.

676 For the purposes of evaluating potential offsite radiation doses to members of the public the operator should evaluate both the effective dose and equivalent dose to the thyroid where relevant. Where the exposure is due to a release the choice of methods for performing the atmospheric dispersion modelling is for the operator to justify. One methodology for performing such analysis was developed by PHE and adopts a probabilistic approach, sampling real historic weather data.[28] An alternative approach using straight line Gaussian plume modelling is also possible as discussed in the guidance to Schedule 3(3)–(6) below.

677 To support operators of smaller, lower-risk premises, by simplifying the process of performing a consequence assessment to determine the extent of emergency planning, PHE have produced datafiles that such operators may request from them.15 The datafiles comprise time-integrated activity concentrations in air per unit release and ground deposition concentrations per unit release, for a range of chemical forms, and will be applicable to a wide range of radionuclides. These datafiles remove the need for the operators of smaller, lower-risk premises to purchase meteorological data and perform significant amounts of atmospheric dispersion modelling as part of the requirements of a full consequence assessment. These datafiles are not as representative as performing a site-specific assessment. They are deemed to be fit for purpose for smaller, lower-risk premises where the operator demonstrates that the unmitigated radiological consequences from a bounding hazard analysis case are in the lower region of the REPPIR risk framework (Appendix 2, Figure 7). Here only outline planning is required and for which contingency planning under the 2017 Regulations would be sufficient as discussed in paragraph 146.

Schedule 3(3)–(6)

(3) The calculations undertaken in order to reach the assessment must consider a range of weather conditions (if weather conditions are capable of affecting the extent of the radiation emergency) to account for—

(a) the likely consequences of such conditions; and
(b) consequences which are less likely, but with greater impact.

(4) The assessment must consider the consequences of the radiation emergencies identified in regulation 4 on the population within the geographical extent of the potential radiation emergency, accounting for different characteristics, including, for example age and other characteristics which would render specific members of the public especially vulnerable.

(5) The assessment must consider what would be an effective and, where relevant, equivalent dose to the thyroid in the context of each radiation emergency identified.

(6) The assessment must include all relevant pathways by which members of the public could be exposed to radiation in the context of each radiation emergency identified.

Guidance Schedule 3(3)–(6)

Considering a range of weather conditions

678 Potential options for atmospheric dispersions modelling include a probabilistic assessment approach based on the application of historical weather data for the specific location of the premises. This enables consideration of a full range of weather conditions including those which are less likely and conditions which include precipitation.[28] For operators of smaller, lower-risk premises, the simplifying datafiles produced by PHE,[15, 28] and discussed in paragraph 677 above represent one means of performing such assessments without the need to develop the in-house capability to perform such assessments. Further details about the PHE datafiles can be found on the PHE website.[15] Alternatively, the operator may adopt a more deterministic approach using a straight-line Gaussian plume model and performing a range of sensitivity studies for differing stability categories and the effects of precipitation.

679 The effect of considering precipitation during the release varies with exposure pathway and radionuclide. In general, pathways which primarily depend on concentrations in air may exhibit lower doses in wet conditions than in dry, because of the influence of precipitation in lowering the concentrations in air due to enhanced deposition. Pathways which depend primarily on deposition on the ground will tend to exhibit higher doses due to the potential for increased ground deposition occurring during precipitation.

680 If novel calculation methods and techniques, for which there is not an existing track record of use in safety submissions in the UK, are proposed to be used for the atmospheric dispersion modelling applied in the consequence assessment then the analyses will need to adequately represent the physical and chemical processes taking place. Where possible, the analytical models should be validated by comparison with actual experience, appropriate experiments or tests. The validation should be of the model as a whole or, where this is not practicable, on a module basis, against experiments that replicate as closely as possible the expected conditions. Care should be exercised in the interpretation of experiments to take account of uncertainties in replicating the range of test conditions. The limits of applicability of analytical models should be identified. Where validation against experiments or tests is not possible, a comparison with other, different, calculation methods may be acceptable. Where possible, independent checks using diverse methods or analytical models should be carried out to supplement the original analysis. It is for the operator to justify the approach they have taken in meeting the requirements in the Regulations.

Consideration of the population within the geographical extent of the potential radiation emergency

681 To inform emergency planning arrangements for persons off site likely to be exposed to radiation, the nature and magnitude of the risks to persons off site (including members of the public and emergency workers) should be assessed.

Guidance
Schedule 3(3)–(6)

682 When considering the population as a whole, where relevant, it is generally sufficient to consider three age groups to represent the differing habits and dose assessment data for the range of ages that need to be planned for. These are infants aged 1 year, children aged 10 years, and young adults aged 20 years. Additionally, doses to the foetus and breastfed infant should also be considered for those radionuclides where these could be potentially limiting.

683 For the purposes of evaluating potential off-site doses to off-site emergency workers the operator should consider the emergency arrangements that are likely to be required in an off-site emergency plan for both the detailed emergency planning zone and the outline planning zone where relevant. Where an off-site emergency plan already exists, this will be a useful initial source of information. The operator, in consultation with the local authority, should identify the potential duties, locations and durations for a representative range of off-site emergency workers, for which realistic dose estimates should be provided to inform the off-site plan.

Consideration of all relevant pathways

684 Dose assessments should consider all relevant external and internal dose pathways, including inhalation, resuspension, ground gamma, ingestion (including commercial and domestic leafy green vegetables and milk), and cloud gamma. This will include assessment of any releases of radioactive material to air or inland watercourses and also doses from direct radiation.

685 Consideration should also be given both to the likely duration of potential releases or external exposure scenarios due to direct shine from a source and the period in which they are most likely to commence.

Schedule 3(7)–(8)

(7) The assessment must identify any protective action that may need to be taken for the range of potential radiation emergencies.

(8) The assessment must assess the consequences of suitable and sufficient source terms by distance and by exposure pathway, and the distances to which protective action would be required based on the United Kingdom Emergency Reference Levels, published by Public Health England.[27]

ACOP (i)
Schedule 3(7)–(8)

Assumptions for the radiological consequence assessment

686 The consequence assessment performed in accordance with Schedule 3 should identify the range of potential consequences for:

- **(a) the short term (at least two days following the start of the release or direct exposure); and**
- **(b) the long term (in the 12 months following the start of the release or direct exposure).**

687 The short-term consequence assessment should be used to determine:

- **(a) the distance at which relevant emergency reference levels (ERLs) would suggest that urgent protective actions are required for persons off site;**
- **(b) the recommended extent of the geographical extent on which the local authority will determine the detailed emergency planning zone; and**
- **(c) the effective dose to emergency workers for both on site and off site for comparison against the relevant reference level.**

688 The long-term consequence assessment should be used to identify the effective dose to members of the public off site for comparison against the relevant reference level in order to inform emergency planning.

ACOP (i) Schedule 3(7)–(8)

Operator's determination of recommended distances for urgent protective action

689 Each suitable and sufficient source term identified under the ACOP for regulation 5 that lies within the 'detailed emergency planning required' region of the REPPIR risk framework (Appendix 2, Figure 7), supplemented by any additional source terms identified for the sensitivity study required by the ACOP for regulation 5, should be selected for analysis.

690 For each of these selected source terms the distance at which the potential dose saving (averted dose) from all relevant exposure pathways becomes equal to the lower ERL following implementation of the relevant urgent protective action (sheltering, and where appropriate, evacuation and stable iodine) should be calculated. These calculations should consider the most vulnerable member of the public outside the premises.

691 The largest distance calculated for each urgent protective action from all the selected source terms should be considered for recommendation as a candidate distance for that particular urgent protective action.

692 In order to inform local authority planning for the implementation of urgent protective actions, the operator should also evaluate the distances where the upper ERLs may be applicable. Important factors such as the timescales within which protective action should be planned to be carried out should also be identified.

Guidance (i) Schedule 3(7)–(8)

Principles for selecting the recommended distance for an urgent protective action

693 The ACOP (i) for Schedule 3(7)–(8) defines a general method for the operator to calculate a recommended candidate distance for each of the urgent protective actions.

694 In practice, for many operators it will only be necessary to recommend a candidate distance for the single urgent protective action of sheltering (given the nature and size of a potential release) and so this has been chosen as an example to illustrate how the calculation defined in ACOP (i) for Schedule 3(7)–(8) should be performed. The example assumes the dose is dominated by the inhalation exposure pathway and the facility is not an operating reactor where use of stable iodine tablets may be a dominant consideration. The calculation is performed using the lower ERL for sheltering. The ERL is a measure of averted dose and it is calculated using two dose calculations. In the first calculation it should be assumed that the exposed individuals are subject to no protective measures and are outside during the entire exposure period (with no protection afforded from being inside a building). The second calculation is for the dose with the relevant protective action in place. The dose averted by this protective action is the difference between the two values.

695 PHE's analysis[27] of the effect of sheltering on inhalation exposures shows a typical dose reduction factor (DRF) of approximately 0.6 (derived on the basis of a combination of modelling and literature review). This value assumes an inhalation dose to an individual sheltering during the entire passage of the plume, until both the indoor and outdoor air concentrations fall back down to zero (or close to it), with no opening of windows and doors to the external environment. Under such circumstances it may be assumed that the DRF remains constant irrespective of the release duration. The fraction of the dose that is averted is therefore 1 – DRF = 0.4, which implies that the distance where the lower ERL for sheltering of 3 mSv is at the distance where the outdoor effective dose is 7.5 mSv (ie 3 mSv divided by 0.4.). For premises where inhalation is the dominant exposure pathway (other than operating reactors), this outdoor effective dose of 7.5 mSv can be used as a surrogate for identifying the initial candidate minimum distance for the urgent protection action of sheltering.

696 In the case of iodine inhalation the lower ERL for stable iodine administration is an equivalent dose of 30 mSv to the thyroid with a tissue weighting factor of 0.04.[27] Iodine tablets are particularly effective if administered early enough during the release but this effectiveness reduces if their administration is delayed a number of hours.[42] For example, a delay of four hours could reduce the DRF to 0.5.[43] It is for the operator to justify what is the appropriate DRF to assume based on its knowledge of the timescale for the release and whether there is scope for the pre-distribution of KI tablets and early administration.

Guidance (i)
Schedule 3(7)–3(8)

697 Doses from direct irradiation, criticality or radionuclides that contribute significantly to external doses will need to be considered when assessing the distance for the urgent protective action against the lower ERL for premises where pathways other than inhalation are significant. For example, where the effective dose is dominated by direct exposure from airborne gases and particles which have been deposited on the ground in inhabited areas the lower ERL for sheltering applies and the DRF for external gamma dose is 0.15 for typical residential brick-built homes and 0.05 for multi-storey buildings.[27]

698 Once the technical assessment described in the paragraphs above is complete, the operator may wish to exercise judgement to adjust the candidate distances for the urgent protective actions calculated by taking into account:

(a) in the case of releases, the range of weather conditions assumed and their likelihood;
(b) that practical protective actions that may still be relevant at outdoor effective doses below 7. 5 mSv such as other urgent protective actions including personal decontamination, medical intervention and reassurance monitoring;
(c) relevant IAEA standards and guidance; and
(d) the need to optimise protection strategies, including consideration of serious consequences to human life, health and safety, quality of life, property, and the environment that define a radiation emergency when assessed against the impact table in Appendix 2, Table 1.

699 Once these have been considered, the operator should recommend the distances for each of the relevant urgent protective actions, justifying any assumptions and judgments that are made. The minimum distance of the urgent protective action is usually taken as a radial distance in kilometres (km).

ACOP (ii)
Schedule 3(7)–(8)

Operator's recommendation for the minimum geographical extent for the detailed emergency planning zone

700 The largest of the distances recommended for the urgent protective actions identified against the lower ERL should be selected as the recommended distance for the minimum geographical extent of the detailed emergency planning zone.

Guidance (ii)
Schedule 3(7)–(8)

Operator's recommendation for the minimal geographical extent for the detailed emergency planning zone

701 The ACOP (ii) for Schedule 3(7)–(8) defines a method by which the operator can determine a candidate recommended distance for the geographical extent of the detailed planning zone. As with the candidate recommended distance for the urgent protection actions discussed under the ACOP (i) for Schedule 3(7)–(8), the operator may exercise judgement to adjust this candidate distance.

702 In practice, the expectation is that once the operator has determined the recommended distances for each of the relevant urgent protective actions in line with paragraphs 686–699, the operator should recommend a minimum geographical extent for the detailed emergency planning zone which is identical to the largest of these recommended urgent protective action distances.

703 The operator's recommendation of the geographical extent of the detailed emergency planning zone should usually be a circular radial distance (km) with the centre point clearly indicated. For premises with multiple facilities located around a site, complex or campus that may have a number of potential centre points, the operator may describe one overall distance that encompasses all facilities, or separate extents that relate to each relevant facility.

Guidance (ii)
Schedule 3(7)–(8)

Principles for recommending the geographical extent for the outline planning zone

704 Operators regulated by HSE that are responsible for recommending the geographical extent for an outline planning zone under regulation 9(1)(b) should perform similar calculations to the ones described in the paragraphs above for determining the detailed emergency planning zone, but this time considering a representative range of source terms that lie in the 'outline planning required' region of the REPPIR risk framework (Appendix 2, Figure 7). However, in performing the assessment the upper ERL may be considered more appropriate and consideration of the timescales of the release may be taken into account when selecting which source term is to be used in the calculation.

705 Once the technical assessment described above is complete, the operator should discuss with the local authority to decide whether an outline planning zone is required or whether generic arrangements are adequate. These existing arrangements might include national standard operational principles for emergency services, and COMAH arrangements coupled with a communications plan. Further guidance can be found in the guidance to regulation 9(3).

ACOP (iii)
Schedule 3(7)–(8)

Assessment of total residual effective doses for members of the public

706 The assessment of the total residual effective doses of a radiation emergency should consider effective doses to members of the public from the boundaries of the premises out to a distance which would correspond to 1 mSv effective dose in the first 12 months following an emergency. Urgent protective actions, including food restrictions at the levels corresponding to the EU Maximum Permitted Levels in food currently applicable to the UK, should be assumed to have been implemented.

707 Ingestion doses from domestic food production should be based on the location of food production in the vicinity of the individual.

Guidance (iii)
Schedule 3(7)–(8)

Assessment of total residual effective doses for emergency workers

708 The assessment of the total residual effective doses of a radiation emergency should consider effective doses to emergency workers both on site and off site out to a distance equivalent to 20 mSv effective dose for at least the first two days following a release or direct exposure.

709 It is recognised that calculating on-site doses to emergency workers is a potentially complex and difficult assessment. The operator will need to exercise considerable judgement on the scope of the analysis, with the principle objective being to provide practical information to help inform emergency planning.

710 As noted in paragraph 200, this information should be shared, as appropriate, with relevant organisations under regulations 13 and 15.

Schedule 3(9)

(9) In this Schedule "source term" means the radioactivity which could give rise to direct external exposures from the premises or which could be released to the environment in a radiation emergency and, for releases, includes—

(a) the amount of radionuclide released;
(b) the time distribution of the release;
(c) the energy associated with atmospheric release; and
(d) the likely chemical and physical form of the radionuclides in the release.

Guidance
Schedule 3(9)

711 Sub clauses (a) to (d) apply in the case of a release and mean:

(a) For each identified radiation emergency the source term will be the quantity of radioactive substances which is released to atmosphere.
(b) The time distribution should include best-estimate values for the time when the release will commence and for its duration, and the rate at which it occurs.
(c) The energy associated with atmospheric release. It is related to the energy associated with the buoyancy and momentum of the plume at the point it is released into the atmosphere. For example, heat and pressure may provide for releases to be lifted and propelled respectively into the atmosphere.
(d) Where relevant, this should include information on particle size and whether the radionuclides are likely to be organically bound (for example, whether isotopes of iodine are likely to be in particulate, elemental vapour or organic form).

Schedule 4 Particulars to be included in a consequences report

Regulation 7(3)

Schedule 4
Parts 1–3

PART 1
Factual Information

(1) The following factual information must be provided in the operator's consequences report—

(a) the name and address of the operator;
(b) the postal address of the premises where the radioactive substance will be processed, manufactured, used or stored, or where the facilities for processing, manufacture, use or storage exist;
(c) the date on which it is anticipated that the work with ionising radiation will commence or, if it has already commenced, a statement to that effect.

PART 2
Recommendations

(2) The operator must include the following recommendations in the consequences report—

(a) the proposed minimum geographical extent, if any; and
(b) the minimum distances to which urgent protective action may need to be taken, marking against each distance the timescale for implementation of the relevant action.

(3) Where a minimum geographical extent is recommended under paragraph 2, the operator must also include within the consequences report—

(a) the recommended urgent protective action to be taken within that zone, if any, together with timescales for the implementation of that action; and
(b) details of the environmental pathways at risk, in order to support the determination of food and water restrictions in the event of a radiation emergency.

PART 3
Rationale

(4) The operator must set out the rationale supporting each recommendation made in the consequences report.

(5) In particular, the operator must set out—

(a) the rationale for its recommendation on the minimum distances for which urgent protective action may need to be taken; and
(b) where the operator and local authority have agreed that no off-site planning is required, and therefore no emergency planning is recommended, the rationale for that agreement.

Appendix 2 Risk framework

Regulations 4 and 5

ACOP Appendix 2 Table 1 Impact table

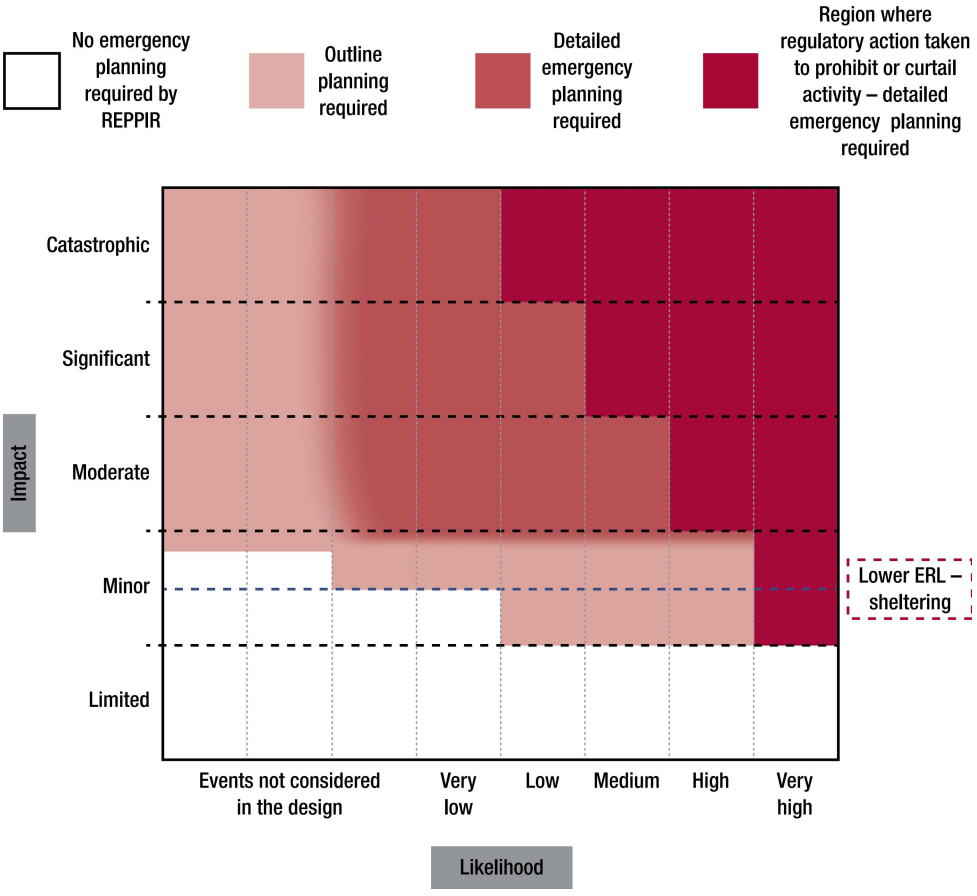
	Descriptors						
		1	2	3	4	5
	Impact descriptor and effective dose	Human life (Acute exposure/ Deterministic Effects)	Health & Safety (Cancer induction)	Quality of life	Property	Environment
A	Catastrophic (>1 Sv)	Death and life changing consequences severe deterministic effects possible.	Possibility of life changing consequences because of significant (> 5%) increased risk of cancer induction.	Complete reconstruction of life activities.	Asset value completely lost.	Exclusion zones increase and heavy restrictions extended to further distance.
B	Significant (100-1000 mSv)	Possibility of moderate deterministic effects.	Possibility of life changing consequences because of very small (0.5%) increased risk of cancer induction.	Initial reconstruction and continued interruption of normal life activities.	Major asset value depreciation.	Exclusion zones of environmental areas and heavy restrictions.
C	Moderate (10-100 mSv)	No potential for deterministic effects, below threshold dose.	Possibility of life changing consequences because of very small (0.5%) increased risk of cancer induction.	Enforced prevention or interruption of normal life activities.	Potential or real asset value depreciation.	Restricted or temporary loss of environmental growth or produce.
D	Minor (1-10 mSv)	No potential for deterministic effects, below threshold dose.	Minimal impacts and unlikely to have life changing consequences.	Potential self-imposed restrictive changes in normal life activities.	Assumed asset value depreciation.	Reluctance to use environmental areas and produce.
E	Limited (less than 1 mSv)	No potential for deterministic effects, below threshold dose.	Normal background	Sustained normal life activities.	Asset value sustainable or dominated by market forces.	Sustained environmental conditions.

Impact

ACOP Appendix 2 Table 2 Likelihood table

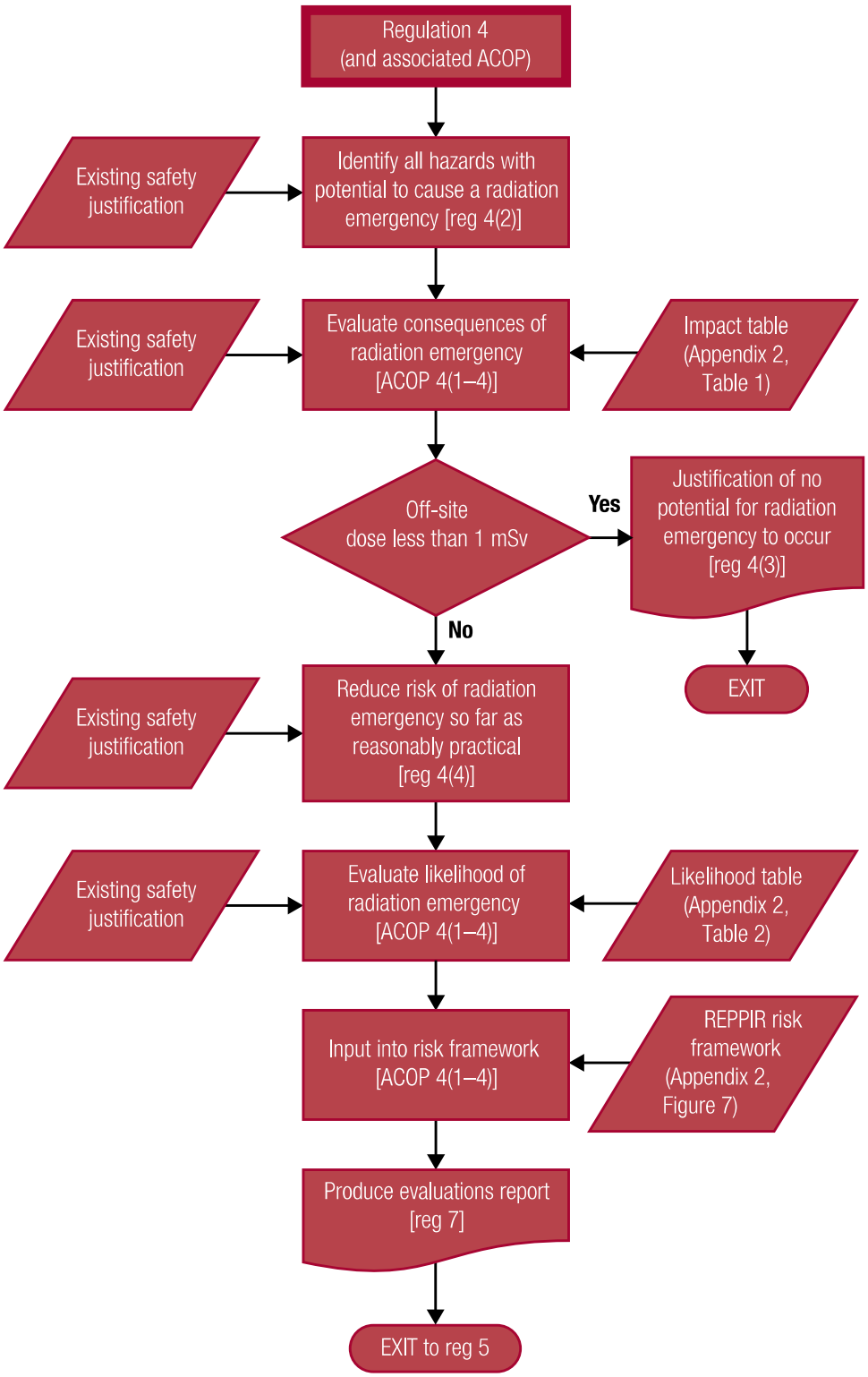
Likelihood descriptor	Relative likelihood of occurring in the next 5 years
Events not considered in the design	Less than 1 in 20,000
Very low	1 in 20,000 – 1 in 2,000
Low	1 in 2,000 – 1 in 200
Medium	1 in 200 – 1 in 20
High	1 in 20 – 1 in 2
Very high	Greater than 1 in 2

ACOP Appendix 2 Figure 7 Risk framework



ACOP Appendix 2 Figure 8a–c Hazard evaluation and consequence assessment (HECA) flow diagram

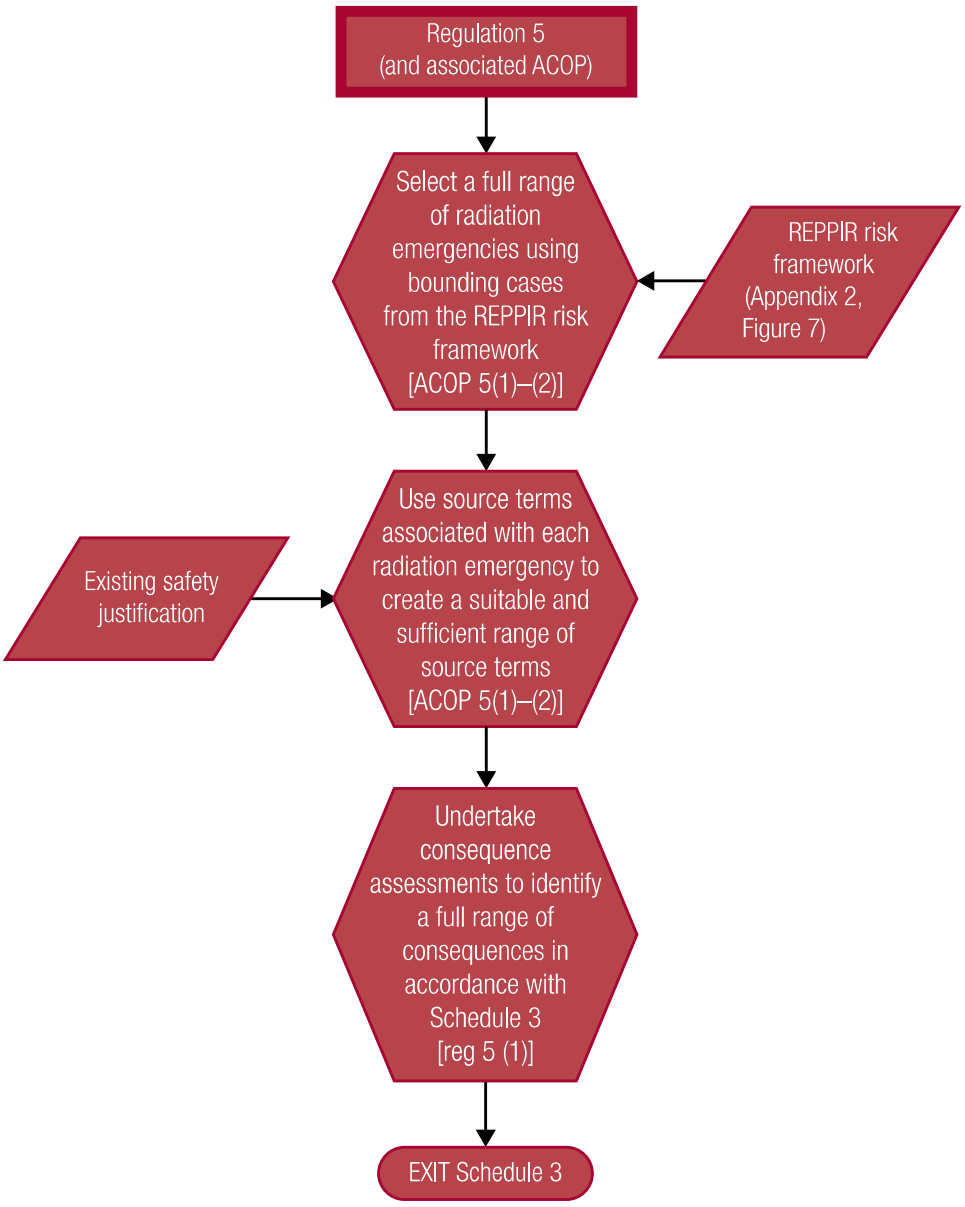
Figure 8(a) Hazard evaluation



Note that a key to the flow diagram shapes is provided after Figure 5 (paragraph 41)

ACOP **Appendix 2 Figure 8a–c continued**

Figure 8(b) Consequence assessment



ACOP Appendix 2 Figure 8a–c continued

Figure 8(c) Consequence assessment considerations