NATIONAL DOSE ASSESSMENT WORKING GROUP

PAPER 11-07: REPORT BACK FROM THE SUB-GROUP ON SHORT DURATION RELEASES

2nd meeting held on 13 March 2007, Aviation House London.

Present

Chair	Rob Allott	EA
Regulators/agencies	Paul Dale	SEPA
	Ray Kowe	HPA
	Justin Smith	HPA
	David Webbe-Wood	FSA
Industry	Laurence Austin	British Energy
Specialists/NGO's	Claire Johnson	Westlakes Scientific Consulting
Apologies	Amanda Moreton	NHS

1. Welcome and introduction

The Chairman welcomed Claire and Laurence to the subgroup.

2. Minutes of previous meeting 26 September 2006

Action 1.1 Rob Allott to ask the steering group to endorse the terms of reference for the subgroup. Ongoing – to be taken to main meeting in April.

Action 1.2 David to check CFIL regulations in the SEPA guidance document. Ongoing

Action 1.3 Subgroup members to send Ray documents to circulate among subgroup. The report on short term discharges to rivers (R&D Technical Report P3-074/TR) has been circulated; the report on short term discharges to atmosphere (HPA W54) still needs to be circulated as do reports by CEFAS and AEAT on short term discharges to sea and the cyclotron assessment report.

Action 1.4 Justin to consider implications of testing the screening assumption for short term aerial releases. Initial investigation complete – see agenda item 4.

Action 1.5 Rob to ask John Titley to carry out testing of screening assumption for short term river aerial release. Initial investigation complete – see agenda item 3.

Action 1.6 Amanda to ask small users if they have any issues they wish to report to the short term release subgroup. Ongoing.

3. Terms of reference

The Chairman outlined the terms of reference for the subgroup for the new members, these are:

The aim of this sub-group is to consider issues relating to the dose assessments for short term non-accidental releases of radionuclides through the environment. In particular it will:

- Give guidance on realistic dose assessment for short term releases for comparison with dose constraint.
- Give guidance on how to combine doses from short term and continuous releases from different sources and sites.
- Give guidance on assessing food concentrations arising from short term releases for comparisons with CFIL's.
- Address the appropriate recommendations in NDAWG paper NDAWG/2/2006 relating to the short term release group.

4. Short term release to river. Case study work to-date.

Rob outlined his case study on short term release to rivers which used the R&D technical report P3-074/TR as the basis for his calculations. The R&D report only presented water and sediment concentrations. Rob has extended the work to include habits and doses. The case study is a cautious screening assessment.

Rob outlined the key assessment parameters. There were a number of discussion points on the parameters and exposure pathways:

The release duration for a cautious short term release of 30 minutes is typical of the time taken for a tank to empty.

The definition of 'average' flow was queried. The median summer flow is a more realistic parameter for the calculations than the total flow averaged over the year.

Action 2.1 Rob to check on the Environment Agency's definition of 'average flow'

For the pessimistic short term release the consumption of a tank of water was questioned, this should be bounded by the adult drinking rate of 0.6 m3 y-1.

Action 2.2 David Webbe-Wood to check on the value of average water consumption rate.

There was the question as to whether irrigation be included as a potential pathway and uptake into cows milk.

Action 2.3 Rob to investigate the inclusion of irrigation and the uptake of river water by cows and subsequent transfer of radionuclides to milk as exposure pathways in the river model.

Rob presented a comparison of doses for various categories of short term release of 1 GBq of activity to a continuous release of 1GBq activity over a year.

The doses were calculated for a river flow at Pangbourne on the River Thames. For each category of short term release assumptions were made about parameters such as flow rate, water, fish and sediment concentration and habits (see meeting note).

The difference in results between the 'cautious' short term and continuous release results is up to two orders of magnitude. There is an anomaly in the ^{3}H results as the maximum activity concentration in fish is assumed to be the same as the maximum activity concentration in the water.

Rob also presented doses for a typical hospital discharge permit; the hospital selected was in Swindon. The doses are predominantly from ^{131}I from fish consumption with the short term dose about 1μ Sv, and the continuous dose about 0.6 μSv.

Conclusions from case study

1. Annual average modelling concentrations equate to integrated concentrations for water, fish (at average temp) and sediment.

2. Low flows occur in late summer and early autumn and coincide with higher temperatures when fish metabolism and hence uptake increases. This also coincides with highest occupancy.

3. Daily water consumption will be pretty constant and hence drinking water dose will not differ between continuous and short term release.

It was noted that if the dominant dose is occurring at the sewage treatment works then the dose from the river is not as important.

Questions raised by case study

1. What about dose for remainder of year from further discharges, following a short term release?

2. What additional modelling data do we need?

3. What addition habit data do we need?

Claire asked if the model was applicable to all rivers. Rob said it is but you need to look at the key processes for a limited number of radionuclides and get the data.

Laurence informed members that licensed sites have monthly discharges and though most of these are directly to the sea there are some (e.g. Berkeley) which discharge to an estuary which might behave like a river. He said that it would be important to investigate if the date of release in any monthly release makes a significant difference. Rob said the R&D model did not include the effects of tides as it is a freshwater model.

Paul asked if twelve monthly releases are equivalent to a continuous release in the R&D mode. Rob said the model will still get different results for the two types of release because of the temporal variation of the parameters.

Rob concluded that there were key areas where the subgroup could go forward:

1. improving the case study to confirm the 20 μSv dose criterion in the Principles document is still valid

2. need to evaluate how we are doing continuous assessments

3. need guidance on what could be classed as a continuous release

4. need modelling and habit data to go with periodic release assessments

5. need ‘rule of thumb’ guides to assess where short term studies are required which more accurately reflect the discharge cycle in real situations.

Action 2.4 Rob to revisit the river case study to see if he can get the continuous release assessment closer to the results of the short term release.

Action 2.5 Subgroup members to consider different discharges which they think might be periodic and to identify where more data might be needed.

Action 2.6 Subgroup members to check nuclear discharge profiles to rivers and sewers to see how often they discharge related to the quantity discharges and the period over which they discharge.

5. Short term releases to air. Case study work to-date.

Justin’s case study was for a generic release of ^{90}Sr to the atmosphere. It only considered the impact of meteorological conditions on air concentrations and deposition rates and did not consider dose. He used a meteorological data file for Heathrow. From the 1 year’s worth of data he identified the met conditions that gave rise to the maximum air concentrations and deposition rates in each month using ADMS. These endpoints were calculated for ^{90}Sr, for a point source, at a stack height of 30m and for distances of 500 and 5000m from the discharge point. For the short term releases he assumed 1/12 of the annual discharge was released in a single hour each month and for the continuous release he assumed a discharge at a rate of 1 Bq/s. He compared the monthly peak with the annual average, at the same location, for the activity of inhaled ^{90}Sr and the annual ground gamma dose for each month of the year.

Conclusions

For the maximum values given above differences between continuous and 12 short-term monthly releases are of the order of 20 to 30 for inhalation dose but 400 to 550 for ground gamma exposure. Larger differences are found between monthly peaks at a specific location and the annual average from a continuous release at the same location.

Deposition would be expected to show more difference than inhalation because individuals are exposed to the elevated deposition levels for longer than they are exposed to elevated levels in the plume. The half-life of the radionuclide will also have an impact here with the difference being less for short-lived radionuclides.

Variations, from one month to the next, of the monthly peak air concentration are very small but are more significant for deposition.

Differences in the ingestion dose are expected to be similar to those for ground gamma exposure depending on assumptions made concerning harvesting practices.

It should be noted that no account has been taken of the more extreme (or indeed less extreme) habits that may occur for short periods of time.

It is unlikely that all 12 short-term releases will occur during the worst met conditions. If this only happens once in a particular direction then the results for monthly peaks should be divided by 12.

It would seem quite possible that short-term atmospheric discharges could lead to significantly enhanced doses to members of the public, despite being within monthly discharge limits. However, assessments would need to be carried out using the actual permissible monthly limits to see if this was likely to be a cause for concern.

Subgroup members agreed that for atmospheric studies there is a real problem deciding on short term release data. It would be useful to look at the aerial discharge from a reactor and see how it may be different.

Action 2.7 Laurence to get data for actual discharges from British Energy and Magnox sites on the period of release and quantities compared to background and to circulate data to subgroup members.

Action 2.8 Claire to find out about aerial discharge release patterns from Amersham.

There is a need to understand how we treat met data. The worst case release over the period of one hour per month is too cautious; a period of 12 hours may be more realistic. Hopefully this figure of 12 hours will be confirmed by Laurence's' data on actual discharges. The assumption of worst case use of met data at different locations is also problematic.

Action 2.9 Justin to determine whether it is possible to identify the 12 hour period in each month where the met conditions give rise to the maximum air concentrations and deposition rates at selected distances using the ADMS model and to investigate the capabilities of the British Energy NECTAR model.

Action 2.10 David Webbe-Wood to provide concentrations in a number of foods for a unit deposition for a range of times between deposition and harvest/slaughter.

Action 2.11 Rob and Justin to revise the various factors affecting short term releases for aerial releases outlined in the first meeting of the subgroup.

6. Forward work plan

The subgroup will draft a paper on its finding's to date for the autumn main NDAWG meeting.

The draft paper will include sections on:

Rivers
Typical discharge scenarios/types, affected sites.
Reworked case study for short term release
Reworked continuous release assessment
Guidance on carrying out short term assessments for rivers

Atmospheric
Typical discharge scenarios/types
Reworked case study on short term release study

Other issues
Multiple discharges
Sewers
Coastal sites
CFIL's

7. AOB

None.

8. Date of next meeting

The next meeting of the subgroup will take place in Wednesday 3rd October, 2007.

9. Summary of Actions

Action 2.1 Rob to check on the Environment Agency's definition of 'average flow'

Action 2.2 David Webbe-Wood to check on the value of average water consumption rate.

Action 2.3 Rob to investigate the inclusion of irrigation and the uptake of river water by cows and subsequent transfer of radionuclides to milk as exposure pathways in the river model.

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Ray Kowe, 16 March 2007