Technical Report

TR-13-23

Assessment of risk to non-human biota from a repository for the disposal of spent nuclear fuel at Forsmark

Supplementary information

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December 2013

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Update notice

The original report, dated December 2013, was found to contain factual errors which have been corrected in this updated version. The corrected factual errors are presented below.

Updated 2016-05

Location	Original text	Corrected text
Page 22, Table 2-2, row Ac-227	Ac-227	Ac-227**
Page 22, Table 2-2, table footer		**The contribution from the decay of Pa-231 is not included.
Page 23, Section 2.3.3, line 4 and 5	….assessment. Resultant…	….assessment. However, the decay of Pa-231 to Ac-227 was not included. Resultant…
Page 65, Chapter 7, Paragraph 3, last line	…release (Section 2.3.2).	…release (Section 2.3.2). However, it should be noted that the decay of Pa-231 to Ac-227 in the biosphere is not included.

Summary

This report deals with risk assessment for non-human biota from radionuclides from a repository for spent nuclear fuel in Forsmark. It has been produced to meet the request for further information regarding the exposure of biota to radiation requested by SSM during their review of the safety assessment 'SR-Site'. The content is applicable also for the repository for short-lived radioactive waste (SFR) present at Forsmark today.

Dose rate estimates were performed for the central corrosion case of SR-Site as well as for its pulse-release scenario, and in a theoretical periglacial climate. In all cases the estimated dose rates were several orders of magnitude lower than the used screening level (10 μGy h^{-1}) which indicates that no impacts on populations would occur. The maximum dose rates in the base case were c one order of magnitude higher than those of the pulse-release. In the base case, the highest dose rate was estimated for reference limnic phytoplankton and highest dose rate in terrestrial ecosystems was calculated for peat moss (similar values). The maximum dose rate in marine ecosystems was estimated for representative zooplankton species and was c two orders of magnitude lower than those for limnic and terrestrial ecosystems.

Since the effects on dose rate from a pulse-release are assumed to depend on the recipient type, three different phases were simulated; a submerged phase (without terrestrial ecosystems), a mixed phase (with all three ecosystem types present) and a land phase (were the sea has receded from the area). The maximum dose rates for the three phases were very similar; highest dose rates occur in the mixed and land phases and are c 4 times higher than the maximum dose rate calculated in the submerged phase.

In the report the use of reference organisms from the ERICA tool has been compared with representative species for the Forsmark area. Parameters considered were organism size, habitat preferences and radionuclide assimilation expressed as concentration ratios (CR). The comparisons show that the largest contributor to observed differences was CR. For representative species CR has been based on site information whenever available. Also differences in habitat preferences had some effect on dose rates. Organisms inhabiting soil and sediment were calculated to receive greater dose rates than those on the soil surface or within the water column. Therefore, should reference organisms be used to represent site species in assessments, habitat occupancies should be weighted toward sediment and soil occupancy. Relative occupancy between different ecosystems should also be incorporated into assessments to not only provide a more ecologically realistic representation of species habits, but also to prevent dose rate underestimation that may occur for some organisms if they are assumed to reside at all times in a single ecosystem. Differences in dose rate as a result of variation in size between representative species and reference organisms were negligible when compared against the influence of CR and habitat on calculated dose rates. The greatest influence of size is associated with species of very small mass.

Spatial and temporal issues are discussed in the report as well as relevant aspects when considering a different climate (a warmer and a colder, periglacial, climate) in dose rate assessments for non-human biota.

Sammanfattning

Den här rapporten behandlar riskuppskattningar till andra organismer än människa från radionuklider från ett förvar av använt kärnbränsle i Forsmark. Rapporten har tillkommit eftersom SSM i sin granskning av en tidigare utvärdering av säkerhetsanalysen SR-Site efterfrågat vissa kompletteringar. Rapporten är skriven för att svara på dessa kompletteringskrav men innehållet är även relevant för förvaret för låg- och medelaktivt avfall (SFR) som finns i Forsmarksområdet idag.

Dosberäkningar har gjorts för basfallet av SR-Sites centrala korrosionsfall liksom för dess pulsutsläpp samt ett fall för att åskådliggöra effekter under ett preiglacialt klimat. I samtliga fall var de uppskattade dosraterna flera storleksordningar lägre än den använda screeningnivån (10 $\mu Gy\ h^{-1}$) vilket indikerar att inga effekter på populationsnivå är att förvänta. Maxdosraterna för basfallet var ca en storleksordning högre än de för pulsutsläppet. Högst dosrater i basfallet beräknades för referensorganismen limniska fytoplankton medan högst dos i terrestra ekosystem uppskattades för vitmossa (liknande värde). Maxdosraten i marina ekosystem uppskattades för representativa zooplanktonarter och var ca två storleksordningar lägre än maxdosraterna för terrestra och limniska ekosystem. Då effekterna från ett pulsutsläpp förväntas vara beroende på vilka typer av ekosystem som agerar recipienter simulerades tre olika faser; undervattenfas (utan terrestra ekosystem), sammansatt fas (där alla tre ekosystemtyper förekom) samt landfas (där havet försvunnit från området). Maxdosraterna för de tre faserna var mycket lika; högsta dosrater förekom i den sammansatta fasen och landfasen vilka var ca 4 gånger högre än maxdosraten som beräknades för undervattenfasen.

I rapporten har användandet av s k referensorganismer från ERICA-verktyget jämförts med representativa arter för Forsmarksområdet. Jämförelsen har gjorts med avseende på organismernas storlek, habitatpreferenser och upptagsförmåga av radionuklider, uttryckt som koncentrationskvoter (CR). Jämförelsen visar att skillnader i uppskattade dosrater i första hand kan hänföras till olikheter i använda CR. För de representativa arterna har använda CR så långt möjligt baserats på platsdata. Även skillnader i habitatpreferenser visade sig ha viss effekt eftersom arter som lever i jord och sediment beräknades få högre doser än de som lever på jordytor eller i vatten. Skulle referensorganismer användas för att representera platsorganismer i kommande säkerhetsanalyser rekommenderas därför att förekomst i jord och sediment ansätts om man vill anta en konservativ hållning. Kombinationer av habitat från olika ekosystem bör också inkluderas, inte enbart för att öka realismen utan också för att analyserna visar att dosrater kan underskattas om man antar att en organism enbart förekommer i ett ekosystem. Effekten av skillnader i organismstorlek var marginell i jämförelse med den för de andra två parametrarna. Den största effekten sågs för mycket små organismer.

I rapporten diskuteras spatiala och temporala aspekter liksom relevanta aspekter när ett annat klimat (ett varmare eller kallare, periglacialt, klimat) beaktas i dosuppskattningar till annan biota.

Contents

1 Introduction

Radioactive waste from nuclear power plants in Sweden is managed by the Swedish Nuclear Fuel and Waste Management Co, SKB. The proposal put forward is that spent nuclear fuel from the power plants will be deposited in a geological repository according to the KBS-3 method. The method involves encapsulating the fuel in copper canisters which are then deposited, surrounded by a buffer of bentonite clay, in deposition holes in a tunnel system at a depth of 400–700 metres in the bedrock. The location of the repository was selected, in June 2009, as Forsmark in the municipality of Östhammar and, in 2011, SKB submitted an application to construct the repository to the Swedish Radiation Safety Authority, SSM. The application was supported by a safety assessment (SR-Site). According to regulations issued by SSM, the safety assessment was to include an assessment of impacts on man and non-human biota from potential releases to the biosphere (SSM 2008). A report (Torudd 2010) summarising the assessment of the impact on non-human biota from potential releases from the planned repository at Forsmark was therefore produced in support of the SR-Site assessment.

Review of the SR-Site assessment by SSM has resulted in requests for further information regarding the biota dose rate assessment. This report has been produced to address these requests. The report is thus an extension and development of the previous assessment (reported in Torudd 2010) and aims to address regulator questions on the initial submission. Furthermore, it also aims to support biota dose rate assessments for the low and intermediate level waste disposal facilities for short-lived radioactive waste (SFR) and the SFR extension project (SR-PSU) at Forsmark, particularly with respect to the selection and representation of site organisms in an assessment context.

The SR-Site non-human biota assessment was one of the first cases where environmental protection policy and the EU ERICA (Environmental Risks from Ionising Radiation in the Environment: Assessment and Management) assessment tool, have been applied as part of the underpinning of a licence application for siting and construction of a repository for spent nuclear fuel. The assessment presented herein builds upon and further develops the approach to assessment as reported in Torudd (2010).

1.1 Environmental protection objectives in the context of long-term safety assessments

There has been a shift from the long-held anthropocentric view of protection of the environment (e.g. ICRP 1977) to one which expressly considers biota. There is now a widely held view that there is a need to demonstrate, explicitly, that the environment can and will be protected from the effects of radiation. This issue has not been driven by any particular concern over environmental radiation hazards; rather, it has been developed to fill a conceptual gap in radiological protection (ICRP 2007).

The objectives of protection policy for non-human biota are not yet as clear as those of human radiological protection, which aims to prevent deterministic tissue reactions and reduce stochastic effects as much as reasonably achievable. ICRP (2007) suggests that the aim should be a negligible effect on the maintenance of biological diversity, the conservation of species, and the health and status of natural habitats, communities, and ecosystems; aims that are reflected in the specific regulations concerning protection of the environment issued by SSM (SSM 2008, Section 6): "*final management of spent nuclear fuel and nuclear waste must be implemented so that biodiversity and the sustainable use of biological resources are protected against the harmful effects of ionising radiation*." Further SSM states (SSM 2008, Section 7) that an assessment *"shall take particular account of the existence of genetically distinctive populations such as isolated populations, endemic species and species threatened with extinction and in general any organisms worth protecting."*. Details concerning relevant species of an assessment are further discussed in Section 1.2 and 3.1. These protection objectives are largely consistent with the ICRP (2008) position that the biological endpoints of most relevance in individuals after radiation exposure are those that could lead to changes in population size or structure. However, since the present assessment represents an unprecedented timeframe with regard to environmental protection (short-lived waste repository – up to hundreds of years; spent fuel repository – several thousand to one million years), the goals of such protection must be considered accordingly.

Over time periods of millennia (or longer), not only will the size of populations change naturally, but the species composition in biota assemblages will fluctuate and evolve. The goal of *explicitly* protecting present populations is thus somewhat counter-intuitive. Instead, it seems more appropriate to target protection, as phrased in ICRP (2007), towards ensuring the environment remains productive, capable of supporting a high biodiversity, and promoting the natural succession of species and permitting the sustainable use of biological resources. The ecosystem itself is thus the objective of protection and not specifically the biota of which it is composed. Protection of the environment is still achieved by ensuring that biota are not impacted significantly, but the focus is taken from protecting the *present* populations to protecting *any* populations that may naturally occur at the site, both now and in the future. Evaluating impact at the ecosystem scale is, however, difficult. For example the ecosystem would have to be characterised in great detail to ascertain the average 'health' and the natural fluctuations within the system. These fluctuations may occur over periods of years to millennia (or longer), during and following various climate events (globally warm and cool climates, including ice-ages), and through geological progression. Therefore, effects on the ecosystem must be extrapolated from presently available knowledge and using reasonable predictions for the specific site. This is in agreement with the general advice from SSM (SSM 2008) that "*the analysis of consequences for organisms in 'today's biosphere'... should be used for the assessment of environmental consequences in a long-term perspective*". The organisms currently found at the site may therefore form a basis for the characterisation of the site, representing future assemblages in terms of the range of biological complexity, life-styles, size classes, and habitat uses exhibited by species, as well as the diversity, function and productivity of the ecosystem. Whilst quantitative criteria for radiological risks to man have been established, the regulatory criteria for protection of non-human biota are only qualitative, i.e. no quantitative criteria to evaluate the significance of estimated risks to biota have been stipulated by SSM. Quantitative criteria have nonetheless been considered internationally and there is a general consensus on dose rate levels that are unlikely to cause effects to flora and fauna. For example, Brown et al. (2003) concluded that only minor effects on biota are to be found for dose rates < 100 μGy h^{-1} whereas the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) concluded that dose rates up to 400 μGy h^{-1} to a small proportion of individuals in aquatic populations would not have a detrimental effect at the population level (UNSCEAR 1996). The ERICA methodology, applied in the current assessment, proposes a screening dose rate at the ecosystem level of 10 μGy h^{-1} (Beresford et al. 2007, Brown et al. 2008), which has been further endorsed by the EU PROTECT project (Andersson et al. 2009). This screening dose rate is commensurate with the ICRP proposed 'derived consideration reference level' (DCRL) of 4–40 μGy h^{-1} for the most sensitive Reference Animals and Plants (ICRP 2008). The DCRL acts as a band of dose rate within which there is some evidence of chance of deleterious effect from ionising radiation occurring to Reference Animals or Plants that, when considered together with other relevant information, can be used as a point of reference to optimise the level of effort expended on environmental protection. Quantitative criteria for evaluating NHB dose assessments are further considered in Section 2.3.5 of this report.

1.2 Background to biota dose rate assessment as applied to SR-Site

The immense variability across and within species presents a major challenge in environmental radiological protection. To investigate/demonstrate the protection of non-human biota from radiation, generalisations are necessary to allow assessments to focus on a few "representative" targets. ICRP (2008) therefore proposes the use of a limited set of Reference Animals and Plants (RAPs) where a RAP is defined as (ICRP 2008):

"*a hypothetical entity, with the assumed basic biological characteristics of a particular type of animal or plant, as described to the generality of the taxonomic level of Family, with defined anatomical, physiological, and life-history properties, that can be used for the purposes of relating exposure to dose, and dose to effects, for that type of living organism*".

The RAPs provide a systematic basis for relating exposure to dose (or dose rate), and dose to different categories of effect, that could be interpreted in terms of the normal biology of these particular types of animals and plants in environmental situations. The effects considered to be of relevance were those of early mortality, morbidity, reduced reproductive success, or some form of observable chromosomal

damage, irrespective of whether or not they arose from stochastic or non-stochastic dose-effect relationships. These effects have been interpreted and set out by the ICRP in terms of multiples of the natural background dose rates typically experienced by each type of animal or plant, in the form of Derived Consideration Reference Levels. The RAP concept is therefore similar to that used for human radiological protection, in that it is intended to act as a foundation for the making of a number of basic calculations, and to serve as points of reference for drawing comparisons with other – and probably more limited – sets of information on other organisms.

The use of a limited set of clearly defined RAPs is consistent with the use of reference organisms, proposed initially by Pentreath and colleagues (e.g. Pentreath and Woodhead 2001) and incorporated as the basis for the ERICA assessment approach (Beresford et al. 2007).

Within the ERICA approach, reference organisms are defined as "*a series of entities that provide a basis for the estimation of radiation dose rate to a range of organisms which are typical, or representative, of a contaminated environment. These estimates, in turn, would provide a basis for assessing the likelihood and degree of radiation effects"* (Larsson et al. 2004).

The reference organism concept is a parallel to "reference man" that is used in dose estimates to humans. The reference organisms are not equivalent to specific species; rather they represent biological components of importance for the functioning of each ecosystem, and thus are suitable targets for impact assessments (Larsson et al. 2004). Together, the reference organisms are intended as a suite that are likely to cover the range of both radiation exposures and radiosensitivities which may arise within contaminated European ecosystems (Copplestone 2012). The use of reference organisms allows models and databases needed in assessments, to be constructed for a limited number of organisms.

The ERICA reference organism concept thus considers a limited number of generalised organism types that have been selected for their potential for exposure to radiation in contaminated environments and their representativeness of the type of plants and animals common to terrestrial and aquatic European habitats. The reason for their likelihood of exposure can be that their habitats tend to concentrate radionuclides (such as soils and sediments) and/or because of the organism's ability to concentrate certain nuclides.

Whilst reference organisms can be applied to evaluate dose rates to plants and animals in a generic (i.e. non site-specific) sense, in order to ensure that an assessment is appropriate and applicable to a particular site of interest, ICRP suggests the use of representative species (ICRP draft for consultation; The practical application of reference animals and plants to different exposure situations. Accessed March 2012). These, as the name suggests, are plants and animals that are characteristic, or representative, of the types of plants and animals located within an assessment area or region, or, in terms of long-term dose assessments, could reasonably be expected to be present in the future. In a site-specific assessment, one of the challenges is thus to identify a small enough number of targets to make assessments manageable without reducing the information value of the assessment beyond credibility.

In SSM general advice (SSM 2008, Appendix 2), the following directions on the evaluation of environmental protection are given:

"*The organisms included in the analysis of environmental impact should be selected on the basis of their importance in the ecosystems, but also in line with their protection value according to other biological, economic, or conservation criteria. Other biological criteria refer (amongst other things) to genetic distinctiveness and isolation (for example, presently known endemic species). Economic criteria refer to the importance of the organisms for establishment of different kinds of livelihood (for instance, hunting and fishing). Conservation criteria refer to possible protection by current legislation or local regulations. Other aspects, such as cultural history, for instance, should also be taken into consideration when identifying such organisms*."

How these criteria are met in this safety assessment is further discussed in Section 3.1.

1.2.1 Species selection and assessment in Torudd (2010)

In the previous assessment (Torudd 2010), three broad groups of assessment organism were considered, these were:

- the generic ERICA reference organisms that were considered applicable to the Forsmark site;
- species of plant and animal that were considered common and/or keystone species as well as species of particular economic importance in the local region; and
- vulnerable or important species that were largely identified through consideration of those national red-list species that are present in the vicinity of the site.

Whilst site relevant species were selected for assessment, lack of required assessment parameters resulted in gaps in the dose assessment analysis. A further category of 'average organisms' was therefore introduced. These were derived to allow site-specific data to be maximally applied by grouping types of organisms (e.g. fish) where radionuclide transfer data were limited for particular species of interest. Nonetheless, data gaps remained for some radionuclides, both for site species and reference organisms. Where this was the case, these radionuclides were excluded from analysis. Similarly, assessment parameters were absent for the vulnerable/protected species for which no site-specific data were available, i.e. where conservation status prevents such data to be obtained. The approach to evaluating radiological impacts for such species was therefore to effectively 'map' vulnerable/protected species to the most similar ERICA reference organism or site representative organism.

The Torudd (2010) assessment focussed on a single calculation case – the central corrosion base case. Regulatory review of this identified a number of areas where additional assessment was deemed appropriate. These are discussed below.

1.2.2 Current assessment approach

The current assessment draws largely upon information presented in Torudd (2010), but is not intended as a supplementary assessment; rather, the assessment approach has been revised. The assessment source term has been updated to move from a probabilistic assessment approach to a deterministic assessment and species selection and representation revised to take into account requirements from SSM that have arisen from review of the initial assessment.

The current assessment has been undertaken to make maximum use of available site knowledge to evaluate radiological effects on species of plant and animal that are representative of those at the site, or that may be reasonably considered to be present in the near-future. Throughout the report, such species are termed representative species. Whilst site-specific data have been applied, where available, to allow calculation of uptake of radionuclides from environmental media to each of the representative species, data gaps remained, and analogue approaches were thus applied to ensure a comprehensive assessment.

Whilst representative species have been included in this assessment (Section 4), ERICA reference organisms have also been evaluated. The purpose of including reference organisms is twofold. Firstly, the reference organisms provide a point of comparison for representative species to allow differences in site-specific data (primarily concentration ratios) from generic databases to be evaluated. Over the very long timescales considered in the assessment, site conditions will change and the comparison against larger, but more generic datasets is intended to provide an indication of the robustness of the assessment to such changes. Secondly, differences in dose rate attributable to organism size can be evaluated to ascertain whether the reference organism geometries can be used in future dose assessments. This is particularly relevant for vulnerable and protected species for which monitoring activities are restricted.

1.3 Regulatory review and requests for further information

The SSM review of the Torudd (2010) assessment identified six areas where additional effort is required. These requirements are detailed below (based on an unofficial translation) and the interpretation of each point, in terms of the approach to addressing each in this revised assessment, is presented.

Requirement 1: Take into account the release of Pd-107, Ac-227 and Pa-231 for the estimate of dose to non-human biota

The initial assessment excluded the radionuclides Pd-107, Ac-227 and Pa-231 due to lack of data on the transfer of each from soil or water to biota. Whilst data on environmental transfers are still lacking, these radionuclides have been incorporated in the current assessment through the application of element analogues and organism analogues. The application of analogue approaches to allow these radionuclides to be included in the assessment is presented in Section 2.3.3. Dose rates associated with each radionuclide are presented for the central corrosion base case (Section 4 and Appendix C).

Requirement 2: Complete calculation of the total estimated dose rate to non-human biota, i.e. total dose rate for all radionuclides included in the analysis

In the previous assessment (Torudd 2010), dose rates were reported for only those radionuclides for which site-specific data were available. This has been addressed in the current assessment by assigning concentration ratio analogues for those radionuclides for which site-specific data were not available. The source of concentration ratios for each combination of radionuclide and assessment organism is presented in Appendix B (B3) and in Sections 2.3.4 and 3.2.4. Total dose rates are presented for the central corrosion base case in Section 4 and Appendix C.

Requirement 3: Report the estimated effects on species highlighted for special protection within the investigation (red-listed species, ecologically important species, or economically important species)

Previously, dose rates to special protection species were evaluated by inference with the assessment focussing on limited representative species, average organisms and reference organisms, without specific discussion around the effects to all species identified for assessment. A revised approach has been taken in the current assessment. Representative species, inclusive of vulnerable or protected species, have been identified for assessment and each is evaluated in its own right. The selection process for representative species and approach to their representation in the current assessment are presented in Section 3. Estimated effects for all assessment species, including those highlighted for special protection are presented for the central corrosion base case in Section 4.

Requirement 4: Estimate impacts on non-human biota during times where the climate is clearly different from that at present, and where representation using today's biosphere conditions would be obviously unreasonable

The assessment timeframe is such that there will be repeated glacial cycles occurring, which will have impacts not only on local climate, but will also significantly affect both the landform and species present at the site. Torudd (2010) focussed solely on the impacts occurring to biota during a temperate climate, similar to present day conditions. The approach in the current assessment has been to also consider the possible impacts of climate cycles on the species that may be present and their habits. It is not, however, feasible to predict future species and habits and the information presented is thus discursive, drawing upon information from Greenland, as an analogue colder climate site. Activity concentrations in the biosphere under cooler climate conditions have also been evaluated and contrasted against the results from the central corrosion base case. Climate considerations are presented in Section 6.

Requirement 5: Estimate impacts on non-human biota following a pulse-release such as could be expected following a canister failure

Torudd (2010) presented dose rates to non-human biota resulting from a single scenario – the central corrosion base case, which assumes canister failure due to corrosion and the associated long-term releases from that canister. However, canister failure could also result in a pulse release of radioactivity to the surface environment. A central corrosion pulse release scenario has therefore been considered (Section 5 and Appendix D), with consideration being given to the implications of the phase of the landscape at the time of canister failure upon biota dose rates.

Requirement 6: Include bird eggs as a reference organism in the analysis.

Torudd (2010) argued that, as bird egg is the only juvenile life stage specifically represented by the ERICA reference organisms, it could be excluded from analysis. In line with SSM's requirement, the bird egg reference organism has been incorporated in the current assessment. Dose rates to bird egg are presented in both of the central corrosion cases (base and pulse release scenario, Section 4 and 5).

1.4 Aim and structure of this report

As noted above, this report represents a further development of the previous assessment by SKB (Torudd 2010) and has been undertaken to address the additional information requests from SSM following review of the initial submission. The report furthermore aims to provide a detailed evaluation of how suitable the ERICA reference organisms are in terms of representing site-specific plants and animals for assessment purposes. Since this report is intended as a further development to the previous assessment, and to negate the need for readers to refer back to the original submission, information presented in Torudd (2010) that remains relevant to the current assessment, is also largely presented herein.

This report corresponds directly to the safety assessment of the spent nuclear fuel and high-level radioactive waste repository, but has also relevance for the low- and intermediate-level short-lived radioactive waste repository. Discussions of the ecosystems, comparisons between reference organisms and representative species of non-human biota, climates (including climate scenarios significantly different from the present) and general spatial and temporal considerations presented within this report are of direct relevance to safety assessments for both repositories. The results presented in this report are for the central corrosion case from the spent nuclear fuel repository whereas the calculations specifically regarding the risk to the environment from release of radionuclides from SFR will be included in a separate report (SKB 2014). The same methodology (described in this report and in Saetre et al. 2014) has been used for both safety assessments. The definitions of scenarios and the source terms used will differ though as the two repositories will contain different types of waste and the repository concepts differ.

The structure of the remainder of this report is as set out below:

- Section 2 provides an overview of the ERICA assessment tool and its application to the SR-Site assessment, including comparison of versions of the tool applied in Torudd (2010) and herein.
- Representative species are identified in Section 3, their representation by ERICA reference organisms described and differences in dose rates arising as a consequence of divergences between site species and generic reference organisms investigated.
- Dose rates arising from the central corrosion base case are presented in Section 4 and results from the central corrosion pulse release case in Section 5.
- The implications of climate on biota dose rates are considered in Section 6, including indicative dose rates to reference organisms and comparison with results from the central corrosion base case.
- Conclusions are reported in Section 7.

Key input data to the assessment, both for reference organisms and representative species, and detailed results are reported in the appendices.

2 The ERICA assessment approach and application in SR-Site

The ERICA assessment approach (and associated tool) was developed within an EU research project in the area of radiological environmental protection (www.erica-project.org). ERICA is a widely used approach (e.g. LLWR 2011, Vandenhove et al. 2010, 2012, Robinson et al. 2010) and is becoming an internationally standardised tool for assessment of dose rates to non-human biota. The current version of ERICA assessment tool, as applied in this assessment, is dated November 2012. Further details of the tool are provided in Appendix A.

Whilst the ERICA tool provides a tiered approach to biota dose assessment, the SR-Site assessment is one of the first cases where the ERICA tool is being used to inform a licence application for the construction of a spent fuel repository, and it was therefore deemed appropriate to undertake as detailed an assessment as possible. A detailed site characterisation programme has been undertaken at Forsmark that has provided an array of data that can be applied to support a biota dose assessment. The approach has therefore been to make maximum use of the available data. Tier 2 of the assessment tool provides the required mechanisms to allow site-specific data to be incorporated and has been used in the current assessment: the full range of radionuclides of relevance, some of which are not included as defaults within the assessment tool, can be incorporated, thus meeting SSM requirements 1 and 2. Site-specific organisms and data can also be incorporated, allowing output in terms of reference and representative organisms to be compared and contrasted. The use of Tier 2 is also consistent with the entry point for assessment in Torudd (2010). The focus of the assessment has been on the calculation of total dose rates (sum of internal and external exposure) for each reference organism and representative species and comparison against available environmental benchmarks, primarily the ERICA screening value.

The remainder of this section provides an overview of the practical application of the ERICA dose assessment approach to the SR-Site project. The focus is limited to basic application in terms of evaluating whole-body dose rates for reference organisms. Details of site representative species used are presented and discussed in Section 3. All calculations performed in the current assessment with the ERICA assessment tool have been made with the version dated November 2012. Information regarding the quality assurance of ERICA and a comparison of versions of the tool from the previous assessment (Torudd 2010) and that presented herein are presented in Appendix A.

2.1 ERICA reference organisms

The ERICA tool considers three broad ecosystems: terrestrial, freshwater and marine, with a range of reference organisms assigned to each (Table 2-1).

A number of criteria that reference organisms should fulfil has been discussed previously (e.g. Pentreath and Woodhead 2001, Strand et al. 2001) and, in the EU project FASSET, the pre-cursor to ERICA, a number of candidate reference organisms were identified. In summary, the choice was based on considerations of (Larsson et al. 2004):

- "*Whether the habitat or feeding habits of the organism are likely to maximise its potential exposure to radionuclides, based on an understanding of the distribution of the different radionuclides within the ecosystem.*
- *Whether the organism exhibits radionuclide-specific bioconcentration which is likely to maximise internal radionuclide exposures in particular circumstances, addressed through taking into account the environmental behaviour of the radionuclides and*
- *Whether the position of the organism within the food chain (e.g. top predator) is such that biomagnification of radionuclides up the food chain may lead to enhanced accumulation…*"

Data limitations necessarily restricted the list of final reference organisms from those initially identified and an overview of the rationale for inclusion (or rejection) of the identified organism types are presented in Larsson et al. (2004). For example, worm and burrowing mammals are included

as reference organisms living within soil in terrestrial ecosystems since they are all subject to high external radiation. Worms also have a potential to bioconcentrate internal emitters. Mammals are a radiosensitive organism group and those with burrowing habits are subject to potential soil ingestion and may be more exposed to Ra-226 than other mammals.

The final reference organisms included in the ERICA tool are shown in Table 2-1. Of the reference organisms available, two have been excluded from the SR-Site assessment: the marine reference organisms reptile; and sea anemones or true corals (colony and polyp) which are not relevant to the conditions at Forsmark today or in the future.

2.2 Approach to dose rate calculation with the ERICA assessment tool

In brief, the ERICA tool estimates absorbed dose rates from both external irradiation resulting from radionuclides in environmental media (air, soil[1], sediment, water) and from the incorporation of radionuclides within the organism. Geometrical data and habitat occupancies for reference organisms, together with data on the decay properties of individual radionuclides, are used to calculate Dose Conversion Coefficients (DCC) that are then applied as a means of converting activity concentrations in environmental media or within the organism itself to an absorbed dose rate for each radionuclide. Internal and external dose rates across all radionuclides of interest are then summed for each reference organism. The assessment approach is illustrated in Figure 2-1.

The total dose rate is then compared against a screening dose rate corresponding to the lowest dose rate potentially leading to detrimental effects on individual organisms. Further information on each aspect of the dose assessment process is provided below.

Table 2-1. ERICA reference organisms in terrestrial, freshwater and marine ecosystems.

Terrestrial	Freshwater	Marine
Amphibian	Amphibian	(Wading) bird
Bird	Benthic fish	Benthic fish
Bird egg	Bird	Benthic mollusc
Detritivorous invertebrate	Bivalve mollusc	Crustacean
Flying insects	Crustacean	Macroalgae
Gastropod	Gastropod	Mammal
Grasses and Herbs	Insect larvae	Pelagic fish
Lichen and bryophytes	Mammal	Phytoplankton
Mammal (Deer)	Pelagic fish	Polychaete worm
Mammal (Rat)	Phytoplankton	Reptile*
Reptile	Vascular plant	Sea anemones or true corals – colony*
Shrub	Zooplankton	Sea anemones or true corals – polyp*
Soil Invertebrate (worm)		Vascular plant
Tree		Zooplankton

* Not relevant for the conditions at Forsmark today or in the future.

[1] Used to represent peat in wetland environments in the SR-Site assessment.

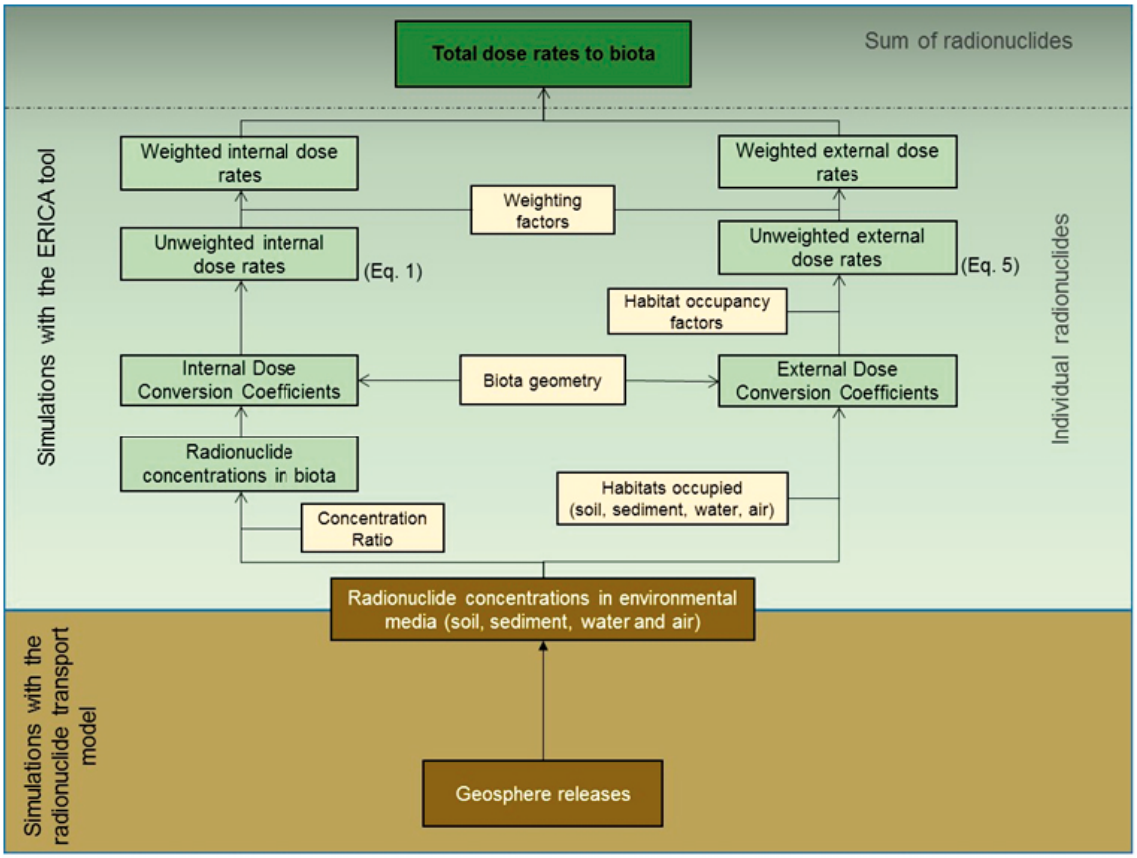

Figure 2-1. *Assessment of the impact of radionuclide releases on non-human biota. Brown boxes indicate modelling with the radionuclide transport model to derive environmental concentration data used as input to ERICA. Yellow boxes indicate input parameters for each organism. Light and dark green boxes indicate calculations performed within ERICA.*

2.2.1 Calculation of dose conversion coefficients

Each reference organism is represented within ERICA by a simplified geometry (ellipsoid) of defined dimensions (length, height and width axes) and mass. Geometrical data for each of the ERICA reference organisms considered within the SR-Site assessment are represented in Appendix B.

The geometrical data are used within the ERICA tool, together with radionuclide-specific radioactive decay properties and information on the habitat occupancies of organisms to calculate dose conversion coefficients (DCC) (Ulanovsky and Pröhl 2006, 2008, 2012, Ulanovsky et al. 2008). These are quantities that link radionuclide activity concentrations in environmental media, or within organisms, to dose rates. Within ERICA, two sets of DCC are defined (Pröhl 2003):

- the dose rates resulting from radionuclide intake, DCC_{int} is defined as the internal absorbed dose rate (µGy h^{-1}) per unit activity in an organism (Bq kg^{-1} fw), and
- the dose rates due to exposure to surrounding media, DCC_{ext} is defined as the external absorbed dose rate (µGy h^{-1}) per unit concentration in environmental media (Bq kg^{-1} fw or Bq l^{-1}).

The derivation of DCC for external exposure differs between aquatic and terrestrial reference organisms. For aquatic organisms, which are immersed in water, there is no substantial difference between the density in water and the organism. Thus, the conditions for radiation transport are relatively homogeneous. For terrestrial animals and plants, the derivation of DCC is based on radiation transport simulated for mono-energetic photons using Monte Carlo techniques. Due to the complexity of the processes and the variability of life-forms, it is impossible to cover all possible exposure conditions. Therefore, generalised, representative cases (as defined by energy, contaminated media,

and organism sizes) are selected for detailed consideration. Exposure conditions for which detailed calculations are unavailable can then be deduced by interpolation. The following source–target relationships are taken into account:

- External exposure of on-soil and above-soil reference organisms to a radionuclide source of uniformly contaminated volume and with a thickness of 10 cm.
- External exposure of in-soil reference animals and plants that live in the middle of a radionuclide source of uniformly contaminated volume and with a thickness of 50 cm.

Together, the DCC_{ext} and DCC_{int} enable internal and external dose rates to an organism to be computed, the total dose rate to an organism is obtained as the sum of these dose rates.

DCC values are included within the ERICA tool for all default radionuclides and the full range of reference organisms. Calculation of additional DCC is required for any additional radionuclides or organisms with calculation being automatically performed by the tool upon addition of required radionuclides and/or information on size, mass and habitat occupancy of additional organisms, the values of which are subject to pre-existing constraints inherent in the ERICA tool.

2.2.2 Calculation of internal dose rate

The ERICA tool assumes, for internal exposure assessment, that radioactivity within the body of an organism is homogenously distributed and separate organs are not considered as would be the case for human dose assessment. Moreover, it is assumed that the fraction of the emitted energy per transformation in the body that is absorbed does not depend on properties in the environment.

Two parameters, in addition to $DCC_{int,}$ are required for the calculation of internal dose rate. These are concentration ratios and radiation weighting factors (both described below).

Internal dose rate is calculated according to the formula (Beresford et al. 2007):

$$D_{int}^{a} = \sum_{i} Conc_{i}^{a} \times DCC_{int,\,i}^{a} \qquad (2\text{-}1)$$

where D_{int}^{a} is the absorbed internal dose rate for reference organism a; $Conc_{i}^{a}$ is the average concentration of radionuclide i in reference organism a (Bq kg^{-1} fresh weight); and $DCC_{int,\,i}^{a}$ is the radionuclide-specific DCC for internal exposure, defined as the ratio between the average activity concentration of radionuclide i in reference organism a and the dose rate to the organism (μGy h^{-1} per $Bqkg^{-1}$ fresh weight). The average concentration of each radionuclide within a reference organism (C_{i}^{a}) is calculated by multiplying the activity concentration of radionuclide i in the environmental media (air, water, sediment or soil) that the organism inhabits by the concentration ratio (see below) for that radionuclide in reference organism a.

The difference in relative biological effectiveness of different radiations is taken into account by multiplying each DCC_{int} by the radiation weighting factors appropriate to each radionuclide (see Section 2.2.4) to derive weighted internal dose rates for each radionuclide. Weighted total internal dose rate is then calculated by summing weighted dose rates for each radionuclide.

Concentration ratios

The uptake of radionuclides in primary producers and consumers in both aquatic and terrestrial ecosystems are modelled using element specific equilibrium constants expressed as ratios between concentrations in organisms and the environmental media they inhabit. They are here called Concentration Ratios (CR). This approach assumes that the pools in organisms are small in relation to pools in soil, sediments and water and that the long-term organism concentrations are in equilibrium with the long-term environmental concentrations in soil or water.

For calculation of dose to non-human biota in the terrestrial ecosystem the soil to biota CR, is defined as the element activity concentration per fresh weight of biota (plant or animal) tissues divided by the element activity concentration in the soil:

$$CR = \frac{Conc_{biota} \times DMC}{Conc_{soil}} \quad (2\text{-}2)$$

where CR is the soil-to-biota concentration ratio expressed in (Bq kg^{-1} fw)/(Bq kg^{-1} dw), $Conc_{biota}$ is the element activity concentration in plant or animal tissues expressed in Bq $(kg\ dw)^{-1}$, $Conc_{soil}$ is the element activity concentration in dry soil expressed in Bq $(kg\ dw)^{-1}$ and DMC is the dry matter content of the plant or animal expressed in kg dw $(kg\ fw)^{-1}$.

For a restricted number of elements (H, C, P and S) uptake from soil is not relevant and the CR is instead calculated as a ratio relating to the element concentration in air. This CR is defined as the element activity concentration per fresh weight of biota tissues divided by the element activity concentration in the air:

$$CR = \frac{Conc_{biota} \times DMC}{Conc_{air}} \quad (2\text{-}3)$$

where CR is the soil-to-biota concentration ratio expressed in (Bq kg^{-1} fw)/(Bq m^{-3}), $Conc_{biota}$ is the element activity concentration in plant or animal tissues expressed in Bq $(kg\ dw)^{-1}$, $Conc_{air}$ is the element activity concentration in air expressed in Bq $(m)^{-3}$ and DMC is the dry matter content of the plant or animal expressed in kg dw $(kg\ fw)^{-1}$. In this safety assessment, this CR is only used for C-14. No site specific measurements for air are available, so literature data have been used for this radionuclide.

For calculation of dose to non-human biota in the aquatic ecosystem the CR is defined as the element activity concentration per fresh weight in biota divided by the element activity concentration of the surrounding water:

$$CR = \frac{Conc_{biota} \times DMC}{Conc_{water}} \quad (2\text{-}4)$$

where CR is the water-to-biota concentration ratio expressed in (Bq kg^{-1} fw)/(Bq l^{-1}), $Conc_{biota}$ is the element activity concentration in plant or animal tissues expressed in Bq $(kg\ dw)^{-1}$, $Conc_{water}$ is the element activity concentration in filtered water expressed in Bq l^{-1} and DMC the dry matter content of plant or animal tissues expressed in kg dw $(kg\ fw)^{-1}$.

Higher CR values indicate higher uptake in biota of that element from the surrounding soil or water. The use of CRs to model uptake of elements by biota is associated with conceptual uncertainties which are further discussed in Tröjbom et al. (2014).

For reference organisms, default CR data within the ERICA assessment tool were applied. However, for those radionuclides added to the tool for the purposes of this assessment, CR data were required. The data applied and their sources are detailed in Appendix B (Section B3). The CR's applied to site representative species are also detailed in the same Appendix and are discussed in Section 3.2.4.

2.2.3 Assessment of external exposure

For external exposure of biota to radiation present in the environment they inhabit, there are two key parameters, aside from DCC_{ext}, used to calculate external exposure to biota. These are habitat occupancy factors and radiation weighting factors. The calculation of external dose rate is performed according to the following equation:

$$\dot{D}^{b}_{ext} = \sum_{z} v_z \sum_{i} C^{ref}_{zi} * DCC^{b}_{ext,\,zi} \quad (2\text{-}5)$$

where v_z is the occupancy factor, the fraction of time that organism *b* spends at a specified location *z* in its habitat, C^{ref}_{zi} is the average concentration of radionuclide *i* in the reference media of a given location *z* (Bq kg^{-1} fw or dw (soil or sediment) or Bq l^{-1} (water)) and $DCC^{b}_{ext,zi}$ is the dose conversion coefficient for external exposure of radionuclide *i* in the location *z* giving a dose rate to organism *b*.

Consistent with the calculation of internal dose rates, the difference in relative biological effectiveness of different radiations is taken into account by multiplying each DCC_{int} by the radiation weighting factors appropriate to each radionuclide (see Section 2.2.4). Weighted total external dose rate is then calculated by summing weighted dose rates for each radionuclide.

Habitat occupancy

For each reference organism, habitat occupancy is defined within an assessment ecosystem. Within the terrestrial ecosystem, occupancy may be assigned to the on-soil (including in-air) or in-soil compartments. In both marine and freshwater ecosystems, biota may inhabit the in-sediment, on-sediment, in-water or on-water compartments. The allowed occupancies for each ecosystem are illustrated in Figure 2-2.

Within an individual ecosystem, multiple habitat occupancies can be assigned to allow for movement of biota between different compartments. For example, in the terrestrial ecosystem, a burrowing mammal may spend a proportion of time within soil and a further proportion on the soil surface. For each organism, the sum of habitat occupancies within an individual ecosystem must sum to 1. The movement of biota between different ecosystems, for example semi-aquatic species such as otter that proportion their time between terrestrial and aquatic ecosystems, is not specifically considered within ERICA; rather, total dose rate within each ecosystem inhabited is calculated. An assessor may then proportion the dose rate from the different ecosystems inhabited to take account of the proportion of time spent between ecosystems.

Default habitat occupancy factors are provided within ERICA, but assessors have the option to vary these within tier 2 to take account of site-specific factors; default values were selected to be conservative and, for a site-specific assessment, may not be representative of the type of behaviours displayed by biota of interest. Nonetheless, for the purposes of this assessment, the default habitat occupancies have been retained for all reference organisms; implications of variation in terms of the behaviour of site representative species are discussed in Section 3.

2.2.4 Radiation weighting factors

As noted above, radiation weighting factors are used to take account of the relative biological effectiveness of different radiations (α, low energy β and high energy β+γ), giving weighted biota dose rates. The discussion on the appropriate choice of radiation weighting factors is still on-going and no definitive recommendation has been made by the ERICA methodology. However, it has been suggested that biota-specific radiation weighting factors of 3 for low-energy electrons (E< 10 keV), 1 for all other β particles and electrons (as well as for γ and x-rays, the “reference radiations”) and

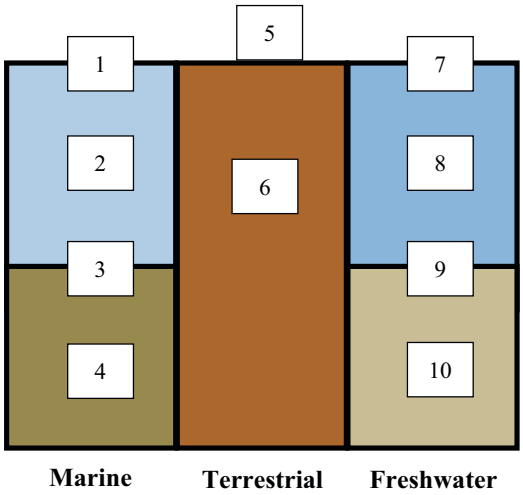

Figure 2-2. *Habitats defined in the ERICA tool for estimation of DCC to biota (from Torudd 2010). 1 = marine water surface; 2 = marine water column; 3 = marine sediment surface; 4 = marine within sediment; 5 = terrestrial on soil; 6 = terrestrial in soil; 7 = freshwater water surface; 8 = freshwater water column; 9 = freshwater sediment surface; 10 = freshwater within sediment.*

10 for α-radiation can be used. The value of 3 for low-energy electrons reflects the experimental RBEs for tritium (Straume and Carsten 1993) and the value of 10 for α-particles, lower than the value of 20 used in human protection, is used because the latter was intended to represent relative biological effectiveness (RBE) for stochastic effects (primarily the induction of cancers) whereas in non-human biota it is the deterministic effects that are of importance (Vives i Batlle et al. 2004). Throughout this assessment, these default weighting factors (high energy β+γ radiation – 1; low energy β radiation – 3; and α radiation – 10) have been applied.

2.3 Application of ERICA to SR-Site

As mentioned previously (Section 1.2), the ERICA reference organisms can be used as a suite of organism types against which other site-specific organisms may be compared. This approach was used in the initial assessment (Torudd 2010) and has continued to be applied in the present study. Nonetheless, in order to ensure that all relevant aspects of the types of populations of plants and animals of relevance to the Forsmark area were considered, a list of representative species for the site has also been developed. The site representative species are considered in detail in Chapter 3 and comparisons are made to dose rate implications from differences between site species and the reference organisms used to represent them. The remainder of this section is focussed on the more practical application of the ERICA tool to the SR-Site project. Consideration is also given to practical issues around the application of the ERICA tool to the SR-Site project in terms of spatial and temporal scales of assessment that lead to assessment uncertainties.

In the initial assessment (Torudd 2010), only those radionuclides for which site and/or literature data were available with respect to biological uptake (i.e. CR) were included in the analysis. This precluded assessment of three radionuclides: Ac-227, Pa-231 and Pd-107. Following review of the initial assessment, SSM requested that total dose rates are calculated taking into account all radionuclides released to the biosphere. The approach taken to include these radionuclides is described in Section 2.3.3. Since the initial assessment was undertaken, a new version of the ERICA tool has been released. A comparison of the output of the initial version to that applied in the current assessment has also been undertaken to evaluate whether changes made to the tool are of consequence to dose rate calculations. Issues around quality assurance in relation to the assessment are presented in Appendix A.

2.3.1 Ecosystems and their representation

For the safety assessments of radioactive waste repositories at Forsmark, freshwater and marine (brackish water) environments are ecosystems of concern for the prevailing conditions as well as terrestrial ecosystems (Lindborg 2010). To be consistent with the extensive reporting within the SR-Site safety assessment, the term marine (ecosystem, species) has been used in the word's wider meaning, i.e. representing a sea ecosystem or species living in the sea. Thus organisms that can tolerate the salinity (~ 5‰) of the brackish water of the Baltic Sea outside Forsmark have been classified as marine organisms.

The terrestrial component of the site is characterised largely by forests and wetland areas where higher concentrations of radionuclides are predicted to enter wetlands, compared to other forms of terrestrial habitats. Wetlands are not specifically represented by the ERICA tool; such ecosystems have therefore been evaluated within the terrestrial ecosystem of the tool.

Agricultural ecosystems have not been considered relevant in the analysis of dose rates for non-human biota. This is because future contaminated agricultural land in Forsmark is likely to originate from drained wetland, and these agricultural soils are expected to be productive (and thus provide a stable environment) for 100 years or less (Lindborg 2010). Thus, the species associated with this land would either be introduced by humans (crop or livestock), or immigrated from adjacent land and consequently they would be part of larger and more stable biological populations. The populations are also actively manipulated by humans. The exclusion of farmed animals from the assessment is consistent with the ICRP view that the protection of humans themselves is probably sufficient for such managed environmental or ecological situations (ICRP draft for consultation; The practical application of reference animals and plants to different exposure situations. Accessed March 2012).

2.3.2 Activity concentrations in environmental media

The basic assumption of the current assessment is that some degree of failure of the barriers of the repository will lead to a release of radionuclides, with different mechanisms of barrier failure being evaluated through separate calculation cases. Several scenarios that have the potential to cause radionuclide mobilisation and release from the engineered barrier system of the deep repository for spent nuclear fuel are identified in Chapter 11 of the SR-Site main report (SKB 2011). The two scenarios identified as the most risk significant are canister failure due to corrosion and canister failure due to shear load.

In the 'canister failure due to corrosion' scenario canisters fail as a result of enhanced corrosion due to advective conditions in the deposition hole following the loss of buffer through erosion. In the 'canister failure due to shear load' scenario, canisters fail due to earthquake-induced secondary shear movement along fractures intersecting the canister position. Details of the two scenarios are discussed in the SR-Site main report (SKB 2011).

Contaminated groundwater from a failed canister may reach the biosphere at different times: the instantaneously accessible fraction of radionuclides from fuel (IRF) may reach the biosphere in a pulse within years or decades after failure, whereas the release from the fuel matrix and corroded metals will result in a continuous release of radionuclides over very long time spans (> million years) (SKB 2010c). In both cases deterministic calculation cases were used. This choice was made because the effects of concern when estimating dose rate to non-human biota are deterministic ones (e.g. effects on reproduction), not stochastic effects as is the case in dose estimates to humans (related to the probability of cancer and heritable genetic damage). In the former assessment of dose to non-human biota (Torudd 2010) the source term of a probabilistic version of the central corrosion case was used, where no canisters failed in most of the repository simulations.

The source terms from these two release fractions were inserted in the radionuclide model for the biosphere (Andersson 2010, Avila et al. 2010, a condensed description is also available in Chapter 8 in SKB 2010c) which delivered environmental concentrations of each radionuclide for a large number of landscape objects over time. An illustration of the model is presented in Figure 2-3. The activity concentrations in environmental media resulting from each release scenario constitute a primary input to the ERICA tool. Activity concentrations in environmental media also form the basis for considerations around the influence of climate conditions on biota.

In aquatic ecosystems the radionuclide concentration in water is used when estimating internal dose rate (uptake is estimated using a CR between organism and water, see Section 2.2.2) whereas the radionuclide inventory of the water compartment as well as the maximum value from either of the two compartments representing sediment ("AquRegolith up" representing the upper centimetres of the organic sediment or "AquRegolith Mid" representing lower, biologically inactive layers of organic sediment) are used for estimating external dose rate. In terrestrial ecosystems the radionuclide inventory of the compartment representing the organic soil (peat, "Ter Regolith Up") is used both for internal exposure (uptake is estimated using a CR between organism and soil, see Section 2.2.2) and external exposure estimates. The highest concentration of each radionuclide (in each relevant media) from all objects throughout the assessment period was used. The various mobilities of each element in the environment are such that the peak concentrations of radionuclides at the surface do not always coincide, but that has not been considered here since we assume a scenario where the highest possible concentrations of all radionuclides occur simultaneously. In a scenario where many radionuclides are quantitatively contributing to the dose rate this will be a very conservative approach, but if the dose rates are dominated by a single radionuclide the conservatism will be low.

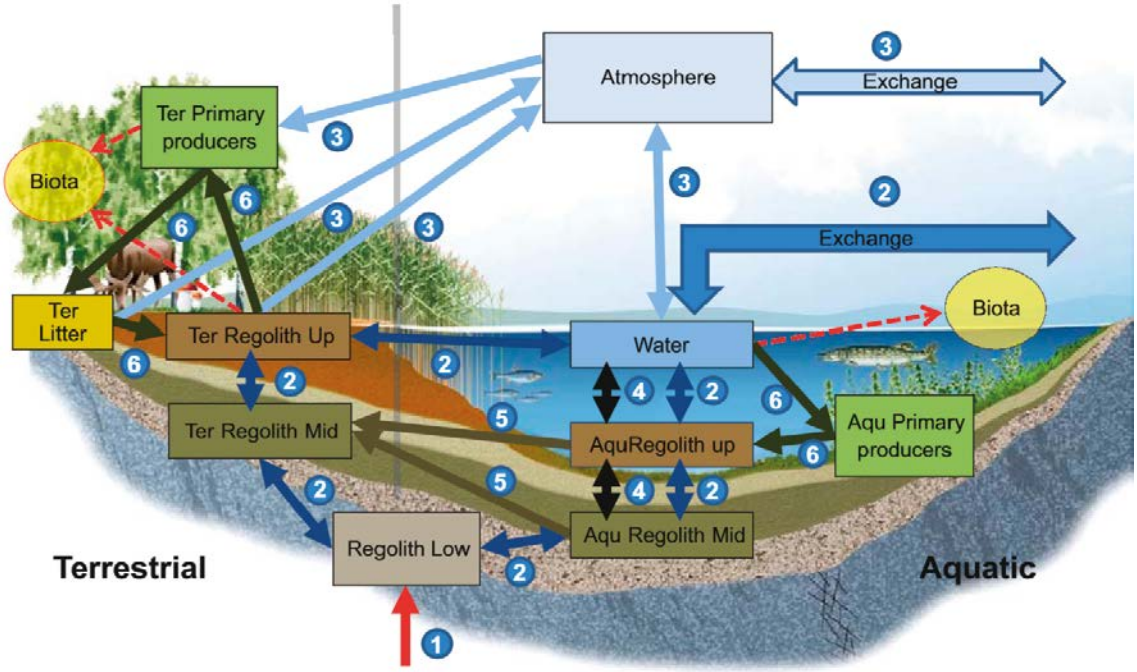

Figure 2-3. *Illustration of the Radionuclide Model for the biosphere used in SR-Site (from Avila et al. 2010). Boxes represent compartments, thick arrows fluxes, and dotted arrows concentration computations for biota. The model represents one biosphere object which contains an aquatic (right) and a terrestrial part (left) with a common lower regolith and atmosphere. The release from the geosphere is represented by a red arrow (1). The radionuclide transport is mediated by different major transport processes, indicated with dark blue arrows for water fluxes (2), light blue for gas fluxes (3), black for sedimentation/resuspension fluxes (4), dark brown for the wetland growth (5), and green for biological uptake/decomposition (6). Import from and export to surrounding objects in the landscape is represented by arrows marked "exchange".*

Activity concentrations in the central corrosion base case

In the simulations of the central corrosion base case, the source term from the geosphere was released to all biosphere objects to ensure that the one giving the maximum exposure for a specific radionuclide, time period and organism type was included. The highest concentrations (for each radionuclide and environmental media) for any object over the simulated time period (100,000 years) were used when estimating dose rate to non-human biota. This may seem an unusual approach, but as with the case when maximum concentrations of different radionuclides occur at different times (see paragraph above) this is only very conservative when many radionuclides are contributing to the dose rate. The radionuclides included in the base case and the maximum environmental concentrations are presented in Table 2-2. Highest concentrations, in water as well as in sediments/soil in all three ecosystems, are for Ni-59 followed by Zr-93 although in marine waters the concentration of Tc-99 is c one order of magnitude higher than that of Zr-93. Both reference organisms and representative species from the Forsmark site (see Sections 2.1 and 3.1) have been included in the base case.

Activity concentrations in the central corrosion pulse release case

In the central corrosion case, the IRF, upon contact with water, is expected to enter the geosphere in a matter of years, as the flow-rates at the points of discharge – the failed canister and eroded buffer – are high. Since the nuclides are generally non-sorbing, and the geosphere acts poorly in retarding flow-paths from the points of discharge, emissions from the geosphere to the biosphere can be expected to occur over some decades. Nonetheless, a conservative estimate is used, assuming that the whole IRF inventory is released to the biosphere during a single year. According to Table 4-3 in (SKB 2010a) the predicted first time a canister can fail due to corrosion is after c 114,000 years and we have here conservatively used the inventory of radionuclides within a canister 100,000 years after closure. The timing of this release is key to the results and is discussed further below.

Table 2-2. Maximum activity concentrations in soil, water and sediment after a release according to the base case of the deterministic central corrosion case.

	Terrestrial	Freshwater		Marine	
Radionuclide	Soil (Bq kg^{-1}_{dw})	Water (Bq L^{-1})	Sediment (Bq kg^{-1}_{dw})	Water (Bq L^{-1})	Sediment (Bq kg^{-1}_{dw})
Ac-227**	3.0E–7	3.3E–11	5.0E–6	2.1E–12	9.8E–7
Ag-108m	2.8E–27	3.5E–32	1.5E–25	2.2E–33	1.0E–26
Am-241	2.9E–10	1.5E–14	4.9E–9	1.1E–16	1.8E–10
Am-243	1.1E–7	1.1E–11	2.9E–6	3.8E–14	3.7E–8
C-14	2.5E–12*	4.9E–10	1.6E–7	1.1E–10	7.1E–8
Ca-41	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Cl-36	3.4E–5	3.6E–7	2.7E–5	2.0E–8	4.2E–5
Cm-244	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Cm-245	9.5E–9	2.3E–13	1.3E–7	5.8E–16	2.0E–9
Cm-246	2.7E–27	5.3E–32	4.8E–26	2.1E–34	7.5E–28
Cs-135	7.7E–3	7.1E–8	1.7E–2	6.8E–10	1.9E–4
Cs-137	2.5E–32	1.3E–36	2.6E–30	2.7E–37	4.8E–31
Ho-166m	7.2E–28	9.9E–33	1.2E–26	5.3E–34	3.8E–28
I-129	5.3E–3	3.0E–6	2.3E–1	6.9E–8	5.6E–3
Nb-94	5.4E–1	1.8E–6	1.7E+0	3.2E–8	2.7E–2
Ni-59	2.1E+2	2.0E–2	2.9E+3	1.8E–4	3.9E+1
Ni-63	1.0E–28	6.3E–33	1.4E–27	2.6E–34	1.7E–28
Np-237	7.8E–2	3.7E–5	3.2E+0	8.5E–7	6.6E–2
Pa-231	1.1E–3	1.6E–7	1.4E–2	3.8E–10	2.0E–4
Pb-210	6.6E–2	3.7E–7	2.0E+0	1.0E–8	2.7E–2
Pd-107	3.6E–2	1.6E–6	4.3E–3	1.7E–8	4.3E–4
Po-210	6.6E–2	3.6E–6	2.0E+0	1.2E–9	3.0E–2
Pu-239	1.6E–2	5.5E–6	2.2E–1	1.3E–8	4.5E–3
Pu-240	4.5E–7	1.8E–10	1.1E–5	6.9E–13	2.3E–7
Pu-242	1.9E–2	6.5E–6	1.5E–1	9.1E–9	3.1E–3
Ra-226	6.6E–2	6.3E–6	1.7E+0	1.7E–7	2.7E–2
Se-79	3.7E–3	1.9E–6	9.3E–2	5.0E–8	3.0E–3
Sm-151	4.1E–30	9.8E–35	8.7E–29	4.2E–36	1.5E–29
Sn-126	5.8E–3	2.0E–7	4.8E–2	2.3E–9	5.2E–4
Sr-90	5.8E–30	6.9E–33	1.6E–29	3.0E–34	4.0E–30
Tc-99	8.5E–3	1.6E–4	6.6E–2	6.5E–6	2.9E–2
Th-229	2.2E–2	1.3E–7	9.3E–2	1.6E–10	2.8E–3
Th-230	1.5E–5	6.8E–11	1.8E–5	2.6E–14	4.2E–7
Th-232	3.5E–11	2.0E–16	3.7E–11	5.9E–20	9.6E–13
U-233	3.0E–2	1.4E–6	2.6E–1	1.9E–8	2.9E–3
U-234	4.6E–5	2.1E–9	2.5E–4	1.7E–11	2.8E–6
U-235	5.6E–6	2.6E–10	1.9E–5	1.2E–12	2.1E–7
U-236	2.9E–5	1.4E–9	1.5E–4	1.0E–11	1.7E–6
U-238	2.0E–5	9.4E–10	1.0E–4	6.9E–12	1.2E–6
Zr-93	6.5E+0	3.3E–4	5.2E+1	5.0E–7	1.2E+0

*Air concentration of C-14; 2.5E-12 Bq m^{-3}. **The contribution from the decay of Pa-231 is not included.

It is conservatively assumed that the total IRF will reach only one discharge area, i.e. the release will not be subdivided over several biosphere objects. All biosphere objects were included in the analysis to ensure that the one giving the maximum dose rate for a specific radionuclide, time period and organism type was included. The time when maximum exposure occurs deviates, depending on e.g. sorbing properties of the different radionuclides. Mobile radionuclides (e.g. Cl-36) give highest exposure early after the occurrence in the biosphere objects whereas for other radionuclides (e.g. Cs-135) the exposure will increase over the modelled time period as the nuclides are accumulated in top sediments or soils where non-human biota are potentially exposed. In order to grasp these differences three independent release times were used in the analyses (the whole IRF at year 100,000 was released at three different time steps): release of the pulse at 9000 BC (representing mainly the marine phase where no terrestrial ecosystems are present), at 2500 AD (representing a mixed phase with presence of a late marine state

(where the water area and turnover is smaller leading to higher radionuclide concentrations in water), as well as presence of freshwater (lakes) and terrestrial ecosystems) and at 9000 AD (representing mainly a land phase when no marine ecosystems are present in the area and the freshwater objects mainly consists of streams instead of lakes). A number of nuclides within IRF have relatively short half-lives (e.g. Sr-90, Cs-137, C-14) and were excluded from the analysis since they would decay to insignificant levels before a failure is predicted to occur (SKB 2010a). The radionuclide model was run until the year 60,000 and the maximum environmental concentrations in water, sediment and soil were identified for each of the assumed periods of release, see Table 2-3.

Generally, the radionuclide with the highest environmental concentrations is Tc-99, with maximum concentrations occurring in mixed and land phases in water as well as in sediment or soil. Following a release during the submerged phase Tc-99, Ni-59 and I-129 dominate in marine ecosystems whereas the concentrations of Tc-99 are much lower in freshwater and terrestrial ecosystems.

Comparing the maximum environmental concentrations with the environmental concentrations used in the base case (Table 2-2) most concentrations are higher in the pulse release case, only for Ni-59 and Nb-94 are all concentrations one order of magnitude lower, or more. The concentrations of Cl-36 and Tc-99 were two or three orders of magnitude higher in the pulse release case compared to the base case for all phases of release with the exception of in terrestrial soil after a release during the submerged phase. This is due to the low sorption of Cl-36 and Tc-99 (see Section 5.1.4), resulting in their migrating out of the system rather than their accumulation in deposits.

2.3.3 Incorporation of the radionuclides Ac-227, Pa-231 and Pd-107 in ERICA

The ERICA tool has an ‘add radionuclide’ functionality which, when used, calculates DCC for the radionuclide of interest for all reference organisms (and any site representative species for which geometrical data have also been incorporated within the tool). This functionality was employed to incorporate the radionuclides Ac-227, Pa-231 and Pd-107 into the assessment. However, the decay of Pa-231 to Ac-227 was not included. Resultant DCC’s for reference organisms and representative species are presented in Appendix B.

2.3.4 Addressing concentration ratio data gaps

The CR values presented in the ERICA tool (Hosseini et al. 2008 (aquatic CR), Beresford et al. 2008c (terrestrial CR)) were used for reference organisms. Of the radionuclides relevant in this assessment, data in the ERICA database is lacking for Ac, Ca, Ho, Pa, Pd, Sm and Sn. For Ca the ERICA data for Sr has been utilised as an element analogue (EA) whereas ERICA data for Am has been used as EA for Ho and Sm which is consistent with Tröjbom et al. (2014). The respective element analogues applied for Ac-227, Pa-231 and Pd-107 in terms of reference organisms were Am, Cm and Ni. The choice of element analogues for Ac-227 and Pa-231 is consistent with that in Smith and Robinson (2008) whereas for Pd-107 the element analogue is consistent with Tröjbom et al. (2014). For these three elements the Wildlife Transfer Parameter Database (ICRP 2011) was used as the main data source. Whilst this database contains much of the CR data contained within ERICA, additional data are available that have not yet been incorporated into the ERICA tool. If data were missing from this database values from the ERICA database were used as parameter analogues (PA).

2.3.5 Evaluation of effects from biota dose rates

Whilst quantitative criteria for radiological risks to man have been established, SSM’s regulatory criteria for protection of non-human biota issued by SSM (SSM 2008) are only qualitative; no specific dose limits are stipulated.

ICRP (2008) notes that “dose limits” of the form used in human radiological protection would be inappropriate for biota, but that some form of numerical guidance is required. Currently there is no international consensus on numerical values that should be applied to demonstrate environmental protection.

The ICRP has set out proposed bands of derived consideration reference levels (DCRL). Within these bands, there is likely to be some chance of deleterious effects of ionising radiation to the organisms of concern that could be used to optimise protection efforts and, by inference, below these bands the risks would appear to be negligible.

Table 2-3. Maximum activity concentrations in soil, water and sediment after a release according to the pulse release case of the deterministic central corrosion case. Note that a release in the land period (AD 9000) cannot affect marine environments, as the sea has emerged out of the simulated area at this time.

	Freshwater						Marine						Terrestrial		
	In water (Bq l-1)			In sediment (Bq kg-1d.w.)			In water (Bq l-1)			In sediment (Bq kg-1d.w.)			In soil (Bq kg-1d.w.)		
Isotope	**Submerged**	**Mixed**	**Land**	**Submerged**	**Mixed**	**Land**	**Submerged**	**Mixed**	**Land**	**Submerged**	**Mixed**	**Land**	**Submerged**	**Mixed**	**Land**
Cl-36	1.4E–11	2.8E–4	5.7E–4	7.4E–8	1.8E–2	1.8E–2	4.3E–8	1.6E–5	–	5.7E–3	1.9E–2	–	1.3E–7	3.5E–2	3.7E–2
Cs-135	4.6E–7	4.6E–7	4.5E–7	1.2E+0	7.4E–2	2.4E–2	3.4E–8	4.4E–9	–	1.8E–2	1.7E–3	–	4.0E–2	4.0E–2	4.0E–2
I-129	4.2E–5	8.1E–5	7.6E–5	4.9E+0	6.4E+0	1.1E–1	1.8E–6	4.9E–7	–	2.1E–1	5.1E–2	–	1.2E–1	2.8E–1	2.8E–1
Nb-94	2.0E–7	1.1E–7	1.1E–7	1.0E+0	8.0E–2	2.4E–2	1.3E–8	2.5E–9	–	2.2E–2	1.8E–3	–	3.1E–2	4.4E–2	4.4E–2
Ni-59	9.7E–5	5.4E–5	5.4E–5	5.1E+1	6.1E+0	3.4E–1	2.2E–6	3.5E–7	–	9.1E–1	1.2E–1	–	5.4E–1	6.2E–1	6.2E–1
Se-79	6.1E–6	9.4E–6	9.7E–6	5.0E–1	4.1E–1	1.1E–2	2.0E–7	5.1E–8	–	1.9E–2	4.0E–3	–	1.3E–2	1.9E–2	1.9E–2
Sn-126	4.2E–7	3.0E–7	3.0E–7	6.0E–1	5.2E–2	5.0E–3	2.0E–8	2.7E–9	–	8.8E–3	8.8E–4	–	9.3E–3	1.0E–2	1.0E–2
Tc-99	3.7E–12	2.7E–2	5.9E–2	4.0E–13	1.4E+1	1.0E+0	7.3E–6	2.6E–3	–	8.8E–1	1.4E+1	–	2.0E–14	2.7E+0	2.7E+0

In a series of European projects (EPIC, FASSET, ERICA, PROTECT), a system dealing with the assessment of dose to non-human biota has been developed (Beresford et al. 2007)[2] and a screening dose rate proposed (Garnier-Laplace et al. 2006, Andersson et al. 2008). This dose rate was originally derived as a predicted no-effect dose rate for ecosystems, based on a distribution analysis of mortality and reproduction response to chronic exposure in a broad range of organisms (Garnier-Laplace and Gilbin 2006). In subsequent analyses restricted to vertebrates, invertebrates, and plants, the use of this screening dose rate was further supported, and it can be interpreted as the dose rate where 5% of species are expected to have a 10% reduction in reproductive rate, accounting for data uncertainties (Andersson et al. 2009, Garnier-Laplace et al. 2010).

The screening dose rate is generic to all types of biota across all ecosystems and is intended not as a "dose limit", but rather as an instrument to assist in the separation of situations of negligible concern from those where it may be appropriate to pause for reflection to consider whether any concern is warranted. Thus, the ERICA screening dose rate and the ICRP DCRLs serve much the same purpose as 'benchmarks'. Such benchmarks are numerical values used to guide risk assessors at various decision points in a tiered approach. Alternative benchmarks have been proposed by others, for instance the US Department of Energy (US DoE 2002; see also IAEA 1992 and UNSCEAR 1996). US DoE suggests using a screening dose rate of 400 μGy h^{-1} for native aquatic animals, and benchmarks of 400 and 40 μGy h^{-1} for terrestrial plants and terrestrial animals, respectively. UNSCEAR use a less restrictive criteria of 100 μGyh^{-1} for terrestrial ecosystems (UNSCEAR 2008). The ERICA screening value is nonetheless more restrictive. Dose assessment results have therefore been interpreted with respect to the ERICA screening value. However, it is understood that ICRP intends recommend the lower band of the DCRL's as a benchmark against which the acceptability, in terms of environmental impacts, of planned activities may be gauged (ICRP draft for consultation; The practical application of reference animals and plants to different exposure situations. Accessed March 2012). Consideration is therefore also given to relevant DCRL's where these are more restrictive than the generic ERICA screening value (as relevant to vertebrates and pine tree).

2.3.6 Ecological, radioecological and spatiotemporal uncertainties in the application of ERICA

On the whole, the largest sources of uncertainty in the dose-effect assessment to non-human biota are those related to the release of radioactive materials from the repository and their transfer to the biosphere, with the assumption of homogeneity across objects, such factors are discussed in other parts of the SR-Site assessment (SKB 2010a). Other factors include the rate at which the radionuclides may be released, or the climactic conditions into which releases may occur, which are investigated in this report, in Sections 5 and 6, respectively.

Some sources of uncertainty correspond to the specific factors affecting exposure and uptake of radioactive contaminants into biota, such as the habitat and size of particular organisms; such factors have been discussed and explored in some detail in this study (Sections 3.2, 4.2.2 and 4.2.3), and in a previous assessment (Torudd 2010). This report does not attempt to consider uncertainties relating to the extrapolation of dose to effect in non-human biota; discussion of these may be found in e.g. UNSCEAR (1996, 2008) and ICRP (2008).

In this section, ecological, radioecological and spatiotemporal issues in the application of ERICA to the SR-Site assessment are discussed in terms of the uncertainties arising for calculated dose rates and approaches that have been applied, where possible, to address such uncertainties. Such uncertainties may not be as significant (i.e. they are not expected to affect the dose rate to or effects in organisms as much) as those mentioned above, however they have not been discussed previously in the context of the safety assessment for biota from radioactive sources from a geological repository, if at all with regards to radioactive protection. Whilst ecological, radioecological, and temporal and spatial scale issues are worthy of comment herein, it is important to note that they are not unique to the SR-Site project; rather, the issues are being considered more widely in relation to long-term dose assessments within the international BIOPROTA programme and more generally within the IAEA MODARIA research programme.

[2] An overview of the entire series and detailed descriptions of each project, including links to the resulting scientific publications, are available at www.erica-project.org.

Radionuclide uptake by biota

The range of variation associated with CR values is large, encompassing three or more orders of magnitude in some cases; variation in CR values therefore represents the greatest uncertainty associated with biota dose assessments (Smith et al. 2010, Beresford et al. 2008b, 2009). Whilst the numerical values assigned to represent uptake of radionuclides by biota give rise to the greatest uncertainty due to the large variation observed in uptake values, additional uncertainties are noteworthy with respect to the application of CR's within assessments.

ERICA assumes that the biota acquire the radionuclides directly from the medium they are exposed (i.e. terrestrial birds and animals relative to soil) without taking into account the food chain. However, the assessment of internal dose ideally requires knowledge of the quantities of radionuclides taken into the body, how they are distributed and their clearance rate, which would be consistent with the approach developed by the ICRP for humans. Uncertainty in dose rate calculations associated with non-homogenously distributed radionuclides is currently being investigated within the IAEA MODARIA programme through the development of voxel phantoms for the ICRP RAPs. It is anticipated that the output of the programme will provide a means of quantifying the uncertainty around dose rates evaluated on the basis of homogenous distribution assumptions.

The approach in the present assessment has been to make use of site data for the transfer of radionuclides from environmental media to representative species. Whilst this does not allow the issue of homogenous distribution to be addressed, it does reduce some uncertainties. The use of site data ensures that the CR values applied in the assessment are representative of site conditions, such as soil and water chemistry that can affect the behaviour and bioavailability of radionuclides. Measured data from the site will also encompass uptake from the foods consumed by animals that inhabit the area. It is nonetheless recognised that there will be natural variability in soil and water chemistry, and hence bioavailability, and in the behaviour of individual animals. The representativeness of samples from the site to the range of conditions and behaviours is uncertain. Comparison has therefore been made (see Section 4.1 and Appendix B, Table B23) between site data and the default ERICA CR values that, for many reference organism-radionuclide combinations, are supported by a larger data set than has been possible under the site characterisation programme.

Temporal scales of assessment

Activity concentrations (soil, sediment, water and air) have been calculated by the radionuclide transport model, which delivers environmental concentrations of each radionuclide for a large number of landscape objects over time. For the central corrosion base case and pulse release case, the maximum far-field release during the simulation period of 1 million years was selected and applied as a constant release rate to the biosphere of Forsmark (Avila et al. 2010). Maximum activity concentrations for each radionuclide in wetland (considered to be equal to soil in the ERICA tool), air (for C-14 in the terrestrial ecosystem) and water and sediments (freshwater and marine ecosystems) were obtained for each landscape object. The maximum activity concentration for each medium, irrespective of the timing of occurrence has then been selected as input to ERICA.

The temporal scale of exposure is a relevant consideration for biota dose assessments in terms of both the exposure of different life stages of a species, but also the length of time over which continued exposure could manifest in, for example, reproductive impacts affecting population dynamics (Smith et al. 2013). However, at this time, guidance on duration and degree of exposure that would affect population dynamics is unavailable. It is nonetheless reasonable to assume that the long timescales associated with releases from the geosphere to the biosphere associated with disposal facilities would be consistent with the timeframes that may be associated with population dynamic effects and assessment should therefore be conducted and output evaluated with due consideration of this; the approach taken herein has been designed to be conservative with respect to temporal scales of exposure. As noted above, peak activity concentrations, irrespective of the timing of occurrence have been used as input to ERICA in each calculation case. The assumption that all radionuclides are at their peak activity concentration simultaneously is likely to be pessimistic; in reality, radionuclides will reach their peak at different times, by processes that are indicated by their migration rate through the geosphere and their radioactive half-life. Nonetheless, the assumption provides a simple methodological approach that is conservative with respect to environmental radioactivity concentrations. The degree of conservatism will be higher if major dose-contributing radionuclides appear in the biosphere objects at different times,

and do not reach steady state concentrations in biosphere objects. The assumption has been adopted in other similar assessments, for example by the UK Nuclear Decommissioning Authority – Radioactive Waste Management Directorate with respect to a generic disposal facility for radioactive waste (Smith et al. 2008, Smith and Robinson 2008) and by Vandenhove et al. (2010, 2012) in evaluating risk to non-human biota from routine liquid discharges from Belgian nuclear power stations. The application of this assumption within the current assessment is considered further in the central corrosion calculation case (Section 4).

Spatial scales of assessment

There are two principal aspects of uncertainty associated with spatial scales of assessment. One relates to assumptions around the ecosystem and habitat occupancies of biota. The other relates to the area over which activity concentrations are averaged to derive environmental media activity concentrations for input into the ERICA tool.

Ecosystem and habitat occupancy

The ERICA tool restricts the occupancy of biota to either the terrestrial, freshwater or marine ecosystems whereas for some animals (e.g. amphibians) transient behaviour may be observed with an animal spending a proportion of time between two or more ecosystems. Whilst it is possible to proportion dose rates calculated for an organism inhabiting different ecosystems according to the relative amount of time spent within each, restricting an organism to one ecosystem is a conservative approach ensuring dose rates are not underestimated as a result of uncertainties in proportionate occupancy of ecosystems. This approach has been adopted in the current assessment.

Within an ecosystem, the default assumption within ERICA is that an organism inhabits a position relative to environmental media (soil, sediment, water, air) that will give rise to the highest dose rate, taking into account the types of occupancy that could occur. For example, the reference organism (Wading) Bird in aquatic ecosystems is, by default, assigned to the within water habitat compartment even though, proportionally, more time would be spent on the water; within air occupancy is not permitted for aquatic ecosystems. Whilst intended as conservative assumptions for reference organisms, the behaviour of some species within a given reference organism type may vary such that alternative occupancy assumptions may be more conservative. For example, the reference organism Amphibian within the terrestrial ecosystem is assumed by default to occupy the on soil habitat compartment. Some species of frog bury within soils however which may give rise to greater exposure to ionising radiation. Use of default assumptions around habitat occupancy may therefore lead to underestimates in dose rate for some species. This is further considered in Section 3.2.1.

Spatial averaging

As noted in Smith et al. (2013), scales of assessment applicable to human radiological assessments are often applied to derive activity concentrations in environmental media as input to biota dose assessments. However, there are significant differences in protection objectives for people and NHB with the former focussing on protection of representative persons (being representative of an appropriately defined potentially exposed group in the case of repository safety assessments) and the latter being focussed on a population of a relevant species (with the noted exception of endangered species for which individual protection objectives may be applied). The environmental concentrations relevant to determining dose to representative people will not necessarily be the same as those for determining the radiological exposure of wildlife populations.

The alternative approach to using human-based scales of assessment is to compartmentalise the biosphere within an assessment model in line with biosphere characteristics, defined through site characterisation activities. This is the approach applied in the current assessment. Nonetheless, consideration should be given to the use of these biosphere objects by the populations of biota of interest in the assessment to allow interpretation in terms of the realistic exposure that individuals and populations may experience (see Section 3.2.3 for further details).

The SR-Site assessment employs a modelling approach whereby the geosphere and biosphere are coupled; by combining predicted discharge of deep groundwater from the repository and landscape geometries, the area's most likely to be affected by a potential release of radionuclides have been

identified and outlined, i.e. biosphere objects that develop over time (SKB 2011). The biosphere objects represent a considerable variation in size (8 ha to 133 ha), timing of succession and object-specific properties.

In the calculation of dose rates for NHB it is typically assumed that wildlife feed, reproduce and spend most of the time within a single biosphere object, where exposure is homogenous throughout that biosphere object. For larger animals and birds this is a cautious assumption because they usually utilize larger areas (Table 2-4) compared to the size of the biosphere objects (the median biosphere object size is 15 ha). For smaller organisms that only utilise a small area, far less than the actual biosphere object, the estimate of potential dose rate may not be accurate if the mean radionuclide concentration in the object is not representative for smaller areas within the object, i.e. there is a large heterogeneity in the concentration of radionuclides within different media of the biosphere object. Such a case could be valid for a terrestrial area, but not necessarily be the case in an aquatic ecosystem where it is assumed that contaminants will be evenly distributed within the water body.

Whilst the current assessment has evaluated radionuclide behaviour in the environment within and between distinct biosphere objects, the approach to deriving input data has been to select the highest environmental media activity concentrations in each ecosystem, irrespective of the location of occurrence. Whilst there may be considerable variation in the size of landscape objects, selection of the highest activity concentrations for each ecosystem means that upper dose rates will be calculated; calculated dose rates reported herein are therefore considered to be upper estimates. Biota occupying similar ecosystems in different regions of the assessment area would be expected to be lower than those reported, particularly when considered alongside the temporal scale conservatisms discussed above.

Ecotones

An ecotone is the transitional area or border between two ecosystems. For example, the bank of a lake is a terrestrial/freshwater ecotone, or where a river meets the sea would also be identified as a freshwater/marine ecotone. Ecotones may have a sharp, distinct transition (e.g. river bank), or a diffuse/obscure border or gradient (e.g. wetlands between ground and lake). Organisms/populations living on the borders of two ecosystem types may be exposed to some of the radionuclides from both simultaneously. This is in addition to, and distinct from, the phenomenon where a mobile organism may experience exposures from multiple ecosystem types by movement from one into another. Organisms living on or around an ecotone (Figure 2-4 ii + iii) may therefore receive different radioactive exposures from contaminants than would be predicted for an organism living in the middle of an ecosystem type (Figure 2-4 i) depending on the concentration of radionuclides in each ecosystem type; the effect may be more pronounced where ecotones are more extensive within an area (Figure 2-4 iii). If, for example, the aquatic environment contains a higher radionuclide inventory than the terrestrial environment (particularly if they are high-energy β or γ emitters), then the location of an organism relative to the ecotone (as per Figure 2-4) could lead to higher than predicted dose rates for terrestrial organisms ii and iii, with organism iii receiving the highest dose rate.

Table 2-4. Description of the estimated home-range or area utilized for resource allocation during a life time for a number of terrestrial organism groups.

Organism	Individual home-range/ utilized area	Reference
Bryophytes	0.001–0.01 m^2 (no roots)	Glime 2006
Vascular plants	0.1–500 m^2 (incl. root system)	Estimate
Insects	m^2 – intracontinental (Europe)	Johansson 1969
Fish	Small lake – Baltic Sea	Aro 1989
Birds	Hectares – intercontinental	Alerstam 1993
Small mammals	0.036–1.7 ha	Truvé and Cederlund 2005
Large mammals	10–3 200 ha	Truvé and Cederlund 2005

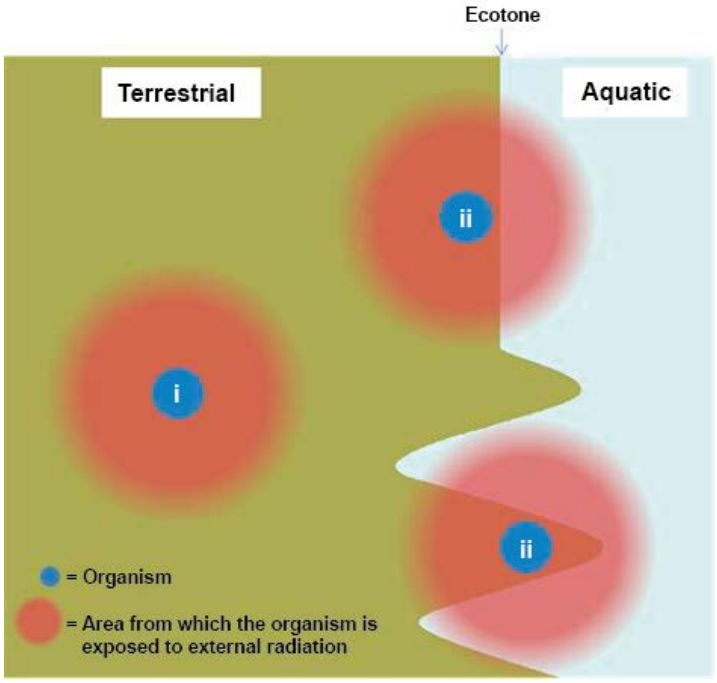

Figure 2-4. *Visual representation of the variation in radiation sources with the location of terrestrial organisms relative to a terrestrial/aquatic ecotone. Red circles indicate the area around the organism (blue circle) from which radionuclides in each ecosystem may expose the organism. i is exposed entirely to terrestrial radionuclides. ii + iii are exposed to both terrestrial and aquatic radionuclides; iii is exposed to an increased proportion of aquatic radionuclides (relative to ii) due to the extensive ecotone in its vicinity.*

Population dynamics

A species may exist at the site as either a single functional population whose range extends up to or beyond the site-area, or multiple populations existing within the site as small, geographically distinct local populations. However, because of the relatively small ecosystem object size, such populations are likely to be able to intermix on a regular or semi-regular basis through short migrations, or during climactic events. Even aquatic organisms that are isolated in distinct ponds, pools or lakes may potentially intermix with populations in adjacent water-bodies during flood events.

Due to the heterogeneity of sources of radionuclides in different areas and ecosystem types within the site, organisms will receive different dose rates depending on their exact location. However the intermixing of populations of organisms will mean that the impact to a population in a highly contaminated area will be diluted due to the emigration of the more highly exposed organisms and immigration of organisms from less contaminated areas or unaffected organisms from outside the site. Thus the distribution of impact upon organisms in the site may be more homogeneous than indicated by the distribution of radionuclides in the various ecosystem objects. Conversely, due to this intermixing of organisms from the site, surrounding areas will contain exposed organisms within their populations; although the immigration of a few impacted individuals will have a nearly negligible impact on an otherwise unexposed population; areas that host impacted organisms that emigrate from the contaminated site will no longer be classifiable as pristine (Kapustka and Landis 2010).

Dose rates calculated on the basis of maximum activity concentrations across the entire assessment area will therefore represent upper exposure levels to individuals that occupy these higher activity areas. Actual effects on plants and animals in the assessment area would therefore be expected to be lower than those reported herein when considered at the level of the population.

Resilience and genetic diversity

Typically, the gene-pool of a population can be expected to contain a range of genotypes with a variety of sensitivities to certain contaminants or stresses. In contaminated areas with sufficiently high exposure, the more sensitive individuals may not reproduce as efficiently as unaffected individuals, leaving the gene-pool enriched with genotypes that confer higher resistance. The individuals with the more resistant genotype may then thrive; thus radiation exposure may result in a reduction in genetic diversity rather than a decrease in population size. This decrease in diversity may make the population more susceptible to other stresses if the loci under selection have multiple functions, or are in linkage with other loci affecting stress tolerance. Studies investigating genetic diversity of organisms existing in contaminated areas (with e.g. chemicals and heavy metals) identified decreased heterozygosity in populations within these areas (Guttman 1994, Bickham et al. 2000); these impacted populations lacked the genotypes of the more sensitive organisms found in neighbouring populations.

Whilst the effect of exposure of populations to radiation in terms of resilience and genetic diversity are acknowledged, the actual effects will depend upon the characteristics of the population and the influence of other stressors in the assessment area. The actual exposure levels leading to effects on genetic diversity are, as yet, unknown; genetic effects have nonetheless been included in the datasets upon which environmental benchmarks have been derived and against which biota dose rates have been evaluated in the current assessment.

The present understanding of the impacts of radiation in multiple stressor scenarios, or upon rarified populations, is thus limited (Vanhoudt et al. 2012), but is the subject of study internationally (e.g. within the Strategy for Allied Radioecology (STAR) network of excellence). Nonetheless, at this time, multi-stressor effects remain an area of uncertainty in environmental assessments.

3 Identification of representative species and approach to incorporating within ERICA

As noted in Section 1.2, it is practically impossible to consider and ensure protection of every individual population of organisms at the site, so generalisations are necessary to allow assessments to focus on a few representative targets characterising the range of species and their habitats present. The challenge is thus to identify a small enough number of targets to make assessments manageable without reducing the information value of the assessment beyond credibility.

The approach to selection of representative species (i.e. site-specific species) within the current assessment, and that undertaken previously (Torudd 2010) is detailed in this section.

3.1 Identification of representative species at the site and their mapping to ERICA reference organisms

As stated above (Section 1.2), the following directions on the evaluation of environmental protection are given in SSM general advice (SSM 2008, Appendix 2):

"*The organisms included in the analysis of environmental impact should be selected on the basis of their importance in the ecosystems, but also in line with their protection value according to other biological, economic, or conservation criteria. Other biological criteria refer (amongst other things) to genetic distinctiveness and isolation (for example, presently known endemic species). Economic criteria refer to the importance of the organisms for establishment of different kinds of livelihood (for instance, hunting and fishing). Conservation criteria refer to possible protection by current legislation or local regulations. Other aspects, such as cultural history, for instance, should also be taken into consideration when identifying such organisms*."

Three criteria for selecting organisms have thus been considered:

- Type 1: Organisms important for the relevant ecosystems. The ecologically important species of freshwater, marine and terrestrial ecosystems were identified using the information compiled in (limnic ecosystems, Andersson 2010; marine ecosystems, Aquilonius 2010; terrestrial ecosystems, Löfgren 2010).
- Type 2: Endangered, endemic, or genetically important species. Such species represent the diversity of natural assemblages; though the limited populations of these species may not provide major ecological functions at the site, they represent a broader range of biological niches and minor ecological roles.
- Type 3: Species of commercial or cultural value (not including domestic/agricultural species). These species were identified from an earlier compilation for the region (Miliander et al. 2004).

Species protected under Swedish law are listed in Endangered Species Act (*swe: Artskyddsförordningen,* SFS 2007:845). Approximately 300 animal and plant species are protected by Swedish law in the whole country and a further c 50 species are protected in one or several regions. All mammals, birds, amphibians and reptiles are also protected according to Hunting Act and the Hunting Ordinance (*swe: Jaktlagen,* SFS 1987:259 and *Jaktförordningen* SFS 1987:905) with the exception of some species for which hunting is legal. The list of species protected by law is static and may therefore not always be relevant for the conditions of a species in a specific area over time. A more up to date list of threatened or particularly vulnerable species, according to the criteria put forward by the International Union for Conservation of Nature and Natural Resources, is the Swedish red-list that is stated and revised each fifth year by the Swedish Species Information Centre by direction of the Swedish Environmental Protection Agency (Gärdenfors 2010). The species on the list are divided into seven categories, of which three have been considered relevant here; 'critically endangered', *sw. akut hotad*, 'endangered', *sw. starkt hotad* or 'vulnerable', *sw. sårbar*. Since the resulting list of species found in the area was limited in the sense that many organism groups were not actively searched for, it was decided to also include red-listed species found in the region (Uppsala County); an extract of the list from the internet site http://www.slu.se/sv/centrumbildningar-och-projekt/artdatabanken/rodlistan was performed in May 2010.

There are no endemic species presently found in the Forsmark area. One species of frog (pool frog, *Rana lessonae*), which in Sweden only lives along the coast in northern Uppland, is present in the area. This species is protected by law and is included in the Swedish red-list.

No species intrinsically exists or persists as an endangered species; indeed, by definition an endangered species is one that is on the verge of becoming non-existent. A population may be 'endangered' as it newly arrives into an ecosystem, or as it fluctuates/declines in response to abiotic, biotic or anthropogenic factors. After a relatively short period (e.g. a few hundred years), populations of endangered species can be expected to either proliferate and stabilise, or disappear; in such time, other species may become endangered. If the factor that causes a decline in the population is removed, most species are expected to recover in approximately five generations (Kattwinkel et al. 2012). As stated above, the goal of this assessment is not to protect the specific species present at the site, including those that are presently endangered, but to protect the environment in general.

For the marine and freshwater environments, all representative species from the search have been included in the assessment, whereas a further selection was performed for terrestrial ecosystems. Since the exposure for radionuclides from the repository in terrestrial areas will be limited to wetland areas, selection of species was focussed on those that may be found in this kind of environment. The resulting list was still long and a finer selection was performed where representative species for distinct ecological functions were identified. As an example, the original list included over 300 species of beetle (Coleoptera), whereas the list presented in this report contains only one species as representative.

3.1.1 Freshwater ecosystems

Freshwater animal and plant species that have been selected for assessment based on the three criteria detailed above are listed in Table 3-1.

Primary producers in freshwater ecosystems in the Forsmark area consist of phytoplankton, microphytobenthos, macroalgae and vascular plants. The phytoplankton species composition varies over the year and no specific species have been listed. Microphytobenthos are small photosynthesising organisms that occupy the bottom of the shallow lakes of the Forsmark area and, together with heterotrophic bacteria, form thick carpets on benthic sediments. Due to the water shallowness, these organisms have an important role as the predominant primary producers in the lake ecosystems (Andersson 2010).

The ERICA tool does not include bacteria as a reference organism and they are typically not included in risk assessments due to their high resistance to ionising radiation (ICRP 2008, Paragraph 29) and their small size below the lower limit of dosimetry for the present methods (Ulanovsky and Pröhl 2006). Nevertheless, microphytobenthos has been included in this safety assessment due to its ecological importance.

Zooplankton has been identified as an ecologically important organism group in freshwater ecosystems, but species composition varies considerably throughout the year and no specific species have therefore been listed. Instead, the ERICA reference zooplankton has been used as a generic representation of the species present over the course of a year.

Table 3-1. Freshwater organisms in Forsmark identified according to three selection criteria (type 1–3, see text for details). The corresponding ERICA reference organism is shown on the right.

Representative species				ERICA Reference Organism
Latin name	**English name**	**Swedish name**	**Type**	
(Several species)	Phytoplankton		1	Phytoplankton
(Several species)	Microphytobenthos		1	"
Potamogeton compressus	Grasswrack pondweed	Bandnate	2	Vascular plant
Tillaea aquatica	Water pygmyweed	Fyrling	2	"
Elatine orthosperma		Nordslamkrypa	2	"
Lythrum portula	Spatulaleaf loosestrife	Rödlånke	2	"
Alisma wahlenbergii	Water-plantain (genus)	Småsvalting	2	"
Cardamine parviflora	Bittercress	Strandbräsma	2	"

Representative species				ERICA Reference Organism
Latin name	**English name**	**Swedish name**	**Type**	
Potamogeton rutilus	Shetland pondweed	Styvnate	2	“
Potamogeton friesii	Flat-stalked pondweed	Uddnate	2	“
Limosella aquatica	Water mudwort	Ävjebrodd	2	“
Persicaria foliosa		Ävjepilört	2	“
Chara sp.	Stonewort (order)	Kransalg	1	“
Nitella confervacea	Least stonewort	Dvärgslinke	2	“
Chara rudis	Rugged stonewort	Spretsträfse	2	“
Nitella gracilis	Slender stonewort	Spädslinke	2	“
Nitellopsis obtusa	Starry stonewort	Stjärnslinke	2	“
Nitella mucronata	Pointed stonewort	Uddslinke	2	“
Nitella capillaries	Slimy-fruited stonewort	Vårslinke	2	“
(Several species)	Zooplankton		1	Zooplankton
Pseudanodonta complanata	Depressed river mussel	Flat dammussla	2	Bivalve mollusc
Unio crassus	Thick shelled river mussel	Tjockskalig målarmussla	2	“
Unio pictorum	Painter’s mussel	Äkta målarmussla	2	“
Anodonta anatina	Duck mussel	Allmän dammussla	1	“
Anisus spirorbis	Ram’s horn snail (family)	Rundläppad skivsnäcka	2	Gastropod
Valvata macrostoma	Large mouthed valve snail	Sumpkamgälsnäcka	2	“
Tanymastix stagnalis	Fairy shrimp (order)	Hällkarsräka	2	Crustacean
Limnadia lenticularis	Clam shrimp	Linsräka	2	“
Lepidurus apus	Tadpole shrimp	Spetsbladfoting	2	“
Pacifastacus leniusculus	Signal crayfish	Signalkräfta	3*	“
Astacus astacus	European crayfish	Flodkräfta	2	“
Bagous binodulus	Weevil (superfamily)		2	Insect larvae
Bagous petro	Weevil (superfamily)		2	“
Donacia brevitarsis	Leaf beetle (family)	Bredfotad rörbock	2	“
Macroplea appendiculata	Leaf beetle (family)		2	“
Sigara hellensii	Water boatman (family)	Bäckbuksimmare	2	“
Hydaticus continentalis	Predaceous diving beetles (family)		2	“
Hydrochus megaphallus			2	“
Cloeon schoenemundi	Small mayfly (family)	Dagsländor (ordning)	2	“
Donacia dentata	Leaf beetle (family)		2	“
Nehalennia speciosa	Pygmy damselfly	Dvärgflickslända	2	“
Stratiomys chamaeleon	Clubbed general	Gulbukig jättevapenfluga	2	“
Oxycera trilineata	Three-lined soldier	Brokig strömvapenfluga	2	“
Chironomidae sp.	Nonbiting midges (family, informal)		1	“
Vimba vimba	Vimba bream	Vimma	2	Benthic fish
Silurus glanis	Sheatfish	Mal	2	“
Gymnocephalus cernuus	Ruffe	Gärs	1	“
Aspius aspius	Asp	Asp	2	Pelagic fish
Lota lota	Burbot	Lake	2	“
Anguilla anguilla	European eel	Europeisk Ål	2	“
Rutilus rutilus	Common roach	Mört	1	“
Tinca tinca	Tench	Sutare	1	“
Perca fluviatilis	European perch	Abborre	1	“
Esox lucius	Northern pike	Gädda	1	“
Rana lessonae	Pool frog	Gölgroda	2	Amphibian
Triturus cristatus	Northern crested newt	Större vattensalamander	2	“
Aythya ferina	Common pochard	Brunand	2	Bird
Alcedo atthis	Common kingfisher	Kungsfiskare	2	“
Podiceps auritus	Horned grebe	Svarthakedopping	2	“
Chlidonias niger	Black tern	Svarttärna	2	“
Lutra lutra	European otter	Utter	2	Mammal

* Not currently present at the site, but species of potential commercial interest deemed likely to exist at the site in the near future (Miliander et al. 2004).

The signal crayfish, *Pacifastacus leniusculus*, is not present in the area, but favourable habitat exists at the site and the species could migrate into the area, or be introduced by humans, in the future. It has therefore been included in the assessment as a representative crustacean. The species, native to North America, is invasive in Europe and potentially ecologically damaging, replacing the native crayfish. Conservation of an invasive species is unnecessary, according to the International Union for Conservation of Nature (IUCN); however signal crayfish has been classified as a species of potential economic value.

3.1.2 Marine ecosystem

Marine animal and plant species that have been selected for assessment, based on the three criteria detailed above, are listed in Table 3-2.

The phytoplankton and zooplankton species composition varies over the year and no specific species have been listed. The ERICA Reference Phytoplankton and Reference Zooplankton have therefore been used as generic representatives for the species occurring throughout the year.

No specific polychaete worm species have been identified as ecologically or economically valuable, or endangered. However, polychaete worms are included in the set of reference organisms and it was considered valuable to include this kind of organism in the assessment, therefore a generalised group of polychaete worm representative species was created.

3.1.3 Terrestrial ecosystem

Terrestrial animal and plant species that have been selected for assessment, based on the three criteria detailed above, are listed in Table 3-3.

Two shrub representative species, which may be economically important in the future, were listed; *Rubus chamaemorus* and *Vaccinium oxycoccus* both grow in wetlands that are the terrestrial systems simulated in this safety assessment. The wetlands in the Forsmark area are too young to be ideal habitats for these species today, but when the habitat matures, and/or if it is ditched, for example to gain areas for agricultural use, the environment will be more suitable. Both species have therefore been included.

The earthworm (*Lumbricus sp.*) was classified as an ecologically important species, although this species does not live in wetlands. When wetlands recede or are ditched more favourable (drier) conditions may allow them to thrive. They have therefore been included as a representative species.

Two ecologically important mushroom species, representing two major functional groups of mushrooms (saprophyte and ectomychorriza), have also been identified in the Forsmark region. While CR values for some elements into these mushroom species have been collected and reported previously (Johanson et al. 2004), no mass or geometry data for either species were collected due to the difficulty associated with measuring such parameters in fungi, i.e. what most people regard as the mushroom is only the fruiting body and a large mass of the individual is present within the soil as mycelium. The sensitivity of mycelium to radiation is not well understood. In order to incorporate mushrooms within the assessment, the mass has been set to the minimum value permissible for this organism type within the ERICA tool (0.17 g) to provide a highly conservative dose rate estimate (see Section 3.2.2). The results should thus only be taken as a tentative estimate.

Table 3-2. Marine organisms in Forsmark identified according to three selection criteria (type 1–3, see text for details). The corresponding ERICA reference organism is shown on the right.

Representative species				ERICA Reference Organism
Latin name	**English name**	**Swedish name**	**Type**	
(Several species)	Phytoplankton		1	Phytoplankton
Stypocaulon scoparium		Taggtofs	2	Macroalgae
Chara horrida	Bristly stonewort	Raggsträfse	2	“
Fucus vesiculosus	Bladderwrack	Blåstång	1	“
Potamogeton compressus	Grasswrack pondweed	Bandnate	2	Vascular plant
Tillaea aquatica	Water pygmyweed	Fyrling	2	“
Elatine orthosperma		Nordslamkrypa	2	“
Alisma wahlenbergii	Water-plantain (genus)	Småsvalting	2	“
Potamogeton friesii	Flat-stalked pondweed	Uddnate	2	“
Limosella aquatica	Water mudwort	Ävjebrodd	2	“
(Several species)	Zooplankton		1	Zooplankton
Macoma balthica	Baltic macoma	Östersjömussla	1	Benthic mollusc
(Several species)	Polychaete worms	Havsborstmaskar	1	Polychaete worm
Idotea balthica		Tånggråsugga	1	Crustacean
Vimba vimba	Vimba bream	Vimma	2	Benthic fish
Zoarces viviparus	Viviparous eelpout	Tånglake	2	“
Lota lota	Burbot	Lake	2	Pelagic fish
Cyclopterus lumpus	Lumpsucker	Sjurygg	2	“
Anguilla anguilla	European eel	Ål	2	“
Clupea harengus	Atlantic herring	Strömming	1, 3	“
Sprattus sprattus	European sprat	Skarpsill	3	“
Perca fluviatilis	European perch	Abborre	1	“
Esox lucius	Northern pike	Gädda	1	“
Salmo salar	Atlantic salmon	Lax	3	“
Salmo trutta	Brown trout	Laxöring	3	“
Sander lucioperca	Zander	Gös	3	“
Coregonus sp.	Whitefish (genus)	Sikfiskar	3	“
Aythya marila	Greater scaup	Bergand	2	Bird
Somateria mollissima	Common eider	Ejder	2	“
Larus argentatus	European herring gull	Gråtrut	2	“
Podiceps auritus	Horned grebe	Svärta	2	“
Cepphus grylle	Black guillemot	Tobisgrissla	2	“
Arenaria interpres	Ruddy turnstone	Roskarl	2	“
Haliaeetus albicilla	White-tailed eagle	Havsörn	2	“
Lutra lutra	European otter	Utter	2	Mammal
Pusa hispida	Ringed seal	Vikare	2	“

Table 3-3. Terrestrial organisms in Forsmark identified according to three selection criteria (type 1–3, see text for details). The corresponding ERICA reference organism is shown on the right.

Representative species				ERICA Reference Organism (RO)
Latin name	**English name**	**Swedish name**	**Type**	
Neckera pumila	Dwarf neckera	Bokfjädermossa	2	Lichen and bryophytes
Nephroma laevigatum	Kidney lichen (genus)	Västlig njurlav	2	“
Hamatocaulis vernicosus	Slender green feather moss	Käppkrokmossa	2	“
Scapania apiculata	Liverwort (genus)	Timmerskapania	2	“
Sphagnum sp.	Peat moss (genus)	Vitmossa	1	“
Bryum knowltonii	Knowlton’s thread-moss	Sjöbryum	2	“
Omphalina philonotis		Myrnavling	1	(No mushroom RO)
Cantharellus lutescens	Yellow foot	Rödgul trumpetsvamp	1	“
Liparis loeselii	Yellow widelip orchid	Gulyxne	2	Grasses and herbs
Carex pulicaris	Flea sedge	Loppstarr	2	“
Carex rostrata	Bottle sedge	Flaskstarr	1	“
Phragmites australis	Common reed	Vass	1	“
Rubus chamaemorus	Cloudberry	Hjortron	3	Shrub
Vaccinium oxycoccus	Cranberry	Tranbär	3	“
Alnus glutinosa	European alder	Al	1	Tree
Betula pendula	Silver birch	Björk	1	“
Pinus sylvestris	Scots pine	Tall	1	“
Picea abies	Norway spruce	Gran	1	“
Vertigo geyeri	Geyer’s whorl snail	Kalkkärrsgrynsnäcka	2	Gastropod
Lumbricus sp.	Earthworm (genus)	Daggmask	1	Soil invertebrate
Nehalennia speciosa	Pygmy damselfly	Dvärgflickslända	2	Flying insect
Euphydryas aurinia	Marsh fritillary	Väddnätfjäril	2	“
Chlaenius sulcicollis		Träsksammetslöpare	2	Detritivorous invertebrate
Chrysochraon dispar	Large gold grasshopper	Guldgräshoppa	2	“
Singa nitidula	Orb web spider (genus)	Älvglansspindel	2	“
Rana lessonae	Pool frog	Gölgroda	2	Amphibian
Bufo bufo	Common toad	Vanlig padda	1	“
Natrix natrix	Grass snake	Snok	1	Reptile
Philomachus pugnax	Ruff	Brushane	2	Bird
Botaurus stellaris	Eurasian bittern	Rördrom	2	“
Porzana porzana	Spotted crake	Småfläckig sumphöna	2	“
Locustella naevia	Common grasshopper warbler	Gräshoppsångare	2	“
Asio flammeus	Short-eared owl	Jorduggla	2	“
				Bird egg
Myotis nattereri	Natterer’s bat	Fransfladdermus	2	Small mammal
Arvicola terrestris	European water vole	Vattensork	1	“
Lynx lynx	Eurasian lynx	Lo	2	Large mammal
Capreolus capreolus	Roe deer	Rådjur	1,3	“
Alces alces	Eurasian elk (U.S.: Moose)	Älg	3	“
Lepus timidus	Mountain hare	Skogshare	3	“
Lepus europaeus	European hare	Fälthare	3	“
Vulpes vulpes	Red fox	Räv	1	“

3.2 Comparison of representative species with reference organisms

The ERICA tool includes bird egg as a reference organism which was not specifically addressed in the list of important Forsmark species. This organism type was included in the current analyses[3].

The marine ERICA reference organisms reptile and sea anemones/true corals are not considered relevant for the ecosystems, due to the unfavourable environmental conditions in Forsmark today or in the future and were therefore excluded from the analysis.

No Reference Mushroom is included within ERICA and thus comparison to the representative species is not possible.

Microphytobenthos (benthic photosynthesising microalgae and cyanobacteria) and freshwater macroalgae are broad 'types' of organisms that are also absent from the ERICA tool. They were nonetheless deemed ecologically important in aquatic ecosystems at the site and were included in the assessment. Thus, freshwater macroalgae has been mapped to the freshwater reference vascular plant, and microphytobenthos has been mapped to freshwater reference phytoplankton. Bacteria is included in the Environment Agency R&D128 dose assessment approach (Copplestone et al. 2001) which assumes that bacteria receive no internal dose due to their very small size (<10 μm) such that radiation from internal sources entirely escapes the cell. Dose rates for bacteria are thus equal to the external absorbed dose in the medium they inhabit (Copplestone et al. 2001). In the present assessment, the microphytobenthos is conservatively calculated with both internal and external exposures.

The site-specific parameters used in the dose rate estimations are size, habitat and residence, and uptake of radionuclides expressed as a concentration ratio (CR). To assess how effectively the reference organisms represent the organisms at the Forsmark site, these parameters are compared and contrasted. Where differences are found, the potential for the under- or over-estimation of impact to the representative species is considered, discussed and addressed where deemed necessary. The mapping of Forsmark species to relevant reference organisms are shown in Tables 5, 6 and 7 for freshwater, marine and terrestrial organisms respectively and are further discussed below.

3.2.1 Ecosystem and habitat use

Since the terrestrial ecosystem that is expected to be contaminated by groundwater discharge in the Forsmark region is dominated by wetlands, some of the site-specific terrestrial organisms also have some interaction with aquatic systems. In contrast to the reference organisms which are determined to be resident wholly on or in the soil, or in the air, these representative species may spend a portion of their time in or on the water or sediment. ERICA reference organisms all have predefined ecosystem occupancy factors (i.e. they are assumed to inhabit freshwater, marine or terrestrial ecosystems), although it is possible to proportion dose rate according to relative occupancy between ecosystems by post-processing the ERICA tool output.

Some organisms may exist in terrestrial environments where un-drained wetland ecosystems are clearly inaccurate (e.g. earthworm, short-eared owl, water-vole, red fox, ringed seal); however use of wetland data has been maintained, giving a conservative result in these cases.

In addition to assuming occupancy in one or other ecosystem, ERICA assumes by default that organisms within an ecosystem inhabit a single habitat; in soil, on soil or in air in terrestrial systems and in sediment, on sediment, in water or on water in aquatic systems. Since many organisms utilise different habitats for breeding and food gathering, a differentiation in habitat preferences gives a more realistic description of the organism exposure scenario. Not taking account of relative occupancy could be seen as a conservative approach if the habitat which gives the highest exposure is chosen (if known). For example, in the terrestrial ecosystem, the highest external exposure is associated with in soil occupancy with those living on top of the same stratum receiving c half of

[3] Whilst bird egg has been included in the assessment, it is noted that this reference organism is currently the subject of discussion with regards to a planned update of the ERICA assessment tool later in 2013. Due to a lack of supporting data on the transfer of radionuclides into bird egg and it being the only non-adult life stage represented by the ERICA reference organisms, bird egg may be removed from the assessment tool.

that exposure as a result of the simple geometrical representation of biota. A similar relationship is expected between in sediment and on sediment or in water versus on water occupancy; however the maximal exposure for organisms inhabiting sediment and water habitats will largely depend upon the partitioning of radionuclides between solid and aqueous phases. Assigning differentiated habitats for a specific organism will therefore lead to either a reduction (if the other considered habitat(s) is less contaminated than that assigned for the reference organism) or an increase of estimated exposure (if the opposite is true).

Habitat occupancy factors for reference organisms and representative species are presented in Table 3-4 for freshwater biota, Table 3-5 for marine biota and Table 3-6 for terrestrial biota and the implications of applying reference organism habitat assumptions to representative species, in terms of potential under- or over-estimation of dose rate, are identified. Further discussion is provided for those representative species that diverge notably from reference organism habitat occupancies.

Microphytobenthos has been mapped to reference phytoplankton which likely mirrors the size of each individual organism of the microalgae component well; the cyanobacteria component of microphytobenthos will be smaller, but it is expected that this would actually decrease dose rate to the organism (see Section 3.2). However, reference phytoplankton is considered to occupy the water column, which may lead to an underestimation of external radiation from sediment for the benthic microphytobenthos. Microphytobenthos mats on the sediment surface can vary in thickness and density – thus some individuals may be further from radionuclides within the sediment, and may experience more shielding from external irradiation from radioactive sources in sediment. However, the upper layers of microphytobenthos will accumulate more particle-borne contaminants that precipitate from the water column.

Table 3-4. Freshwater reference organism habitats and comparison to the habitat uses of relevant representative species. For representative species, potential for underestimation in dose rate through use of default ERICA habitat assumptions for the reference organism is depicted by emboldened text and the symbol <; normal text indicates no difference (=) or overestimation (>) of dose rate.

Reference Organism	Habitat		Representative Species Habitat
Phytoplankton	In water 100%	=	In water 100%
		<	**On sediment 100% (Microphytobenthos)**
Vascular plant	On sediment 100%	=	On sediment 100%
Zooplankton	In water 100%	=	In water 100%
Bivalve mollusc	On sediment 100%	<	**On sediment 50%, in sediment 50% (Multiple species)**
Gastropod	On sediment 100%	=	On sediment 100%
Insect larvae	In sediment 100%	=	In sediment 100% (Chironomidae sp.)
		>	On water 100% (Multiple species)
		>	In water 100% (Multiple species)
Crustacean	On sediment 100%	>	On sediment 100% (Multiple species)
		=	On sediment 100%
		<	**On sediment 75%, in sediment 25% (*Tanymastix stagnalis*)**
Benthic fish	On sediment 100%	>	On sediment 50%, in water 50% (Multiple species)
Pelagic fishAmphibian	In water 100%In water 100%	=	In water 100%
		<	**In water 50%, In soil (terrestrial) 50% (*Rana lessonae*)**
Bird	In water 100%	<	**In water 30%, in soil (terrestrial) 40%, on soil (terrestrial) 30% (*Triturus cristatus*)**
		=	On water 80%, in water 20% (Swimming birds, multiple species)
		<	**In water 20%, in soil (terrestrial) 10%, in air (terrestrial) 70% (*Alcedo atthis*)**
		>	In water 20% , on water 20%, in air (terrestrial) 60% (*Chlidonias niger*)
Mammal	In water 100%	<	**In water 10%, on water 30%, on soil (terrestrial) 60% (*Lutra lutra*)**

Table 3-5. Marine reference organism habitats and comparison to the habitat uses of relevant representative species. For representative species, potential for underestimation in dose rate through use of default ERICA habitat assumptions for the reference organism is depicted by emboldened text and the symbol <; normal text indicates no difference (=) or overestimation (>) of dose rate.

Reference Organism	Habitat		Representative Species Habitat
Phytoplankton	In water 100%	=	In water 100%
Macroalgae	On sediment 100%	=	On sediment 100%
Vascular plant	On sediment 100%	=	On sediment 100%
Zooplankton	In water 100%	=	In water 100%
Benthic mollusc	On sediment 100%	<	**In sediment 100% (*Macoma balthica*)**
Polychaete worm	In sediment 100%	=	In sediment 100%
Crustacean	On sediment 100%	>	On vegetation (≃ in water) 100% (Idothea baltica)
Benthic fish	On sediment 100%	>	On sediment 50%, in water 50% (Multiple species)
Pelagic fish	In water 100%	=	In water 100%
Bird	In water 100%	<	**In water 20%, on water 60%, on soil (terrestrial) 20% (Sea birds, multiple species)**
		<	**On soil (terrestrial) 100% (*Arenaria interpres*)**
		<	**In water 20%, on soil (terrestrial) 30%, in air (terrestrial) 50% (*Haliaeetus albicilla*)**
Mammal	In water 100%	<	**In water 10%, on water 30%, on soil (terrestrial) 60% (*Lutra lutra*)**
		<	**In water 50%, on water 10% , on soil (terrestrial) 40% (*Pusa hispida*)**

Compared to the two representative species of marine macroalgae that are epilithic (grow on rock surfaces; *Stypocaulon scoparium*, *Fucus vesiculosus*), the reference macroalgae (classified as 'on sediment') may give a somewhat conservative calculation. Organisms that inhabit, or spend significant periods of time on rock surfaces may experience decreased exposure to external irradiation, as rocks typically contain lower concentrations of radionuclides than soils or sediments in the same areas. ERICA does not consider rock as a specific habitat; instead it uses on soil/on sediment as a conservative substitute.

Burrowing or partial burying in sediment is a common behaviour amongst benthic animals in aquatic ecosystems. The reference organisms for freshwater bivalve molluscs, and crustaceans, as well as marine benthic molluscs are assumed to spend their time on top of the sediment; however the site-specific organisms demonstrate some burying behaviour and exist in the sediment for some periods. The reference organism will thus underestimate dose rates to these organism types.

The ecologically important species *Sphagnum sp.* grows both on wet soils in the terrestrial ecosystem and in the freshwater ecosystem where it may be submerged, on the sediment surface, or floating on water as a mat. The proportion of the individual organisms present above or below the water surface varies between different sphagnum species and also over the course of a year. The reference lichen and bryophytes is situated on soil, which is an equivalent or a conservative representation of the representative species concerning radionuclides in soil, but is not conservative in relation to radionuclides present in the water. To estimate the range of dose rates to *Sphagnum sp.* the two extremes of habitat have been considered: a) an entirely terrestrial habitat (Terrestrial – on soil; ref: *Sphagnum sp.*), and b) a fully submerged habitat (Freshwater – in water; ref: *Sphagnum sp.* (Subm.)). The CR values for freshwater primary producers are used for the fully submerged *Sphagnum sp.* (Subm.).

Table 3-6. Terrestrial reference organism habitats and comparison to the habitat uses of relevant representative species. For representative species, potential for underestimation in dose rate through use of default ERICA habitat assumptions for the reference organism is depicted by emboldened text and the symbol <; normal text indicates no difference (=) or overestimation (>) of dose rate.

Reference Organism	Habitat		Representative Species Habitat
Lichen and bryophytes	On soil 100%	=	On soil 100%
		>	On trees (≃ in air) 100% (Multiple species)
		>	In water (freshwater) 100% (Sphagnum sp.(Subm.))
Mushroom (No RO mushroom)	*		On soil 100% (Multiple species)
Grasses and herbs	On soil 100%	=	On sediment 100%
Shrub	On soil 100%	=	On sediment 100%
Tree	On soil 100%	=	On sediment 100%
Detritivorous invertebrate	In soil 100%	>	On soil 100% (Multiple species)
Gastropod	On soil 100%	=	On soil 100%
Flying invertebrate	On soil 100%	>	In air 100% (Multiple species)
soil invertebrate	In soil 100%	=	In soil 100%
Amphibian	On soil 100%	<	**In soil 50%, in water (freshwater) 50% (*Rana lessonae*)**
		<	**In soil 40%, on soil 30%, in water (freshwater) 30% (*Bufo bufo*)**
Reptile	On soil 100%	=	On soil 100%
Bird	On soil 100% (above ground, 3 m)	=	On soil 100% (Multiple species)
		>	On trees (≃ in air) 100% (Locustella naevia)
		>	In soil 10%, in air 90% (Asio flammeus)
Bird egg	On soil 100%	=	On soil 100%
Small mammal	In soil 100%	>	In soil 84%, on soil 8% , in water (freshwater) 8% (Arvicola terrestris)
		>	In air 100% (Myotis nattereri)
Large mammal	On soil 100%	=	On soil 100%
		<	**In soil 50%, on soil 50% (*Vulpes vulpes*)**

* No data/not described.

Amphibians at the site are also present both within aquatic and terrestrial environments. According to (Löfgren 2010) the pool frog has 170 active days per year and, as this species is quite tightly constrained to water environments, this part of the year can be assumed to be spent in the water. The frogs hibernate on land and bury themselves in soil, thus the part of the year not spent in water can therefore be assumed to be spent in soil. The salamander and the common toad also hibernate in soil; however during the active part of the year they stay in terrestrial environments in connection to wet areas, and an estimate is that half of the active part of the year is spent in water and the other half on soil. The freshwater reference amphibian spends all its time in water, making it a conservative representation for radionuclides in water but not for radionuclides in soil; the terrestrial reference amphibian is assumed to exist entirely on the soil, which will underestimate dose rates from radionuclides in water. For the amphibian representative species that live for part of the year in terrestrial and freshwater habitats, it was calculated that they would ingest material from the habitat they are occupying. Thus, both internal and external sources from each habitat were considered in the assessment.

The ERICA tool does not consider subterranean components of plants and mushrooms (e.g. roots, mycelium) and the representative species similarly do not include such data; both map the organisms as entirely on soil. As such, a significant proportion of the biomass of such organisms that exists in soil, and where higher dose rates can be expected, is ignored. The dose rates for plant reference organisms may therefore be underestimated.

Of all the considered organism groups, habitat and residence varies most for birds, both in the diversity of habitats used and the period of residence at the site. Most bird species considered are migratory birds that utilise different sites for breeding and overwintering. Some species leave the country whereas others travel shorter distances. The migratory habits and home-range of birds (and other NHB) are discussed in more detail in Section 3.2.3). The habitat use of aquatic birds largely falls into three distinct categories: that of the swimming birds (*Aythya farina, Podiceps auritus*), shore birds that

mostly stay on land, and fishing birds that catch fish from a flying position (*Alcedo atthis*). *Chlidonias niger* demonstrates an intermediate behaviour between the swimming and fishing birds. These behaviours contrast to the reference bird in marine and freshwater environments, which follows the highly conservative assumption that it spends 100% of its time in water. The terrestrial bird, *Locustella naevia* spends all it's time in trees (i.e. in air), and *Asio flammeus* lives in burrows (in soil, 10%) when not flying (in air, 90%), the remaining representative species are deemed to spend all their time on soil. In the case of the terrestrial reference bird, occupancy is classified as on soil and 3 m above ground; dose rate estimates using the reference bird will thus underestimate the dose rates to the terrestrial representative species living entirely on soil.

In agreement with the reference organism, most terrestrial large mammals spend their life on the ground (on soil), with the exception of the red fox which lives in burrows in the ground. It has been assumed that the red fox spends half of its time in the soil and the other half on the soil. The terrestrial reference large mammal may underestimate the dose rate to the red fox due to the increased (by approximately a factor of two) external irradiation experienced while underground. One representative species of terrestrial mammals (European water vole) has been assumed to share its lifetime between the terrestrial and freshwater ecosystems. Most of the time (83%) it is assumed to be present within soil.

The marine reference mammal spends all its time in water whereas the two representative species are assumed to live more differentiated lives. It is assumed that the European otter spends 60% of its life on soil (from the terrestrial ecosystem), 10% in water and 30% on water, whereas the ringed seal is assumed to spend 40% of the time on soil, 10% on water and 50% in water. It may seem odd to place a seal in the simulated terrestrial area since the parameter values used to parameterise this environment are chosen for wetlands since those are supposed to be the most contaminated terrestrial ecosystems in the modelled landscape. Seals do not live in wetlands but occupy rocks when out of the water; however the ERICA assessment tool lacks the facility to include rock habitat in an assessment. Therefore, in order to retain a consistent approach, and to remain conservative it has been assumed that during the time spent in terrestrial areas the ringed seal will be exposed to radionuclides in the wetland peat whereas a more realistic scenario had been to assume no exposure during this time since rocks are not supposed to accumulate radionuclides to the same concentrations as peat.

In this assessment it is assumed that marine and freshwater bird and mammal representative species forage solely within the aquatic environment, but may spend some time on land and/or in the air. External exposures from the various habitats are calculated in proportion to the representative species estimated occupancy in that habitat, however internal exposure is assumed to come wholly from sources from the aquatic environment.

3.2.2 Organism size

Geometry data for representative species are limited, with some types of organisms represented by the measurement for a single individual. In some cases, where no data were available, the geometry from the reference organism was used, making further comparison irrelevant. Of the data available, the reference organism differed in size from the average of the corresponding representative species by as much as 15,000 times, with 14 reference organisms differing by greater than a factor of 10. For half of the organism types (where data was sufficient), the reference organism was not within the range of sizes demonstrated by the representative species (see Appendix B).

In the previous assessment (Torudd 2010) using a limited range of radionuclides, dose rates were compared against organism size. The dose rates for external exposure to high-energy β and γ decrease with increasing size due to self-shielding, whereas dose rates from internal irradiation from high-energy β and γ increase with size of the organism, albeit marginally. Dose rates from internal α and low-energy β are unaffected by organism size. Thus, a smaller organism will typically experience higher dose rates than a larger organism. The highest dose rates calculated in the previous assessment (Torudd 2010) were for freshwater phytoplankton, the smallest organism group. As shown in the earlier study (Torudd 2010), organism size over 1 g (~1 cm^3) has little effect on the calculated internal or external dose rates. This is consistent with findings from EMRAS II (Vives i Batlle et al. 2004, 2007, 2011), which states that geometry selection is important for small-sized organisms such as fish eggs (dimensions in the order of millimetres) whereas it is less important for larger organisms (ellipsoidal dimensions in the order of a few centimetres or more), especially for radiations which have

close to 100% energy absorption. However, it can be expected that with decreases of size at very small scales (perhaps 10 μm^3 or less; smaller than any organism in the present assessment) the internal dose rate will decrease, as the range of gamma and high-energy beta radiation from internal sources will be greater than the diameter of the cell.

In cases where representative species are larger than the relevant reference organism, the dose rates from external radiation may be lower than calculated; use of the reference organism in the assessment will therefore provide a somewhat conservative result. For example, while the freshwater crustacean representative species is approximately 15,000 times larger than the reference organism freshwater crustacean, the sizes involved are of the scale where little impact on dose rate will occur (greater than g or cm^3), so whilst the dose rate estimated using the reference organism is conservative, it should make only a minor difference overall in terms of risk evaluation. However, there may be some concern where a representative species is both smaller than the corresponding reference organism and smaller than centimetre scale, as this may lead to an underestimate of dose rate when using the reference organism values. The site-specific freshwater and marine vascular plants, marine macroalgae, and freshwater gastropod are all smaller than their respective reference organisms and are smaller than centimetre scale. The dose rates calculated in the ERICA tool for these organisms, using the reference organism geometries, may therefore underestimate dose rate.

The very small geometries for the site-specific aquatic plants were due to the simplified measuring criteria used - measuring only the stem/stipe, and thus greatly underestimating the size of the organism, by ignoring branched structures. Thus the difference in the dimensions of the reference organisms and the actual dimensions of the site-specific vascular plants/macroalgae will be less than that indicated in this report. The geometry of the reference organism plants does not accurately reflect the large, branched structures of certain plant species.

ERICA plant reference organisms do not include the roots and the geometries will therefore underestimate the overall size of these organisms. For larger representative species plants, incorporation of root structures is likely outside the size allowances for in-soil occupancy within the ERICA tool.

Both marine site-specific benthic fish species are rounder than the reference benthic fish (flatfish) and the representative species will therefore have comparably less direct contact with the sediment surface. The representative species benthic fish species may therefore receive lower external dose rates from sediment-associated radionuclides. Furthermore, as noted in Ulanovsky and Pröhl (2006), the more an ellipsoid deviates from a spherical shape, the higher its surface area to volume ratio, resulting in greater dose rates from external sources. The representative benthic fish species will therefore have a reduced external exposure as a result of their more spherical shape from that of the reference benthic fish. Conversely, the freshwater salamander has a more elongate form than the reference amphibian (frog); the more an ellipsoid deviates from a spherical shape, the higher its surface area (Ulanovsky and Pröhl 2006) and thus it will be more affected by external irradiation.

The terrestrial representative gastropod species is much smaller than the corresponding reference organism: estimated weight differs by c 1,000 times from that specified for the reference gastropod. The size is in the range where it may affect the dose rate.

3.2.3 Home-range

In most ecosystems there are species that migrate to different habitats or regions during their life cycle that only will be exposed to external radiation during the part of their expected life time spent within a biosphere object. Internal radiation from sources ingested from the site will continue to provide an exposure to the organism, even away from the site, but these sources will decrease as they are excreted from the body; the rate at which this occurs will be dependent on the element's specific biological half-life in that organism. Thus the size of the home-range is inversely correlated to the dose rate to the organism. Any deviation from 100% residence at the site can only mean a lower dose rate than calculated in the present assessment.

Birds exhibit the broadest diversity of home-ranges, as well as the largest home-range of any organism type. It is reasonable to assume that breeding takes place in the contaminated area, at the site, whereas the other part of the year (approximately half of the year) is spent outside of the contaminated area, thus out of reach for exposure from the considered radionuclides. One exception to this is the white-tailed eagle which is assumed to stay in the contaminated area during the whole year.

Some important pelagic fish species show significant migratory patterns. For example large migrations of sexually mature fish including both perch (*Perca fluviatilis*) and pike (*Esox lucius*) were found from the Baltic Sea to the lake Norra Bassängen in Forsmark in the spring (Loreth 2005). The small and sometimes dry streams of the Forsmark area cannot sustain a stationary fish population. Instead, the streams may function as feeding areas and/or channels for migration of fish during times of the year when there is enough water. In the coastal basins it is mainly the littoral and coastal fish communities that potentially are most exposed to radionuclides. Such species are often using this area as a spawning and nursery area and e.g. the most abundant pelagic species, the Baltic herring, has migratory patterns between pelagic open-water and littoral habitats. Migratory patterns or movements of Baltic Sea fish species between these habitats occur both on a micro and macro scale and cover annual, seasonal and diurnal patterns (Aro 1989). The Baltic Sea salmon also has a diversified migration pattern where natural spawning occurs in rivers mainly in Gulf of Bothnia. The migratory patterns may be divided into three different categories, post-smolt, feeding and spawning migration. Similarly, the pelagic species Baltic Sea trout and the Baltic Sea sprat have migratory patterns. The European eel, *Anguilla anguilla* demonstrates the reverse behaviour, living in freshwater rivers, and migrating to the sea to spawn. In the northern Baltic Sea the littoral fish community is dominated by freshwater species. The river-spawning whitefish (*Coregonus lavaretus*) disperse along the coast after the spawning; similarly perch and pike-perch seem to leave the spawning area for deeper waters during the winter. On the other hand the pike, which spawns in shallow bays and inlets, seems more stationary and the home-range is usually a couple of square kilometres (Aro 1989). Consequently, a majority of fish pelagic species, both freshwater and marine species, seem to have some migratory behaviour with implication for the interpretation of estimated dose rates to fish.

3.2.4 Concentration ratios

Empirical parameter values assessed through site specific measurements reflect the integrated effects of many environmental and ecological processes between soil, water and biota. These constants are usually greatly dependent on the specific environment in which they are determined, and it is commonly argued that they are not applicable outside the assessed environment (US EPA 1999, IAEA 2010). This implies that literature data usually have limited value other than for screening purposes and that site-specific data should be used when available. Hence site-specific data are generally prioritised over literature data in the parameterisation of CR. The rationale for this principle is that literature data usually are a compilation of data from disparate sources and studies, where the environmental context of the data is not always available. Thus, literature data are often highly variable, which is unfavourable in the assessment context, whereas site-specific data usually have been sampled to represent the specific modelled conditions.

In this assessment a strict distinction between CR for ERICA reference organisms and the representative species were used since the CR values included in the ERICA tool were used for reference organism whereas CR based on site-specific data, from Tröjbom et al. (2014) were used for representative species when available. For radionuclides lacking in the ERICA database other literature data were used (Appendix B) and site-specific data were never applied for reference organisms.

Site-specific data

The main approach in Tröjbom et al. (2014) is that available site-specific data are utilised as much as possible. The best estimates (BE) of the element-specific parameters represent the current Forsmark site estimated by geometric means (GM) of measurements exclusively from the present-day Forsmark site. The deterministic simulations performed in our assessment are based on these best estimates. Data from the Laxemar-Simpevarp area (situated approximately 460 km south of Forsmark) are used when data from Forsmark are not available (see Tröjbom et al. 2014 for reasoning of this choice). In cases when data from both Forsmark and Laxemar-Simpevarp is missing literature data has been utilised instead.

The number of samples for specific species is often low and in order to gain parameter values based on a reasonable amount of data, site-specific data has been pooled in relevant ways (further described in Tröjbom et al. 2014). The organism types included in the site dataset is shown in Table 3-7.

Table 3-7. Organism types included in the site database (samples from Forsmark and Laxemar-Simpevarp).

Marine	Freshwater	Terrestrial
Phytoplankton	Microphytobenthos	Mosses
Microphytobenthos	Macroalgae	Field layer
Macroalgae	Vascular plants	Shrub layer
Vascular plants	Filter feeders	Tree
Crustaceans	Fish	Rodents
Molluscs		Large herbivores
Filter feeders		Carnivores
Zooplankton		Crops
Fish		Mushrooms

The site samples have been analysed for many elements but since the concentrations of many of the dose contributing radionuclides are far below detection limits in natural ecosystems at the site today, CR values for these radionuclides have to be estimated from other elements if site data is to be utilised. The first option when data for a specific element is missing was therefore to use site-specific data for a relevant element analogue (EA) as discussed in Tröjbom et al. (2014). Site-specific data for another (relevant) organism was used as parameter analogue (PA) as a second choice, assuming the element behaves similarly in both organisms in the given environmental context. The use of parameter analogues is associated with increasing amounts of uncertainties (IAEA 2010). This analogue type is commonly used also e.g. in the ERICA database and one of the first to formulate this approach was Copplestone et al. (2003). See Tröjbom et al. (2014) for descriptions and discussions about the utilised analogues.

When site-specific data could not be used for representative species literature data has been utilised. Three literature sources have been utilised (the database of ERICA, the Wildlife database (ICRP 2011) and IAEA 2010). Data from ICRP (2011) have often been prioritised before ERICA since it is a more recent update of data, but the number of samples presented in the two sources as well as the representation of the presented values (the relevance of included species) has also been considered in the choice. IAEA (2010) has been considered less relevant for non-human biota, since it focus on parameters for use in dose estimates to humans, but has been used in some cases.

As mentioned in Section 2.2.2 the CR used for C-14 is a ratio between concentrations in biota and in atmosphere. No site-specific data have been utilised for estimating C-14 CR values in this safety assessment, instead the values in the ERICA database have been used also for representative species.

Further consideration is given to the CR data applied in respect of the results of the central corrosion base case (Section 4).

4 Potential for impact on non-human biota from the central corrosion base case

4.1 General results

The estimated dose rates to non-human biota in the base case of the central corrosion case are presented in Figures 5 to 7 for freshwater, terrestrial and marine biota, respectively. Tabulated results are presented in Appendix C. All dose rates calculated for reference organisms and representative species were a factor of 100 times or more lower than the ERICA screening dose rate (10 μGy h^{-1}) and are significantly below the most limiting of the ICRP DCRL's (4 μGy h^{-1}). There is no ICRP DCRL available for either phytoplankton or zooplankton and direct comparison is therefore not possible. The only ICRP RAPs for which more cautious DCRL's are proposed, as compared with the ERICA screening value, are for mammals (deer and rat), bird and pine tree for which the lower DCRL of 4 μGyh^{-1} is applied. Phytoplankton and zooplankton are acknowledged to be less radiosensitive than the likes of mammals and pine tree and use of the ERICA screening value for dose rate evaluation is therefore considered to be conservative.

Highest exposure is seen in freshwater and terrestrial ecosystems whereas the highest dose rates in marine ecosystems are almost two orders of magnitude lower. This is expected due to the lower radionuclide concentration in marine areas. The general pattern seen is that small organisms receive larger dose rates and also that organisms residing in sediment or soil receive higher exposure than organisms living on sediment/soil or in or on water. Detailed discussions about the importance of these two characteristics (size and habitat/ecosystem) as well as of CR on estimated dose is presented in the sections below.

4.2 Freshwater ecosystems

In freshwater ecosystems, highest exposure occurs for reference phytoplankton (4.7×10^{-2} μGyh^{-1}) followed by microphytobenthos (representative species), insect larvae (reference organism), vascular plants (representative species) and zooplankton (representative species) (see Figure 4-1). The lowest dose rates in limnic ecosystems are seen for representative species of pelagic fish (northern pike; doses c 3 orders lower of magnitude lower than the highest dose in this ecosystem). External exposure dominates for benthic fish, microphytobenthos and some representative species of crustaceans and insect larvae and is of importance also for molluscs, gastropods and some representative species of amphibians and birds. The dominating radionuclides are Ra-226, Ni-59 and Nb-94 and for phytoplankton also Np-237. Internal exposure is dominating for the rest of the organisms and Np-237 is a dominating contributor together with Pu-242, Ra-226 and Po-210.

Comparing dose rates for the reference organisms with the highest/lowest value of the corresponding representative species (Figure 4-1) shows that the largest differences (c 7 times) are seen for insect larvae and pelagic fish (reference organism higher exposure) and zooplankton (representative species higher dose rate). For insect larvae the difference is due to differences in habitat; the representative species are living on water, in water or on sediment which reduces the external exposure from radionuclides within the sediment and the largest difference is when comparing the reference insect larvae (sediment dwelling) with representative species living on water. Comparing the dose rate for the reference insect larvae with that of the representative species living within sediments (*Chironomide* sp.) the internal exposure is c 6 times higher which is due to a higher CR value used for the dose contributing radionuclide Np-237 (c 6 times higher).

The dose rate for pelagic fish is dominated by internal exposure and the difference between reference organisms and representative species (c 6 times) results from differences in CR values, particularly Np (site data c 60 times lower), see Appendix B for a comparison of CR data and Appendix C for total dose rates per radionuclide. The dose rate to zooplankton is also dominated by internal exposure and the largest difference in dose rate between representative species and reference organisms is due to a larger CR value for Np (site data 70 times higher).

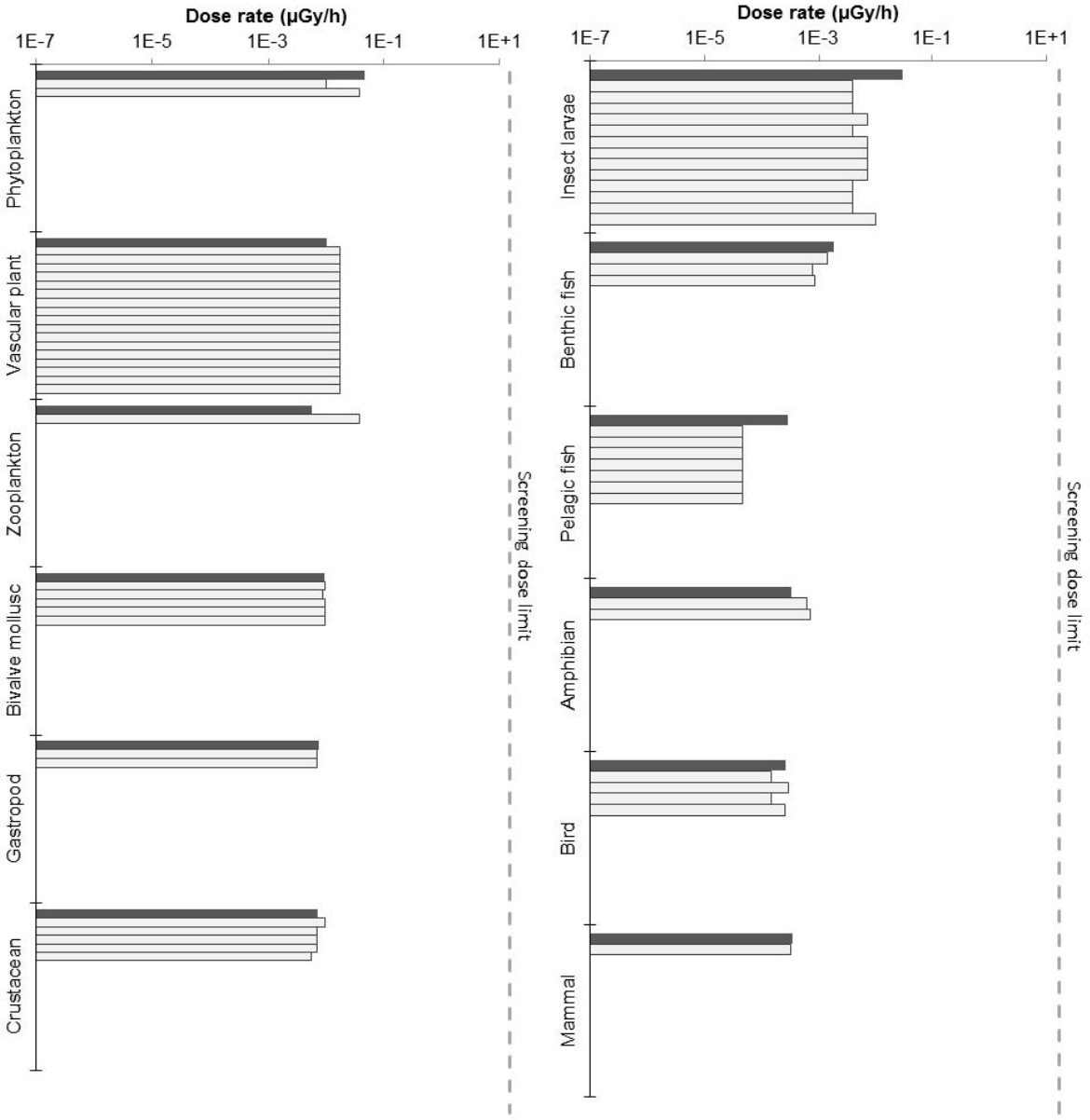

Figure 4-1. *Total dose rate to reference organisms (black bars) and its corresponding representative species (white bars) in the freshwater ecosystem simulated in the base case of the central corrosion case (see Appendix C for tabulated results).*

Minor differences (a factor of two) are also seen for phytoplankton and benthic fish. For phytoplankton, small differences in CR values (a CR value of 5 times higher is used for Np in reference organisms) result in a lower dose rate for the representative phytoplankton species. This is counteracted in microphytobenthos by the occupancy being on the sediment surface such that higher external exposure occurs relative to the reference phytoplankton which occupies the water column, Ra-226 and Nb-94 being the key contributory radionuclides. For benthic fish, differences in dose rates between the reference organism and representative species are due to differences in habitat occupancy; the reference benthic fish is situated on the sediment surface at all times, whereas the representative species spend half of the time on sediment and the other half in water, thus decreasing external exposure. The differences in CR values described for pelagic fish are also valid for benthic fish since the same CR values have been used for both benthic and pelagic species.

Vascular plant representative species all received slightly higher dose rates relative to the corresponding reference organism (c 70%), due to higher CR of Pu (10 times; literature data). Size differences between the reference organism and representative species did not result in differences in dose rate.

The very small size of the gastropod representative species, relative to the corresponding reference organism led to slightly increased dose rates, but this was entirely offset by a decrease in dose rate due to lower CR values in the representative species (20 times for Ni).

A single crustacean representative species (fairy shrimp – *Tanymastix stagnalis*) was calculated to receive an increased dose rate compared to the reference organism and the other crustacean representative species. This difference relates to the residence of fairy shrimp in sediment (Table 3-4) leading to an increased exposure from sediment nuclides, in particular Ra-226, Ni-59 and Nb-94. All other crustacean representative species and the reference organism reside on the sediment surface and therefore receive a lower external dose rate.

Amphibian representative species received a higher dose rate than the corresponding reference organism (c 2 times) due to their presence for part of the year in the terrestrial environment, where they received higher exposures from radionuclides in soil. The other representative amphibian species (Northern crested newt) shows only a marginal difference in dose rate compared to the reference amphibian (2 times). Northern crested newt is assumed to spend time in, as well as on soil (53 and 23%, respectively), when not in water. This gives a marginally higher dose rate compared to the freshwater reference amphibian and a marginally lower dose rate compared to the terrestrial reference amphibian (10%).

Differences in dose rate amongst the bird reference species were due to the semi-terrestrial habitat of the common kingfisher and the black tern which led to increased exposure from terrestrial sources. Compared to the dose rate of the freshwater reference bird the deviations are small (10–20%). Also the small difference observed for European otter (c 10%) compared to the reference mammal is due to deviations in habitat utilisation.

The small difference in dose rates observed for bivalve molluscs is due to differences in habitat utilisation (reference organism on sediment whereas some representative species live partly within sediment). The lower CR value used for Ni in representative species (20 times) also contributes to the difference observed.

4.3 Terrestrial ecosystems

The most exposed organism types in terrestrial ecosystems are lichen and bryophytes, with the representative species peat moss being the most exposed (dose rate 1.8×10^{-2} μGyh^{-1}). Dose rates for peat moss are around one order of magnitude larger than the next most exposed terrestrial organism type (earthworm – 1.8×10^{-3} μGyh^{-1}; Figure 4-2). The lowest dose rates (a further order of magnitude lower) were calculated for representative species of trees, shrubs, grasses and herbs, and mushrooms. External exposure dominates for vegetation (except lichen and bryophytes) and mushrooms and is of importance also for some mammals, amphibians and soil invertebrates. Nb-94 is the dominating radionuclide to external dose rate followed by Ra-226 and Ni-59. Internal exposure dominates for the rest of the organisms and the most important contributor is Ra-226, with the exception of bryophytes for which Po-210 is the dominating radionuclide. Ni-59 and Np-237 also contribute to internal exposure.

Comparing dose rates for the reference organisms with the highest/lowest value of corresponding representative species (Figure 4-2), the largest differences (4–5 times higher values for reference organisms) are seen for vegetation (trees, shrubs and grasses and herbs). For the reference organism grasses and herbs, exposure is dominated by internal exposure whereas external exposure dominates for corresponding representative species, see Appendix C. The higher internal exposure is due to higher CR values for the dominating radionuclides (c 150 times higher for Po, 6 times higher for Ra and 70 times higher for Np). The same pattern is also seen for shrubs and trees for which the same CR values have been used for representative species. The values used for different reference organisms are generally higher than those for representative species.

Since there is no reference mushroom included in ERICA, the estimated dose rates to representative species of mushrooms cannot be compared, but the dose rates are of the same order of magnitude as those for terrestrial vegetation (with the exception of lichen and bryophytes). This is expected since the same CR values are used for several elements where site-specific data for mushrooms are missing and both organism types are considered to be situated on soil in this assessment.

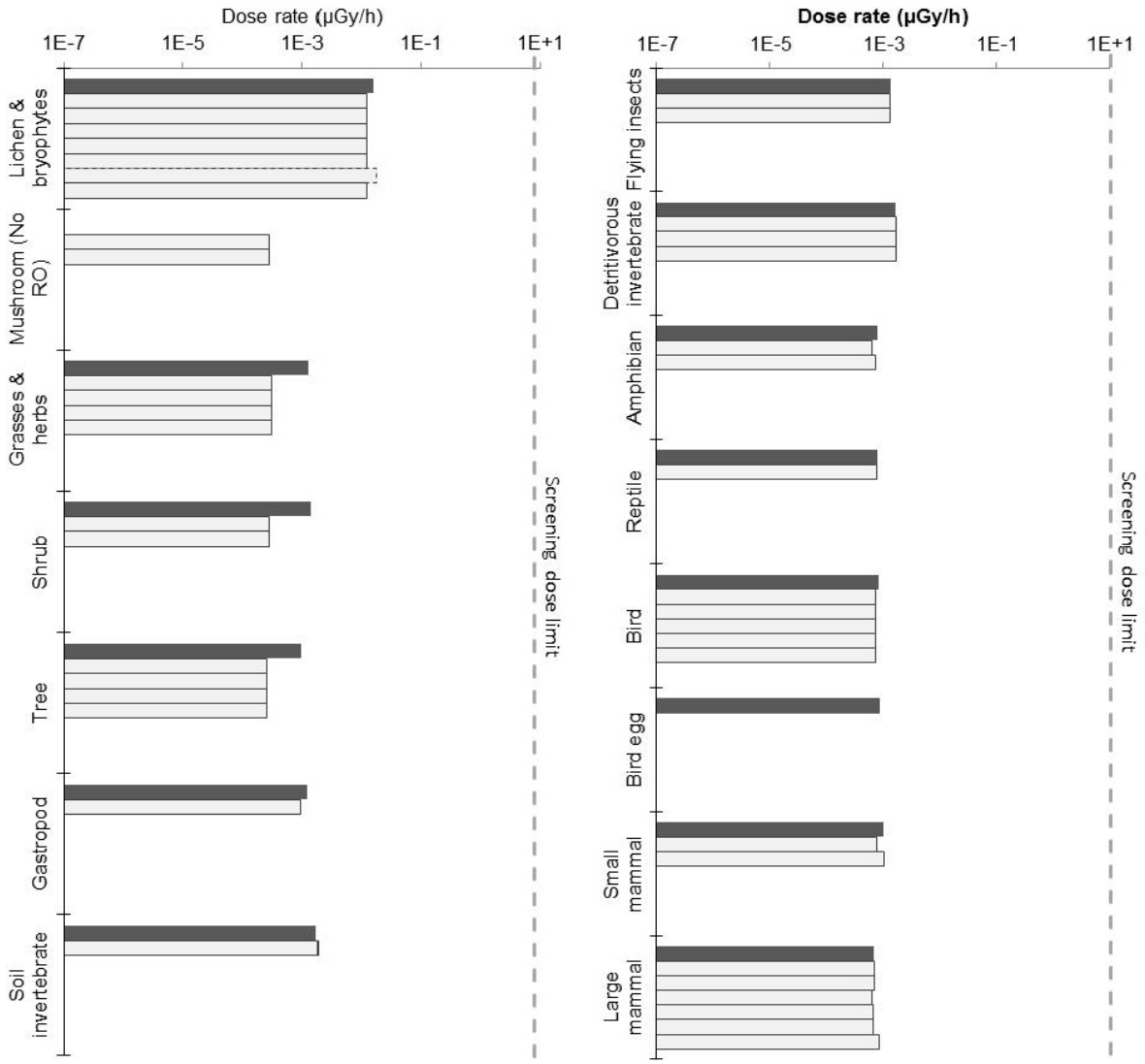

Figure 4-2. *Total dose rate to reference organisms (black bars) and its corresponding representative species (white bars) in the terrestrial ecosystem simulated in the base case of the central corrosion case (see Appendix C for tabulated results).*

The *Sphagnum* sp. that is submerged in the freshwater environment had a higher dose rate than both the terrestrial (on soil) *Sphagnum* sp. and the reference organism lichen and bryophytes. The use of freshwater CR for submerged *Sphagnum* sp. resulted in higher internal exposure from Np-237, Pu-239 and Pu-242, resulting in a larger total dose rate, despite a marked decrease in exposure from Po-210 relative to the terrestrial organisms. The other representative bryophyte species (for which terrestrial CR's have been used) had somewhat lower dose rates (c 30%) than the corresponding reference organism; the difference is due to lower CR values for Ra and Np (7 times).

The dose rate for red fox was higher than the reference large mammal and the other mammalian representative species due to its burrowing behaviour (in soil) that slightly increases its exposure to Nb-94 and Ra-226. Differences in habitat utilisation (see Table 3-6) is also the explanation for the somewhat lower dose rates for representative small mammals compared to the corresponding reference organism which is assumed to live entirely within soil. The dose rate for European elk (representative large mammal) deviates only c 20% from that of the corresponding reference organism. This difference is due to deviations in CR values (600 and 300 times lower values used for Np and Nb, respectively).

Contrary to the results for their freshwater counterparts, terrestrial representative species of amphibians and birds show somewhat lower dose rates (20 and 10%, respectively) compared to their corresponding reference organisms. This is due to a decreased external exposure from radionuclides in terrestrial soil when residence in freshwater habitat is taken into account. The conclusion drawn is that the dose rates calculated for terrestrial reference amphibians and birds in this assessment are more conservative estimates than corresponding freshwater organisms.

The small difference in dose rates observed for the reference organism and representative species of gastropods (25%) is due to a small difference in CR used for the dose contributing radionuclide Np-237 (c 3 times lower for representative species).

4.4 Marine ecosystem

The highest dose rates in the marine ecosystems are for representative species of zooplankton (7.9×10^{-4} μGyh^{-1}) followed by representative species of birds and mammals and reference phytoplankton (Figure 4-3). The lowest dose rates are seen for representative species of pelagic fish. As in the freshwater ecosystem these dose rates are c 3 orders of magnitude lower than the highest dose rate in the same ecosystem. Internal exposure dominates for phytoplankton, zooplankton and pelagic fish, the reference mammal and the representative species of crustaceans. The dose dominating radionuclides are Ra-226 and Po-210. Ni-59, Np-237 and Pu-239 are also of importance. Tc-99 is the dominating dose contributor in marine vegetation. External and internal dose are of the same importance in marine vegetation whereas external exposure more or less dominates the exposure for the rest of the organisms. The external exposure is dominated by Ra-226 and Nb-94 followed by Ni-59. Np-237 also contributes.

Comparing dose rates for the reference organisms with the highest/lowest value of corresponding representative species (Figure 4-3), the largest differences are seen for zooplankton and mammals (65 and c 40 times higher values for representative species). Deviations are also seen for birds (25 times higher exposure for representative species) and pelagic fish (10 times lower exposure for representative species). The exposure of zooplankton is dominated by internal exposure and there is a large difference in the CR value used for Np (the value used for representative species is almost 2,000 times higher than that used for reference organisms and is based on site-specific data for the element analogue Nd. The value is high compared to those used in ERICA for the proposed analogues Am, Cm and Eu (Tröjbom et al. 2014). Site-specific data are from a study by Kumblad and Bradshaw (2008) and there may have been problems with analytic precision (Tröjbom and Nordén 2010). In cases where total dose rates for marine ecosystems approaches the screening value this value should be further investigated. Also for pelagic fish, the differences can be explained by differences in CR values for the radionuclides contributing most to internal dose rate (170 times higher CR for Pu and 15 times higher for Ra in reference organisms).

For marine mammals and birds deviations are due to differences in habitat. For example, all representative bird species demonstrated higher dose rate compared to the corresponding reference organism due to their mixed habitat use – spending some time in the terrestrial ecosystem. The representative species with high residence times in the terrestrial ecosystem, the ruddy turnstone and the white-tailed eagle, had the highest dose rates (c 25 times higher than for the marine reference bird). The higher dose rates in representative bird species are due to increased external exposures from Nb-94 and Ra-226 as compared with the reference organism. The high dose rates to the Ringed seal (c 20 times higher than for the marine reference mammal) are disputable due to the conservatively assigned partial occupancy on soil (see Section 3.2.1). To provide a more accurate dose rate assessment for the seal, an estimate of the dose rate associated with on rock occupancy would be needed. It can be expected that dose rates would decrease to levels similar to, or lower, than that of the reference mammal. However, while the dose rate calculated remains at levels lower than other organisms within the assessment, and several orders of magnitude lower than the screening dose rate, such information is of relatively low priority.

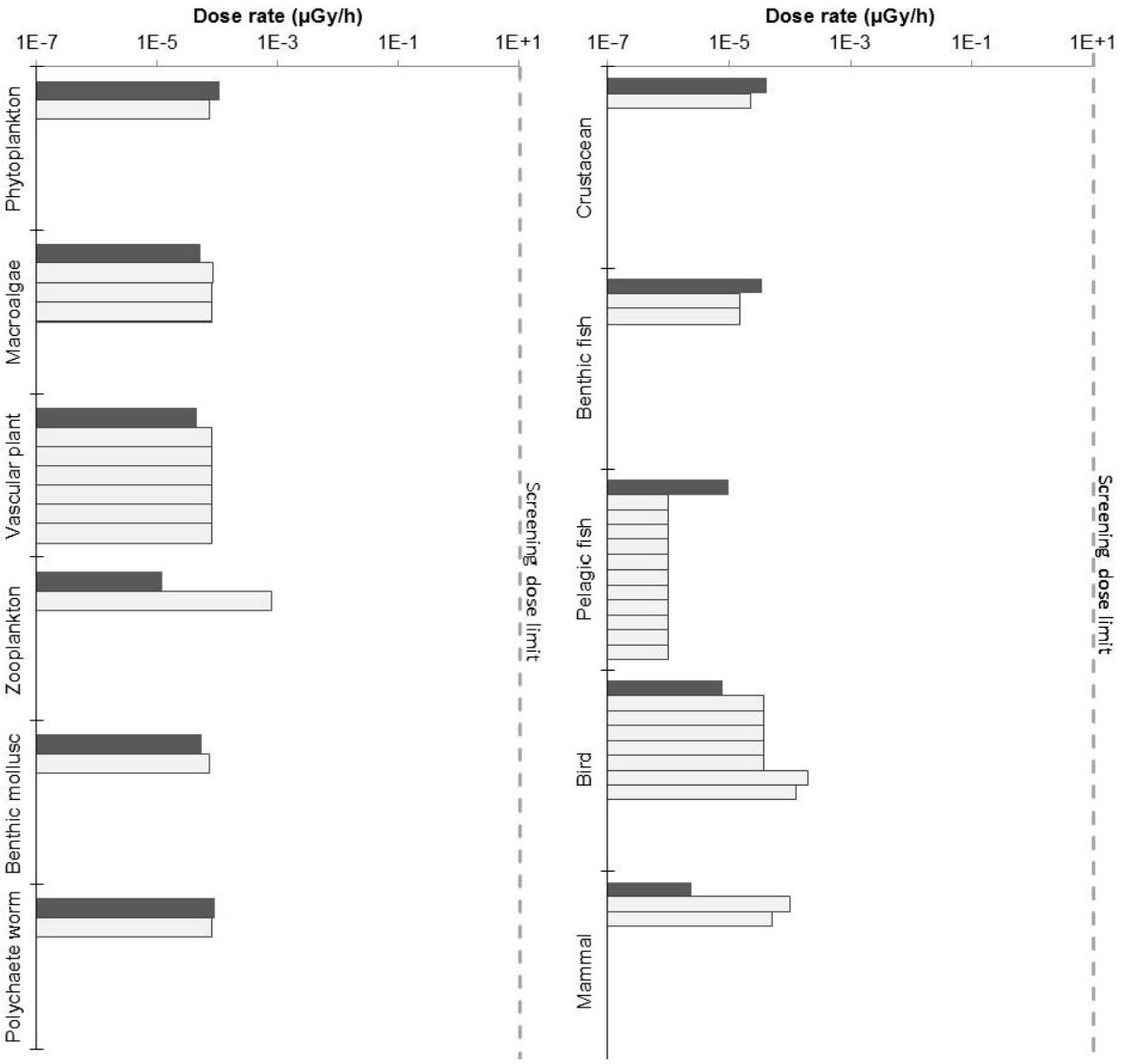

Figure 4-3. *Total dose rate to reference organisms (black bars) and its corresponding reference species (white bars) in the marine ecosystem simulated in the base case of the central corrosion case (see Appendix C for tabulated results). The hashed bar represents the submerged (freshwater) form of Sphagnum sp.*

Compared to their respective reference organisms, the dose rates of the macroalgae and vascular plant representative organisms were higher. This is due to their smaller size and the higher CR value of Ra (10 times). Higher dose rates were also observed for the representative species of benthic molluscs as compared with the corresponding reference organism. In this instance the variation is associated with differences in habitat occupancy with the representative species occupying the sediment whereas the reference organism inhabits the sediment surface leading to decreased external exposure from Ra-226 and Nb-94.

The representative crustacean species is c 1,000 times smaller than corresponding reference organism which suggests that exposure should be higher but this is counteracted by the differences in habitat occupancy (the reference organism lives on sediment whereas the representative species lives in water) and the exposure is therefore somewhat lower (c 50%).

Sizes also differ for benthic fish (representative species c 200 times smaller than the reference organism) but organism size is in the interval where size has a low influence on the dose rate (see Section 3.2.2). The somewhat higher dose rate for the reference organism (c 60%) is partly due to differences in habit utilisation (reference organisms always on sediment, representative species 50% in water). The internal exposure is also higher for the reference organism as a consequence of the higher CR values applied for the dose contributing radionuclides Ra-226 and Ni-59 (c 15 and 10 times, respectively).

4.5 Summary and recommendations

4.5.1 Concentration ratios

The aim of using CR values based on site-specific data is to include more realism in this parameter, which often has quite a large impact on the estimated dose rates for non-human biota (Smith et al. 2010). The influence of concentration ratios as the main source of uncertainty in assessments of dose to non-human biota has been discussed and quantified within the inter-comparisons carried out within the context of the IAEA EMRAS programme (Beresford et al. 2008a, b). This stresses the importance of using properties of the site for these highly aggregated transfer factors that are supposed to reflect everything that is important with respect to biological uptake and accumulation. The values within the ERICA database are used for screening purposes and should be conservative estimates used when site information is not available. It is interesting to see that site-specific data to some extent agree with the ERICA values, but some major differences have been high-lighted above. Details of the values used for representative species can be found in Tröjbom et al. (2014).

For the terrestrial ecosystem, site-specific data are used for all of the five dominating radionuclides. The corresponding figures for freshwater and marine ecosystems are three and two respectively. As discussed above, the single largest difference in estimated dose rates between reference organisms and representative species (c 65 times) was due to differences in CR (marine zooplankton). In many other cases the deviations in CR did have some effect on the estimated dose rate, but to a smaller extent.

4.5.2 Habitat and ecosystem

In the present assessment, one of the variables influencing dose rate most, between representative species and their corresponding reference organisms, was habitat. In general, those organisms that had an increased interaction with sediment or soil had higher dose rates. Aquatic representative species that had a partial residence in the terrestrial ecosystem had larger exposures than those that remained entirely in their aquatic ecosystem, due to the higher concentration of radionuclides in the terrestrial environment. Conversely, terrestrial representative species that existed partially in an aquatic ecosystem (in or on water) received lower dose rates than wholly terrestrial organisms.

With sediments having overall higher radionuclide concentrations than water in freshwater and marine ecosystems, it is considered appropriate that, in future assessments where reference organisms may be applied to represent site organisms, the occupancy of reference organisms should be maximised in relation to the sediment, giving maximal external dose rates while maintaining the same internal dose rates (which is calculated by the CR of radionuclides from the water) in situations where sediments have a higher radionuclide concentration than water. This would serve to maximise conservatism in the assessment and reduce likelihood of dose rates to any site organisms being underestimated. The present assessment also highlights the importance of ecological considerations concerning mixed residence in various ecosystem types of certain organisms. In particular, dose rates to aquatic amphibians, birds and mammals may be significantly underestimated by considering only their ‘primary’ habitat.

4.5.3 Size

It is clear that the impact of size (mass and/or geometry) on dose rate is not linear, with size differences of several orders of magnitude varying dose rates by only a small fraction and the present assessment demonstrates that the impact of size on dose rate is minimal compared to the impact of habitat or CR. For example, the freshwater gastropod representative species had slightly lower dose rates than that of the reference gastropod (size difference c 200 times). Lower CR values of the representative species decreased the dose rate and negated the increase in dose rate that occurs as a result of the smaller geometry and mass. If representative species are assessed using reference organism CR values, such that size is the only variable, then total dose rate increases to approximately 8.4×10^{-3} μGy h^{-1} – a difference from the reference organism of ~12%. While this change will not raise dose rates sufficiently to approach the screening dose rate, in agreement with the assertions of the previous assessment (Torudd 2010), it indicates that, for organisms under 1 g/1 cm^3, the impact of differences in size on total dose rate is not insignificant.

Aquatic vascular plants and macroalgae representative species were also identified as smaller than their corresponding reference organisms and were also smaller than 1 g or 1 cm^3 scales. Dose rates to the representative species marine algae and marine vascular plants (which were as much as 125 and 63 times smaller than their corresponding reference organisms) were affected by their smaller size, with dose rates ranging from 9% to 30% higher than the reference organism. Whilst size variation was also noted for freshwater vascular plant representative species the difference was of a lower scale (around 5 times smaller than the reference organism). Dose rate was therefore only marginally higher than that or the reference organism (around 2%). For the European crayfish which is ~15,000 times larger than the reference organism crustacean and exists at a scale of hundreds of grams, the dose rate for the representative species is ~20% lower than the reference organism.

4.5.4 Conclusion and recommendations

The dose rates calculated in the central corrosion base case are, without exception, significantly lower than the screening dose rate of 10 μGyh^{-1}, indicating that no significant effects at population are predicted and no deeper investigation is necessary. These doses are also somewhat conservative in terms of the spatial and temporal scales of assessment. The highest activity concentrations for each radionuclide, irrespective of the location of occurrence or the time at which peak concentrations occur, have been selected as inputs to the assessment (see discussion above). Exposure to representative species is therefore expected to be lower than the results presented herein.

Overall, the reference organisms reflected the representative species from the Forsmark site acceptably well. Where radionuclide releases are moderately low, we can conclude that the use of the reference organisms provides a reasonable assessment; however, where releases may be higher, and dose rates calculated in the ERICA reference organisms approach the screening limit, this report makes the following recommendations for the inclusion of certain site-data, to more accurately assess potential risk to non-human biota.

The largest difference in dose rate observed between representative species and reference organisms was due to differences in CR values (for marine zooplankton, see above) but generally the largest differences are due to assumptions concerning species habitat and ecosystem occupancy. Organisms inhabiting soil and sediment were calculated to receive greater dose rates than those on the soil surface or within the water column. Therefore, to minimise underestimation of dose rates to biota under release scenarios similar to those of the present assessment, habitat occupancies should be weighted toward sediment and soil occupancy. Relative occupancy between different ecosystems should also be incorporated into assessments to not only provide a more ecologically realistic representation of species habits, but also to prevent dose rate underestimation that may occur for some organisms if they are assumed to reside at all times in a single ecosystem (with a lower concentration of radionuclides).

The influence of concentration ratios as the main source of uncertainty in assessments of dose to non-human biota (see Section 4.5.1) stresses the importance of using properties of the site for these parameters, whenever available.

Differences in dose rate as a result of variation in size between representative species and reference organisms were negligible when compared against the influence of CR and habitat on calculated dose rates. The greatest influence of size is associated with species of very small mass. Use of reference organisms in such instances may lead to a slight underestimation in dose (up to 30%) where representative species are substantially smaller (such as marine algae and vascular plants).

Since the dose rates of the representative mushroom species are of the same order of magnitude as those for terrestrial vegetation, and as the validity of this can be questioned since the presence of underground mycelia are not included and the exposure estimate is limited to the fruit bodies, we do not stress mushrooms to be included in a safety assessment until knowledge about the size, radiosensitivity and radionuclide accumulation properties of mushroom mycelia has increased.

5 Dose rates to reference organisms following a pulse-release

The focus of the central corrosion pulse-release case is on the exposure of reference organisms as points of reference against which potential impacts may be evaluated. The assessment of this case was performed in parallel with those of the central corrosion base case (Chapter 4) and the periglacial case (Chapter 6). As representative species for the Forsmark area were included in the base case to evaluate the suitability of using the ERICA reference organisms for assessment of the relative risk to non-human biota at the site it was considered appropriate to use only reference organisms (applied in their default settings, i.e. habitat occupancies and CR data have not been revised) as a first try in the pulse release case and if the estimated dose rates were close to the ERICA screening value, important characteristics of representative species from the Forsmark area could be added. As seen below, the dose rates were all several orders of magnitude below the screening value and therefore only the results for the reference organisms have been included in this report.

Results of the central corrosion pulse-release case are presented in Figures 5-1–5-3 for freshwater, marine and terrestrial reference organisms, respectively. Tabulated results are presented in Appendix D. As described in Section 2.3.2 three distinct landscape phases were simulated; submerged where the assessment area is submerged below the Baltic Sea and no terrestrial ecosystems are therefore present; mixed where there is a mix of terrestrial, freshwater (lakes) and marine areas; and land where the landscape is primarily terrestrial and freshwater objects consist primarily of streams rather than lakes and marine environments are absent.

Results indicate that all reference organism dose rates are well below the ERICA screening value (10 μGy h^{-1}). The maximum dose rates for the three time steps are very similar with highest maximum dose rate in mixed and land phases (6.5×10^{-3} μGy h^{-1}) and c 4 times lower maximum dose rate in the submerged phase. Compared to the maximum dose rate in the central corrosion case base case, the maximum for the pulse-release case is c one order of magnitude lower.

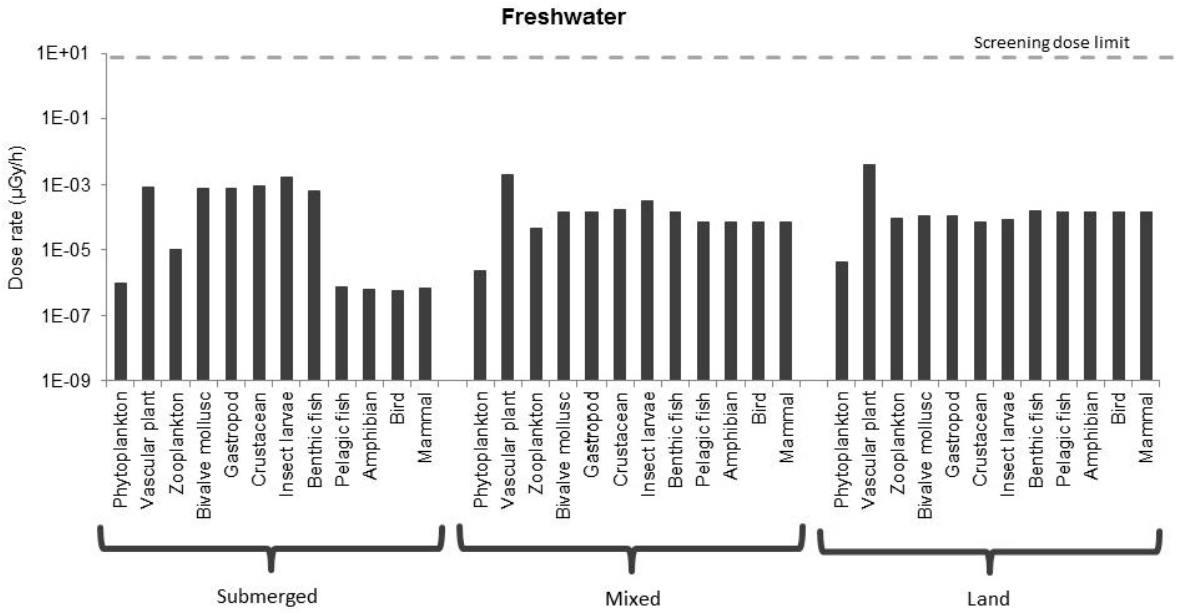

Figure 5-1. *Maximum dose rates to freshwater reference organisms in the pulse-release case of the central corrosion case during the submerged, mixed and land phases.*

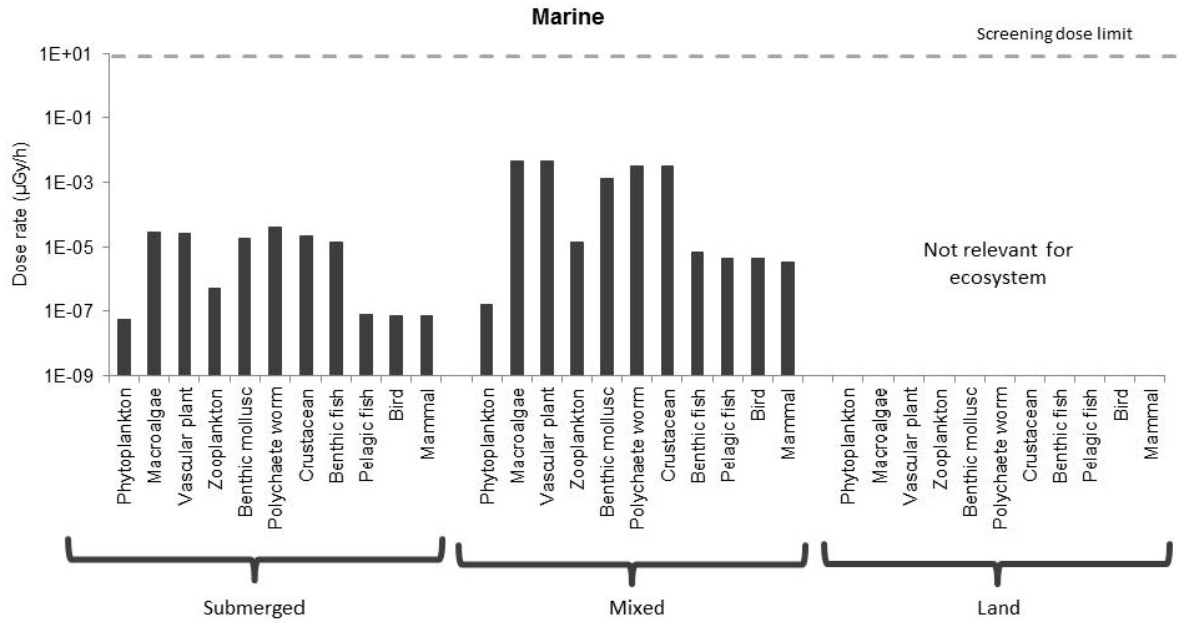

Figure 5-2. *Maximum dose rates to marine reference organisms in the pulse-release case of the central corrosion case during the submerged, mixed and land phases.*

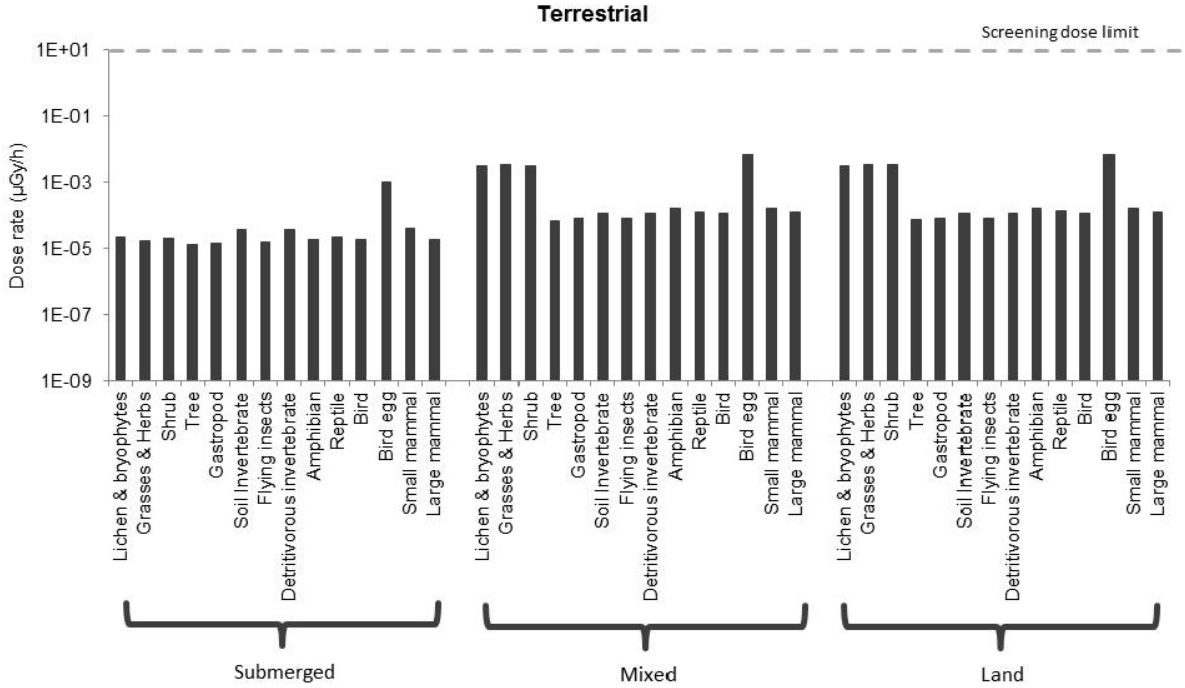

Figure 5-3. *Maximum dose rates to terrestrial reference organisms in the pulse-release case of the central corrosion case during the submerged, mixed and land phases.*

5.1 Submerged phase

For the submerged phase the maximum dose rate is received by freshwater insect larvae (1.8×10^{-3} µGy h^{-1}) followed by terrestrial bird egg (9.7×10^{-4} µGy h^{-1}) and then freshwater crustaceans, vascular plants, gastropods, molluscs and benthic fish. The highest dose rates are seen for organisms living in or on sediment whereas pelagic species receive dose rates c three orders of magnitude lower. For the freshwater ecosystem the external dose rate is more important than internal for the benthic species whereas the contribution of internal and external exposure is similar for benthic marine species (see Appendix D). In both ecosystems, internal exposure dominates for pelagic species.

In freshwater ecosystems, Sn-126 is an important contributor (<10%) to dose for all organism types. For benthic organisms, Nb-94 is also of importance, whereas I-129 and Cs-135 are important contributors for larger pelagic species. For zooplankton, dose is received from Ni-59, I-129, Se-79 and Sn-126 where Sn-126 is the dominating radionuclide for phytoplankton.

In marine ecosystems, Tc-99 is one of the dominating radionuclides for benthic organisms with additional contributions from Nb-94 and Sn-126. For larger pelagic species Se-79 is the dominating radionuclide, followed by Tc-99. As in freshwater ecosystems the exposure of phytoplankton is dominated by Sn-126 and that for zooplankton by I-129 and Sn-126.

In terrestrial ecosystems, external exposure dominates for all organisms except bird egg, lichen and bryophytes and large mammals. For bird egg the total dose rate is totally dominated by I-129 whereas Cs-135 and Se-79 dominate the dose rate of lichen and bryophytes, followed by I-129 and Sn-126. For the rest of the organisms Nb-94 is the dominating radionuclide. Sn-126 is of importance for most organisms whereas Nb-94, Cs-135 and I-129 are of importance for large mammals.

5.2 Mixed phase

In the mixed phase, the maximum dose rates are of the same magnitude for all three ecosystems. The highest dose rate is for bird egg in the terrestrial ecosystem (6.5×10^{-3} μGy h^{-1}) and dose rates of similar magnitude are also seen for lichen and bryophytes, grasses and herbs and shrubs. In the freshwater ecosystems the highest dose rate is received by vascular plants whereas other organisms receive dose rates of at least one order of magnitude lower. In marine ecosystems, similar dose rates are predicted for vascular plants, macroalgae, worms, crustaceans and benthic molluscs.

In the terrestrial ecosystem, external exposure is comparable for all organism types whereas the internal exposure is of important for those with highest total dose rate (bird egg, lichen and bryophytes, grasses and herbs and shrubs). Tc-99 is the dominating radionuclide for all organisms with Nb-94 and Cl-36 also being of importance for some reference organisms.

In the marine ecosystem, the internal exposure dominates the dose rate for all organisms with the exception of phytoplankton and benthic fish (for the latter, internal and external exposure are of the same magnitude). Tc-99 is the key contributory radionuclide. In freshwater ecosystems, internal exposure again generally dominates, but is of similar magnitude to external exposure for benthic organisms and also for phytoplankton. Tc-99 is the dominating radionuclide for all organisms, and for benthic organisms I-129, Sn-126 and Nb-94 are also important. The radionuclides Sn-126 and Cl-36 are also important for phytoplankton and zooplankton, respectively.

5.3 Land phase

The results for the land phase are similar to those of the mixed phase with the exception that marine ecosystems are not present in the area. The relative importance of I-129 and Sn-126 for benthic organisms in the freshwater ecosystem is diminished and that of Tc-99 has increased for all organisms.

5.4 Time aspects

The general pattern is that dose rates from release during the submerged phase are lower than for the other phases. In the pulse-release scenario all radionuclides enters the biosphere system during the first year of canister failure and, during the remainder of the simulation period, are distributed throughout the environment at rates corresponding to their mobility in the different ecosystems and environmental media. Mobile radionuclides released during the submerged phase are expected to yield lower dose rates in all environments because of a higher rate of dilution and loss during this phase. Following an early release (submerged phase), maximum activity concentrations are reached in different environmental media for Cl and Tc in the first year of the simulation, indicating large mobility (Kd values used for the lower/upper regolith layers are $4\times10^{-4}/1\times10^{-2}$ and $6\times10^{-}5/3\times10^{-3}$ m^3 (kg dw)$^{-1}$ for Cl and Tc respectively). For highly sorbing radionuclides it can be expected that the highest dose rates occur

in freshwater and terrestrial ecosystems from a release during the submerged phase. This is because of the longer time required for radionuclides to pass through lower sediment/soil layer before reaching the upper regolith layers and surface water where exposure occurs. In terrestrial ecosystems, maximum concentrations of Cl, I and Se are reached early in the simulation period (Kd values used for the lower/upper regolith layers are $7\times10^{-3}/7\times10^{-1}$ and $2\times10^{-2}/5\times10^{-1}$ m^3 (kg dw)$^{-1}$ for I and Se respectively), whereas the maximum activity concentrations of Cs and Nb are reached much later (Kd values used for the lower/upper regolith layers are 36/26 and 2/40 m^3 (kg dw)$^{-1}$ for Cs and Nb, respectively). The pattern in freshwater ecosystems is more heterogeneous.

For freshwater ecosystems, dose rates for phytoplankton, vascular plants, and zooplankton are lowest for an early release (submerged phase), intermediate in the mixed phase and greatest during the later land phase. Dose rates for pelagic fish, amphibians, birds and mammals were substantially greater (by several factors orders of magnitude) following a release during the mixed or land phases as opposed to one occurring during the submerged phase. The substantially larger dose rates in the mixed and land phases are due to an increase in Tc-99 concentrations as compared with the submerged phase. A lower dose rate was determined for all benthic biota for a release occurring during the mixed phase compared with one to the submerged phase, with even lower dose rates being evident for a release during the land phase, with the exception of benthic fish for which a slightly higher dose rate was observed. These lower dose rates are consistent with reduced concentrations of Cs-135, Nb-94, Ni-59 and Sn-126 in the sediment in mixed and land phases compared with the submerged phase. Reduced exposure to these radionuclides results in reduced external exposure to benthic organisms; internal dose rates are slightly higher in the mixed and land phase releases as compared with the submerged phase release. Pelagic organisms experience higher internal dose rates (with the exception of phytoplankton) and slightly higher external dose rates with increasing phase of release (submerged < mixed < land).

In comparing dose rate results for marine biota during the different release phases, higher dose rates are observed for all organisms for a release occurring in the mixed phase as compared with the submerged phase, with the exception of benthic fish for which a lower dose rate is observed. The substantially larger dose rates in the mixed phase are due to increased Tc-99 concentrations as compared with the submerged phase. Overall, benthic organisms have higher dose rates than pelagic organisms due to sediment exposure; sediments contain higher concentrations of all radionuclides compared with marine water. Internal dose rates to all organisms (except phytoplankton) are larger following a release to the mixed phase as compared with the submerged phase. External dose rates are greater for pelagic organisms, but are largely the same for benthic organisms when the release occurs in the mixed phase.

Terrestrial ecosystems are not present in the simulated area during the submerged phase, but radionuclides released during this phase may remain within the area and give rise to exposure in terrestrial ecosystems later when these have emerged. Terrestrial organism dose rates are lower after a release during the submerged period and nearly identical after a release during the mixed and land phases. For an early release (submerged phase) external exposure generally dominates whereas internal exposure is dominating during the two later phases. The largest differences in dose rates for releases during submerged and mixed/land phases are for grasses and herbs and shrubs (c 200 times). As expected, the less mobile radionuclides Sn-126, Nb-94 and Cs-135 dominated dose rates after an early release (submerged phase) whereas the very mobile radionuclide Tc-99 dominates dose rates after releases in mixed or land phases.

5.5 Discussion

Results of the central corrosion pulse-release case indicate that all reference organism dose rates are well below the ERICA screening dose rate (10 μGy h^{-1}), by a minimum of three orders of magnitude. The maximum dose rates for the three release phases are very similar; the highest dose rates occur for releases during the mixed and land phases and are c 4 times higher than the maximum dose rate calculated for the submerged phase release.

The large difference between calculated dose rates for reference organisms and the ERICA effects screening value indicate that no impact on populations would occur following a pulse release consistent with a canister failure.

6 Climate conditions significantly different from the present

Variation in climate conditions has the potential to affect the exposure of biota. Differences may arise in relation to the species present under different climate conditions, but also variation in the behaviour of those species that remain present and the behaviour of radionuclides. In relation to climate variation, and acknowledging that it is not possible to make predictions of the future, SSM general advice (SSM 2008) states that for *"... predicted climates where representation using today's biosphere conditions would be obviously unreasonable, e.g. colder climates with permafrost, it is sufficient to make a general analysis based on currently available knowledge of relevant ecosystems*."

The central corrosion base case focussed on a temperate climate similar to the conditions at the present day. However, over the assessment timeframe, climate cycling will occur with climate ranging from temperate conditions similar to those currently present at the site through to periglacial conditions where permafrost is present and, ultimately, to glacial conditions where the site is covered by an extensive ice sheet (SKB 2010b). Ice sheet coverage will limit, considerably, the ability of species to remain in the assessment area. Warmer climate conditions may also occur under a global-warming variant.

In line with SSM's advice, a general analysis has been performed, taking into account current knowledge of, for example, Greenland as an analogue ecosystem that is being extensively studied within SKB's Greenland Analogue Surface Project (GRASP). GRASP aims to identify the differences between long-term change in a cold and a temperate climate, and to examine how the hydrological characteristics and ecosystem properties vary.

The analysis of how climate may affect biota dose rates is based on the types of plant and animal that may be present at the site under warmer-climate and periglacial conditions and discussion around the possible changes in their habits that may influence exposure. Dose rates for reference organisms, consistent with the types of plant and animal species that may be present under different climate conditions are also presented where variation in dose rates from the central corrosion base case is deemed likely.

6.1 Influence of warmer climate conditions on biota dose rates

In cases where the climate is warmer than today by a few degrees Celsius, e.g. due to a global warming scenario, it can be expected that some of the species found at the site, on the limit of their tolerance, would disappear and be replaced by other organisms, better adapted to such conditions. The number of site species that would correspond to each organism type may differ, as the abundances of certain types of organism may vary. However, it can be expected that all organism types presently relevant to the site, characterised by the ERICA reference organisms, would be represented by other species at the site. Similar to present conditions, no ERICA marine reptile or sea anemone or true corals (colony or polyp) are expected at this site, even under warmer conditions than today, due to the prevalent environmental conditions of the site. No significant differences in size, habitat or CR values are predicted for species under warmer conditions from those of the present site. In addition, precipitation rates under a warmer climate could be considerably higher (c 20%) than at present (SKB 2011).

The change in climate, particularly the increase in annual precipitation, would influence the hydrological cycle and may give rise to increased run-off and may affect various processes in the biosphere such as evapotranspiration, primary productivity and rate of peat formation etc. These various factors were considered with respect to the transport and accumulation of radionuclides under a warmer climate regime previously (SKB 2011, Section 10.6.2). It was concluded that the transport and accumulation of radionuclides in the biosphere during warmer temperate periods of the global warming variant climate scenario are likely to be similar to those in the initial temperate period of the reference evolution (SKB 2011). Biota dose rates would therefore be expected to be similar to those reported in the central corrosion base case.

6.2 Influence of periglacial climate conditions on biota dose rates

Cold climate and permafrost may influence a number of processes in the biosphere that affect transport, accumulation and exposure. For example permafrost will prevent discharge of deep groundwater to most of the lakes and wetlands in the area (Bosson et al. 2010). The reduced precipitation and longer periods of frozen conditions result in reduced vertical transport on a yearly basis. The terrestrial vegetation community will change with climate. Primary production will be hampered in a harsher climate, resulting in a reduced rate of in-growth of wetlands into lakes (Brydsten and Strömgren 2010) and a reduced productivity of natural food stuffs and agricultural crops in the area (Löfgren 2010). Thus, to evaluate the effects on exposure of non-human biota during fluctuating periods of temperate and permafrost conditions, an alternative simulation was carried out to that of the central corrosion base case.

As noted in the report of the biosphere radionuclide model (SKB 2010a), under permafrost conditions, modelled parameters describing hydrological fluxes are generally lower than in temperate conditions, although the runoff is larger (Bosson et al. 2010). The terrestrial ecosystem parameters are also, in general, lower during permafrost conditions. Values for these parameters were derived from other parts of Sweden, or from other sites, e.g. Greenland (Löfgren 2010).

6.2.1 Activity concentrations in environmental media

The same potential recipients for radionuclide discharge are identified regardless of the identified climate conditions i.e. marine, freshwater and wetland ecosystems (Lindborg 2010). However, under periglacial conditions, the number of biosphere objects were discharge of deep groundwater containing radionuclides may be restricted due to permafrost and is only possible when a talik (an area of unfrozen ground within a permafrost region) is present beneath a lake. Therefore, a biosphere object having a potential through-talik (object 114) was simulated. More details of this simulation are found in Avila et al. (2010). Groundwater discharge will also occur in marine areas but due to the longer distance for the groundwater to reach this area and a larger dilution in this larger water body the exposure to biota are assumed to be lower than for those of a through-talik lake and a release to a marine ecosystem has therefore not been further investigated here.

The simulation was performed for 39 radionuclides. Comparison has been performed for the radionuclide concentrations of the lake in object 114 under periglacial and temperate conditions (Table 6-1). The maximum concentrations are higher in the periglacial lake than in the same object under temperate conditions (as simulated under the central corrosion base case). It should be noted, however, that the activity concentrations for object 114 are lower at all times, irrespective of climate, than the activity concentrations used in the central corrosion base case. This is due to the selection of maximum activity concentrations in environmental media in the base case across all objects as opposed to focussing on a single biosphere object.

6.2.2 Variation in species under periglacial conditions

The distribution range of species are always to a certain degree restricted by variables related to climate and consequently species and ecosystems will move along climate gradients as climate variables change. It is therefore expected that, under periglacial conditions, the species composition of the sites will change. As the environment becomes colder, the geographical range of organisms will move south; some temperate species at the site presently, may be limited by their cold-tolerance and will become rarer or absent at the site; whereas polar (Arctic) species may extend into the area, with present polar species becoming more abundant and new species entering the site.

Table 6-1. Maximum environmental concentrations in object 114 for the permafrost simulation (periglacial lake) and comparison of these concentrations with those of the base case (temperate lake).

Radionuclide	Sediment		Water	
	Max. conc. (periglacial lake) (Bq kg^{-1} dw)	Comparison periglacial lake/ temperate lake	Max conc. (periglacial lake) (Bq l^{-1})	Comparison periglacial lake/ temperate lake
Ag-108m	8.9E–29	4.5	3.8E–35	5.4
Am-241	2.7E–12	2.6	6.4E–18	0.5
Am-243	3.9E–09	3.1	6.5E–15	0.9
C-14	8.5E–09	0.7	2.1E–12	0.7
Ca-41	0.0E+00	–	0.0E+00	–
Cl-36	6.8E–06	0.9	7.3E–10	0.9
Cm-244	0.0E+00	–	0.0E+00	–
Cm-245	1.5E–10	2.7	8.0E–17	0.7
Cm-246	4.6E–29	2.7	2.5E–35	1.0
Cs-135	7.7E–05	5.1	2.1E–11	0.7
Cs-137	1.0E–33	4.0	7.4E–40	6.8
Ho-166m	9.2E–30	3.8	8.2E–36	1.9
I-129	6.2E–04	1.4	5.0E–09	1.1
Nb-94	3.3E–03	3.1	1.1E–09	1.6
Ni-59	1.1E+01	6.6	1.2E–05	0.6
Ni-63	8.8E–31	3.3	2.2E–36	0.6
Np-237	9.6E–03	1.7	8.3E–08	1.5
Pa-231	4.2E–05	4.6	8.8E–11	0.7
Pb-210	2.0E–09	4.0	5.4E–16	10.8
Pd-107	1.0E–04	1.5	3.1E–09	1.4
Po-210	0.0E+00	–	0.0E+00	–
Pu-239	7.4E–04	2.0	4.5E–09	0.9
Pu-240	1.9E–08	1.4	1.1E–13	0.8
Pu-242	9.5E–04	3.3	5.3E–09	0.8
Ra-226	9.4E–04	2.4	3.2E–09	0.8
Se-79	4.3E–04	1.4	5.4E–09	1.3
Sm-151	6.2E–32	4.2	5.3E–38	1.3
Sn-126	1.9E–04	9.9	8.5E–11	0.5
Sr-90	5.8E–32	2.9	3.4E–36	0.5
Tc-99	1.7E–03	0.9	2.2E–07	1.0
Th-229	9.4E–06	1.1	1.6E–12	2.6
Th-230	3.6E–08	1.6	3.6E–15	0.5
Th-232	2.6E–28	1.9	2.0E–35	0.4
U-233	7.6E–04	11.3	3.6E–10	0.4
U-234	1.2E–06	11.8	5.5E–13	0.4
U-235	7.5E–08	12.5	3.2E–14	0.3
U-236	8.3E–07	12.5	3.5E–13	0.3
U-238	5.6E–07	12.5	2.4E–13	0.3
Zr-93	2.4E–01	2.9	1.2E–07	0.4

A relevant approach to describe the potential species present under different climate conditions is to use information from regions/biomes that today have such a prevailing climate that correspond to the appropriate climate conditions assessed. Organisms present in representative habitats under periglacial conditions were identified during SKB's assessment for the Greenland Analogue Surface Project (GRASP). This assessment identified species which corresponded to most reference organisms, with the following exceptions.

- In the freshwater environment, no amphibian and mammal species were identified at the Greenland site, these reference organisms are thus expected to be absent at the Forsmark site under periglacial conditions.
- In terrestrial ecosystems at the Greenland site no species representing the reference tree, gastropod, amphibian, and reptile were identified. These reference organism types are therefore likely to be absent at the Forsmark site under periglacial conditions.
- No site-investigation of marine ecosystems were performed at the Greenland site, but a brief literature search identified species present in the Greenland marine ecosystem that correspond to all of the reference organisms.

All organism types that would become absent under periglacial conditions received dose rates, in the assessment of the central corrosion base case (Section 4), that were significantly lower than that of the highest exposed organism type. The organism types that receive the highest dose rates (freshwater: phytoplankton; marine: phytoplankton; terrestrial: lichen and bryophytes) are expected to remain present in each ecosystem at the site under periglacial conditions, therefore no change in risk is expected due to changes in the assemblages of organisms types found.

Variation in biota habits and exposure potential

The species-specific parameters used in the dose rate estimations are size, habitat and uptake of nuclides/elements expressed as CR. As stated in Section 4, size variation has been shown to be of low importance in terms of calculated dose rates. Variation in the size of species of plant and animal that may be present under periglacial climate conditions is therefore likely to be of low consequence.

The major habitat preferences by species in regard to maximising the potential exposure are similar between biomes, based on the resolution using the present set of reference organisms. For example, the highest external exposure is expected for organisms living within soil or sediment, and species using these habitats are also present under periglacial climate conditions. Consequently, the different combinations of habitat preferences based on different taxa under temperate conditions are suggested to also be suitable and representable examples of combinations found under both periglacial and extended global warming conditions. However, the behaviour of species present under both temperate and periglacial climate conditions is likely to vary in terms of proportionate habitat usage.

As noted previously (Section 6.2), cold climate and permafrost will lead to changes in the vegetation community, both in terms of species present (which may itself affect the presence of consumers) and productivity. Reduced primary productivity may have implications for the behaviour of primary consumers which in turn will affect secondary consumers and so forth. For example, energy requirements may be increased in warm-blooded animals in order to maintain metabolic rates under cooler climate conditions which, together with lower primary productivity, may give rise to larger grazing areas in order to meet feeding requirements. The spatial needs of individuals, and thus populations, of primary consumers may therefore increase. Where such an effect occurs, the population density of primary consumers would decline and the predator populations relying on primary consumers as a food source would consequently have increased spatial ranges. The consequences of this are twofold. Firstly, the area over which animals range for feeding purposes would increase such that there may be lower consumption of contaminated foods (lower precipitation and reduced groundwater flow under permafrost conditions is also likely to restrict the migration of radionuclides). Radionuclide assimilation may therefore effectively be reduced due to a dilution effect from the consumption of less contaminated foodstuffs as feeding ranges increase, leading to reduced internal exposure. Secondly, an increased requirement to range over larger areas, for example to obtain sufficient food to meet metabolic requirements, is likely to reduce external exposure to radionuclides as the time spent in more contaminated areas is reduced. Burrowing animals are also likely to spend less

time resting as metabolic requirements increase and the period of foraging increases to meet those needs. External exposure may also be reduced through the development of thicker body coverings (fur, down, etc), which will increase shielding from external beta radiation.

Whilst it cannot be stated with certainty that the spatial ranges of individuals will increase to the extent that exposure will effectively be diluted through occupancy of areas with lower radioactivity concentrations, it is likely that, when considering an assessment population as a whole, the typical dose rates across individuals within such populations is likely to be reduced. This argument is supported by Sazykina (2003) in which it is noted that long-distance migrations of Arctic animals, in general, are favourable for survival, since animals do not stay within any contaminated local area for a long time; thus accumulated dose rates to migratory animals are expected to be lower than those for sedentary organisms.

The uptake of radioactivity into reference organisms associated with arctic climates was considered in the EC EPIC (Environmental Protection from Ionising Contaminants in the Arctic) project. However, it has not been possible to undertake a review of how CR varies according to climate; it is understood that the data within EPIC for uptake into Arctic reference organisms have been incorporated within ERICA (Copplestone et al. 2005) and comparison of distinct datasets has not therefore been possible. It is however noted in Sazykina (2003) that, for poikilothermic (cold-blooded) organisms, both the accumulation and removal of toxicants is reduced at low temperatures. For the purpose of dose rate illustration for periglacial climate conditions, the degree of bioaccumulation has been assumed to be consistent to the current climate and default reference organism CR's have been applied.

Dose-effect relationships under colder climate regimes

Within the EPIC project (Brown et al. 2003) dose-effect relationships for arctic reference organisms were evaluated. Points of note included that development of embryos and young poikilothermic organisms in the Arctic occurs slowly and therefore, for a given dose rate, Arctic organisms would receive much greater dose rates during the radiosensitive stages of ontogenesis when compared with similar species in temperate climates. Nonetheless, the development of radiation effects in poikilothermic (or hibernating) organisms would be expected to occur more slowly as a result of lower environmental temperatures, but tissue repair mechanisms would also be less effective. Furthermore, it was noted that long-lived species, depending on their reproductive strategy, may be more vulnerable to radioactivity because of the potential for integration of dose in the reproductive organs with time.

As a result of the review of dose effects in Arctic organisms, the general conclusion was made (Brown et al. 2003, Sazykina 2003) that the threshold for deterministic radiation effects in wildlife lay somewhere in the range 0.5–1 mGy d^{-1} (approximately 20–40 μGy h^{-1}) for chronic low-LET radiation. Use of the ERICA screening value is therefore likely to be conservative with regard to evaluating biota dose rates for species under periglacial climate conditions.

6.2.3 Biota dose rates

In Section 6.2.1, activity concentrations were compared for the same biosphere object (object 114) under temperate (i.e. central corrosion base case) and periglacial climate conditions. Activity concentrations were greater for the latter climate when the biosphere object is in the form of a periglacial lake with a talik. At most, activity concentrations were around 13 times greater for the talik than for the same object when in lake form. Whilst the activity concentrations were greater under periglacial conditions, the activity concentrations remained lower than the maximum activity concentrations used as input to the central corrosion base case. However, in order to illustrate that the effects on biota under periglacial climate conditions would not exceed those calculated for the base case, an illustrative dose assessment has been performed.

Dose rates have been calculated for reference organisms that are considered to be representative of the types of plant and animal that may be present at the site under periglacial conditions (Section 6.2.2) using ERICA CR data. Dose rates for periglacial conditions relate to object 114, which is the only original biosphere object identified as likely to have a talik form under extreme permafrost (200 m) conditions. Results are presented in Figure 6-1 and Appendix E.

Dose rates to reference organisms within a periglacial lake with talik, whilst larger than those for the same organisms in the same biosphere object during temperate conditions (based on increased activity concentrations) are several orders of magnitude lower than dose rates calculated for the central corrosion base case and around five orders of magnitude lower than the ERICA screening value. Dose rates are dominated by the radionuclides Np-237 (internal exposure) and Ni-59 (external exposure). Most exposed organism is phytoplankton followed by insect larvae.

6.3 Conclusions

Variation in climate conditions has the potential to affect the exposure of biota. Differences may arise in relation to the species present under different climate conditions, but also variation in the behaviour of those species that remain present and the behaviour of radionuclides. The greatest differences are likely to be observed in relation to colder climate conditions.

Whilst the species composition of the region will change in relation to climate, overall it is considered likely that species consistent with the broad reference organism types will be present with some exceptions (e.g. amphibians). The behaviour of the species present is likely to vary from that of similar (or the same) species present at the site under temperate climate conditions and this may affect both the accumulation of radionuclides and external exposure, which may in part arise from different spatial requirements.

Comparison of activity concentrations predicted for the landscape object receiving radionuclide input under periglacial conditions (object 114) indicates an increased exposure in that object as compared with temperate conditions. Nonetheless, dose rates for reference organisms remain significantly lower than the screening value and it is therefore concluded that plants and animals present at the site under periglacial climate conditions are extremely unlikely to be exposed to radioactivity at levels where radiation effects would be observed.

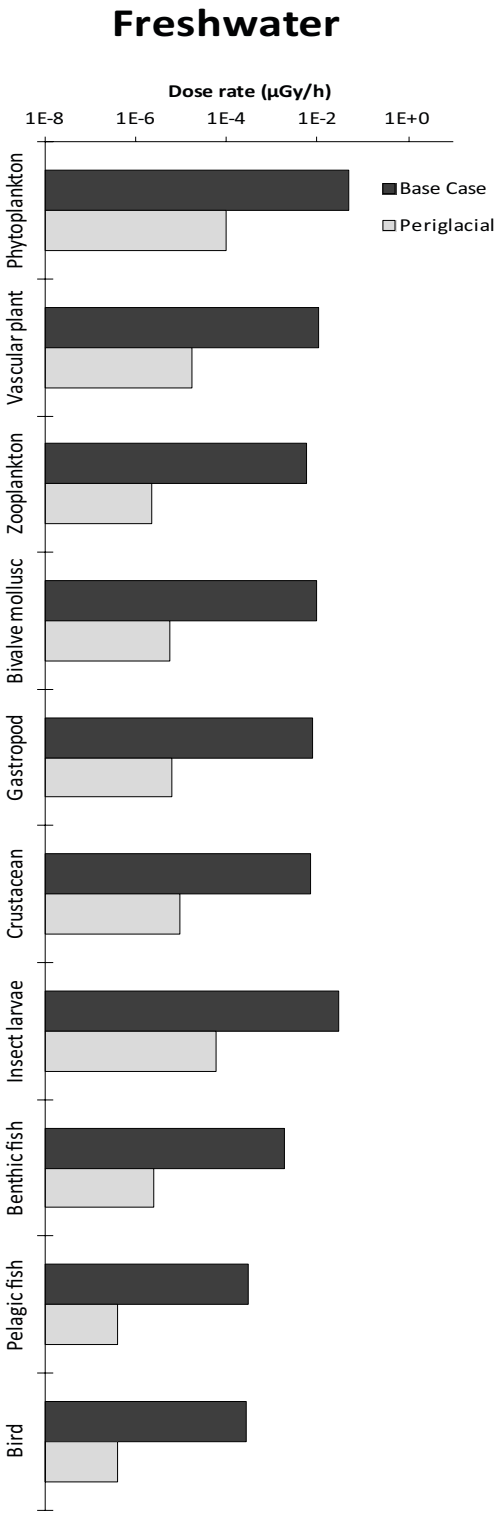

Figure 6-1. *Dose rates to freshwater reference organisms for biosphere object 114 under periglacial climate conditions (lake with talik) as compared to freshwater reference organism dose rates in the central corrosion base case (temperate climate conditions).*

7 Conclusions

In all considered scenarios, the calculated dose rates to non-human biota were, by a wide margin, below those where negative effects to populations can be expected. Therefore we can conclude that the geological repository of spent nuclear fuel poses no risk to the environment in Forsmark.

As stated in Section 1.3, the SSM review of the Torudd (2010) assessment identified six areas where additional information regarding the biota dose assessment was required. Below is a short summary of the requested information and the response in this report, including references to where in this report the detailed information is presented.

Requirement 1: Take into account the release of Pd-107, Ac-227 and Pa-231 for the estimate of dose to non-human biota

As described in Section 1.3 these radionuclides have been included in the central corrosion base case (results presented in Section 4). The contribution to total dose rate is negligible for Ac-227 and Pd-107 whereas the contribution from Pa-231 to total dose rate is at most c 2% for a very limited amount of analysed organisms (Appendix C). These radionuclides do not appear as part of the IRF fraction that may reach the biosphere as a pulse release (Section 2.3.2). However, it should be noted that the decay of Pa-231 to Ac-227 in the biosphere is not included.

Requirement 2: Complete calculation of the total estimated dose rate to non-human biota, i.e. total dose rate for all radionuclides included in the analysis

Total dose rates for the central corrosion base case are presented in Section 4 and Appendix C. All estimated dose rates are several orders of magnitude below the screening dose rate (10 $\mu Gy\ h^{-1}$). The maximum dose rates of the central corrosion base case were for the reference organism freshwater phytoplankton (c $5\times10^{-2}\ \mu Gy\ h^{-1}$). The most exposed organism in the terrestrial ecosystem (peat moss) was of a similar magnitude whereas the most exposed marine organism (zooplankton) received a dose rate c two orders of magnitude lower.

Comparing our results with those of Torudd (2010), the dose rates for reference organisms are c one order of magnitude higher which could be expected since more radionuclides are considered herein. The most exposed organisms in freshwater and terrestrial ecosystems are consistent (phytoplankton and lichen & bryophyte, respectively) whereas the most exposed marine organism differed (polychaete worm in the current assessment and phytoplankton in Torudd (2010)).

Requirement 3: Report the estimated effects on species highlighted for special protection within the investigation (red-listed species, ecologically important, or economically important species)

Representative species, including ecologically and economically important species and vulnerable or protected species, have been identified for assessment and each is evaluated in its own right. Estimated effects for all assessment species are presented for the central corrosion base case in Section 4. Some differences between representative species and reference organisms could be seen, but considering the low estimated dose rates these are of minimal importance for the overall assessment results.

Requirement 4: Estimate impacts on non-human biota during times where the climate is clearly different from that at present, and where representation using today's biosphere conditions would be obviously unreasonable

Climate considerations are presented in Section 6 and Appendix E. Variation to cold climate conditions has the potential to affect the exposure of biota. Differences may arise in relation to the species present under periglacial climate conditions, but also variation in the behaviour of those species that remain present and the behaviour of radionuclides. No such variations are expected in a warmer climate than today. Whilst the species composition of the region will likely change in relation to any shift in climate, overall it is considered likely that species consistent with the broad reference organism types will be present with some exceptions (e.g. amphibians under periglacial climate conditions).

Comparison of activity concentrations predicted for the landscape object receiving radionuclide input under periglacial conditions indicates an increased exposure as compared with temperate conditions. Nonetheless, dose rates for reference organisms remain significantly lower than the screening value and it is therefore concluded that plants and animals present at the site under periglacial climate conditions are extremely unlikely to be exposed to radioactivity at levels where radiation effects would be observed. No such variations in radionuclide input are predicted under a warming scenario, therefore the outcome is predicted to be similar to that of the central corrosion base case.

Requirement 5: Estimate impacts on non-human biota following a pulse-release such as could be expected following a canister failure

A central corrosion pulse release scenario has been considered in Section 5 and Appendix D. The type of landscape present in the biosphere at the time of canister failure was considered when estimating biota dose rates. Three independent release times were simulated representing a submerged phase (without terrestrial ecosystems), a mixed phase (comprising a late marine state as well as presence of freshwater and terrestrial ecosystems) and a land phase where the sea has receded from the area. The results show that all reference organism dose rates are well below the ERICA screening dose rate (10 μGy h^{-1}), by a minimum of three orders of magnitude indicating that no impact on populations would occur. The maximum dose rates for the three release phases are very similar; the highest dose rates occur in the mixed and land phases and are c 4 times higher than the maximum dose rate calculated for the submerged phase release.

Requirement 6: Include bird eggs as a reference organism in the analysis.

Dose rates to bird egg are presented in the central corrosion base case (Section 4) and in the pulse release from the scenario (Section 5). Calculated dose rates are well below the ERICA screening dose rate (10 μGy h^{-1}) in both scenarios.

The total dose rate for bird egg in the base case is of the same size as those estimated for birds, mammals, amphibians and reptiles mirroring the use of the same CR values for terrestrial vertebrates. The dose rate is c 20 times lower than the maximum terrestrial dose rate (for the Reference lichen and bryophytes) and is dominated by internal exposure. The radionuclides contributing most to dose are Ra-226, Nb-94 and Ni-59.

In the pulse release scenario bird egg is receiving the highest dose rate in the terrestrial ecosystems, in the same order of magnitude as those for lichen and bryophytes, grasses and herbs and shrubs. Internal exposure from Tc-99 is dominating.

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Appendix A

The ERICA tool: description, updates and quality assurance

A1 The ERICA assessment tool

The ERICA assessment tool guides a user through the assessment process, keeps records and performs the calculations to estimate whole-body dose rates to selected organisms for the majority of radionuclides included in ICRP Publication 38 (ICRP 1983). The assessment tool is designed to be applied in a tiered approach with successive tiers incorporating more site specific information. It is supported by a range of publications that detail the assessment framework and application (Beresford et al. 2007a, b, Brown et al. 2008, Larsson 2008) and associated effects data, as compiled within a focussed radiation effects database (FREDERICA 2006, Copplestone et al. 2008, Garnier-Laplace et al. 2008).

There are three separate assessment tiers where, by satisfying certain criteria, users may exit the assessment process while being confident that the effects on biota are negligible, and that the situation requires no further action. Where effects are not shown to be negligible, assessment should continue to the next tier with more user-defined input data being incorporated to focus the assessment and reduce uncertainties. The assessment tiers are as follows:

- Tier 1: a simple and "conservative" assessment based on pessimistic assumptions with a minimum requirement for input data so as to permit the exemption of situations of negligible concern from further evaluation. Tier 1 does not permit the addition of any other radionuclides or species beyond the default sets within the ERICA tool.
- Tier 2: also a 'screening' tier, but with greater user interface to allow a more informed assessment to be undertaken through the addition of radionuclides and/or organisms of particular relevance to a site assessment. In addition to dose rate, the output of tier 2 assessments include: a) "expected" risk quotient (RQ) values obtained by deterministic calculations using mean values for all parameters; and b) "conservative" (95th or 99th percentile, assuming an exponential distribution of dose rates) RQ values obtained by multiplying the "expected" RQ by an appropriate uncertainty factor. Where the sum of all "conservative" RQ is below one for each organism, then there is likely to be negligible radiological concern and the tool suggests that the assessment can be concluded. Where some "conservative" RQ's exceed one, but all "expected" RQ's are less than one, the tool suggests that the results and assessments be reviewed. Finally, if any "expected" RQ exceeds one, the tool recommends further assessment using tier 3.
- Tier 3: a probabilistic risk analysis that demands more interaction from the user. The assessment does not yield a simple yes/no answer and instead of using a single screening dose rate for assessment evaluation, the user is expected to consider aspects such as biological effects data (as available in the FREDERICA database) and compare these with dose rate output for each assessment organism. The necessary simulations are carried out with user-selected probability distributions for selected parameters and mean values for others. In addition to mean dose rate output, standard deviation, median and different percentiles of the dose rates are provided to allow more detailed consideration by the user. Sensitivity analyses are also carried out to identify those parameters contributing the largest uncertainties to dose rate estimates.

A2 Updates to the ERICA tool since the initial assessment (Torudd 2010)

Although the calculation models used in the current version of ERICA tool (dated November 2012) are the same as those implemented in the 2009 version, it is important to note that the current version includes some corrections to errors that could have affected the results presented in the report TR–10–08 (Torudd 2010):

- From update November 2012:

  "Problem solved: When editing an organism using a version of the tool prior to this update, ERICA updates the DCC values in the database. However, if the organism had been used in a previous assessment and then the user ran the assessment again the tool failed to read the updated DCC values from the database (and instead used the old values saved in the project file). The new version of the tool uses the updated values automatically".

- From update June 2011:

  "Fixed a problem in the Add Isotope Wizard when in some case the isotopes were not added properly (the calculation of the DCC values was uncompleted). It is recommended to remove the previously added isotopes and to add them again".

  "Fixed missing in-soil DCC for 'Detritivorous invertebrate' when adding new isotopes. It is recommended to remove the previously added isotopes and to add them again."

In order to assure that there is no difference between the results obtained using the ERICA tool released at 2009 (used in the assessment reported in Torudd (2010)) and the current version of ERICA tool (November 2012), the results in Torudd (2010) and the ones obtained using the current version have been compared.

All site specific species and additional radionuclides not included as defaults within the assessment tool were added to a clean database in ERICA tool (November, 2012) and dose rate estimations were performed using the input data reported in Torudd (2010). Results were compared with those presented in Torudd (2010) and were found to be consistent. The change in versions between the assessment presented in Torudd (2010) and that presented herein has not therefore affected assessment output.

A3 ERICA quality assurance documentation

The ERICA tool was developed as part of a EU research project by a large consortium of European organisations, led by Swedish Radiation Safety Authority (SSM). It is currently being maintained by a consortium involving the Norwegian Radiation Protection Authority (NRPA), Environment Agency (England, UK), Centre for Ecology and Hydrology (UK), French Institute for Radiological Protection and Nuclear Safety, IRSN (France), SSM (Sweden) and Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas, CIEMAT (Spain).

During the development process of the ERICA tool the software developers continuously performed unit tests of the individual calculation modules to ensure that the same outputs were produced for a given set of inputs. The most important validation document, containing information on the testing carried out in ERICA, is the Deliverable D10 of ERICA (Beresford et al. 2007b). This document presents the application of outputs of the ERICA project to five different case study sites to assess the applicability of the methodology: Drigg Coast Sand Dunes, UK (terrestrial ecosystem); Loire River, France (freshwater ecosystem); Sellafield, UK (marine ecosystem); Komi Republic, Russia (terrestrial ecosystems); and the Chernobyl exclusion zone, Ukraine (terrestrial ecosystems). In addition to testing carried out during the development of the ERICA assessment approach and associated tool, the performance of dosimetry and transfer components of the ERICA tool has been tested against other non-human biota dose assessment models in the context of international comparison exercises (Beresford et al. 2008a, b, Vives i Batlle et al. 2011, 2012). The ERICA Tool has also been validated partly through scenario exercises for the Chernobyl area (Beresford et al. 2008c, 2010), Perch Lake scenario (Yankovich et al. 2010), a waste disposal site in Australia (Johansen et al. 2012) and other specific scenarios. These exercises are effectively comparisons with experiments and field data.

Prior to any new release/update, an integration test is implemented in collaboration with external test users and according to the instructions in the ERICA testing protocol. The strategy outlined in the testing protocol is defined as a staged process to testing and that allow only those aspects of the tool that have changed to be tested. Testing should ensure consistency in outputs for a given set of inputs and, when underpinning databases have been amended, that the outputs are changed appropriately.

Appendix B

Biota assessment data

Data in support of the biota dose assessment are presented in this appendix. Data include biota geometries, mass and habitat data for reference organisms (Section B1) and representative organisms (Section B2). Concentration ratios are then presented for each organism (including reference organisms) in Section B3 and a comparison between reference organism CR data and that applied to representative species. Dose conversion coefficients are presented in Appendix F.

B1 Geometry, mass, habitat data and dose conversion coefficients for reference organisms

The size and mass of each ERICA reference organism included in the SR-Site assessment are presented in Table B-1. Habitat occupancy data are presented in Table B-2 and DCC's, calculated on the basis of geometry and habitat occupancy data, are presented in Tables B-3 to B-8 for each radionuclide included in the SR-Site assessment.

Table B-1. ERICA default reference organism geometries.

Reference Organisms	Mass(kg)	Length(cm)	Width(cm)	Height(cm)
Terrestrial Ecosystem				
Lichen and bryophytes	1.10E–04	4.01E+00	2.29E–01	2.29E–01
Grasses and Herbs	2.62E–03	5.00E+00	1.00E+00	1.00E+00
Shrub	2.62E–03	5.00E+00	1.00E+00	1.00E+00
Tree	4.71E+02	1.00E+03	3.00E+01	3.00E+01
Soil Invertebrate	5.24E–03	1.00E+01	1.00E+00	1.00E+00
Detritivorous invertebrate	1.70E–04	1.74E+00	6.13E–01	3.05E–01
Gastropod	1.40E–03	1.88E+00	1.54E+00	9.27E–01
Flying insects	5.89E–04	2.00E+00	7.50E–01	7.50E–01
Amphibian	3.14E–02	7.99E+00	3.00E+00	2.50E+00
Reptile	7.44E–01	1.16E+02	3.49E+00	3.49E+00
Bird	1.26E+00	3.00E+01	1.00E+01	8.02E+00
Bird egg	5.03E–02	6.00E+00	4.00E+00	4.00E+00
Mammal	3.14E–01	2.00E+01	6.00E+00	5.00E+00
Mammal	2.45E+02	1.30E+02	6.00E+01	6.00E+01
Marine Ecosystem				
Phytoplankton	6.54E–11	5.00E–03	5.00E–03	5.00E–03
Macroalgae	6.54E–03	5.00E+01	5.00E–01	5.00E–01
Vascular plant	2.62E–02	9.29E+00	2.32E+00	2.32E+00
Zooplankton	6.14E–05	6.20E–01	6.10E–01	3.10E–01
Polychaete worm	1.73E–02	2.30E+01	1.20E+00	1.20E+00
Benthic mollusc	1.64E–02	5.00E+00	2.50E+00	2.50E+00
Crustacean	7.54E–01	2.00E+01	1.20E+01	6.00E+00
Benthic fish	1.31E+00	3.99E+01	2.49E+01	2.51E+00
Pelagic fish	5.65E–01	3.00E+01	6.00E+00	6.00E+00
(Wading) bird	1.26E+00	3.00E+01	1.00E+01	8.02E+00
Mammal	1.82E+02	1.80E+02	4.39E+01	4.39E+01
Freshwater Ecosystem				
Phytoplankton	2.05E–12	7.97E–03	7.01E–04	7.01E–04
Vascular plant	1.05E–03	1.00E+02	1.00E–01	2.00E–01
Zooplankton	2.35E–06	2.00E–01	1.40E–01	1.60E–01
Insect larvae	1.77E–05	1.50E+00	1.50E–01	1.50E–01
Bivalve mollusc	7.07E–02	1.00E+01	4.50E+00	3.00E+00
Gastropod	3.53E–03	3.00E+00	1.50E+00	1.50E+00
Crustacean	1.57E–05	1.00E+00	3.00E–01	1.00E–01
Benthic fish	1.47E+00	5.00E+01	8.01E+00	7.01E+00
Pelagic fish	1.26E+00	5.00E+01	8.01E+00	6.01E+00
Bird	1.26E+00	3.00E+01	1.00E+01	8.02E+00
Amphibian	3.14E–02	7.99E+00	3.00E+00	2.50E+00
Mammal	3.90E+00	3.30E+01	1.50E+01	1.50E+01

Table B-2. Reference organism habitat occupancy factors.

Reference organism	Habitat						
	On-soil	In-soil	In-air	Water surface	Water	Sediment surface	Sediment
Terrestrial							
Amphibian	1	0	0				
Bird	1	0	0				
Bird egg	1	0	0				
Detritivorous invertebrate	0	1	0				
Flying insects	1	0	0				
Gastropod	1	0	0				
Grasses & Herbs	1	0	0				
Lichen & bryophytes	1	0	0				
Mammal (Deer)	1	0	0				
Mammal (Rat)	0	1	0				
Reptile	1	0	0				
Shrub	1	0	0				
Soil Invertebrate (worm)	0	1	0				
Tree	1	0	0				
Freshwater							
Amphibian				0	1	0	0
Benthic fish				0	0	1	0
Bird				0	1	0	0
Bivalve mollusc				0	0	1	0
Crustacean				0	0	1	0
Gastropod				0	0	1	0
Insect larvae				0	0	0	1
Mammal				0	1	0	0
Pelagic fish				0	1	0	0
Phytoplankton				0	1	0	0
Vascular plant				0	0	1	0
Zooplankton				0	1	0	0
Marine							
Benthic fish				0	0	1	0
Benthic mollusc				0	0	1	0
Crustacean				0	0	1	0
Macroalgae				0	0	1	0
Mammal				0	1	0	0
Pelagic fish				0	1	0	0
Phytoplankton				0	1	0	0
Polychaete worm				0	0	0	1
Vascular plant				0	0	1	0
(Wading) bird				0	1	0	0
Zooplankton				0	1	0	0

B2 Geometry, mass, habitat data and dose conversion coefficients for representative species

Geometry, mass and habitat data for each of the representative species are presented in Table B-9 for the freshwater ecosystem, Table B-10 for the terrestrial ecosystem and Table B-11 for the marine ecosystem. A comparison of size differences between representative species and the corresponding reference organism is then presented in Table B-12. Dose conversion coefficients for each representative species, calculated in relation to size and habitat occupancy are presented in Tables B-13 to B-18.

Table B-3. Size, mass and habitat occupancy data for representative species in freshwater ecosystems.

Species	Habitat[a]	Occupancy ratio	length (cm)	Width (cm)	Height (cm)	Mass (kg)	Notes[b]
RS-Phytoplankton	In water	1	–	–	–	–	RO dimensions
Microphytobenthos	On sediment	1	–	–	–	–	RO dimensions
Grasswrack pondweed	On sediment	1	0.2	0.002	0.002	4.19E–04	
Water pygmyweed	On sediment	1	0.2	0.002	0.002	4.19E–04	
Elatine orthosperma	On sediment	1	0.2	0.002	0.002	4.19E–04	
Spatulaleaf loosestrife	On sediment	1	0.2	0.002	0.002	4.19E–04	
Alisma wahlenbergii	On sediment	1	0.2	0.002	0.002	4.19E–04	
Bittercress	On sediment	1	0.2	0.002	0.002	4.19E–04	
Shetland pondweed	On sediment	1	0.2	0.002	0.002	4.19E–04	
Flat-stalked pondweed	On sediment	1	0.2	0.002	0.002	4.19E–04	
Water mudwort	On sediment	1	0.2	0.002	0.002	4.19E–04	
Persicaria foliosa	On sediment	1	0.2	0.002	0.002	4.19E–04	
Chara sp.	On sediment	1	0.1	0.002	0.002	2.09E–04	
Least stonewort	On sediment	1	0.1	0.002	0.002	2.09E–04	
Rugged stonewort	On sediment	1	0.1	0.002	0.002	2.09E–04	
Slender stonewort	On sediment	1	0.1	0.002	0.002	2.09E–04	
Starry stonewort	On sediment	1	0.1	0.002	0.002	2.09E–04	
Pointed stonewort	On sediment	1	0.1	0.002	0.002	2.09E–04	
Slimy-fruited stonewort	On sediment	1	0.1	0.002	0.002	2.09E–04	
RS-Zooplankton	In water	1	–	–	–	–	RO dimensions
Depressed river mussel	In sediment/ on sediment	0.5/0.5	0.1	0.025	0.05	0.0654	
Thick shelled river mussel	In sediment/ on sediment	0.5/0.5	0.1	0.025	0.05	0.0654	
Painter’s mussel	In sediment/ on sediment	0.5/0.5	0.1	0.025	0.05	0.0654	
Duck mussel	In sediment/ on sediment	0.5/0.5	0.1	0.025	0.05	0.0654	
Anisus spirorbis	In sediment/ on sediment	0.75/0.25	–	–	–	2E–05	RO dimensions
Large mouthed valve snail	On sediment	1	–	–	–	–	RO dimensions
Tanymastix stagnalis	On sediment	1	–	–	–	–	RO dimensions
Clam shrimp	On sediment	1	–	–	–	–	RO dimensions
Tadpole shrimp	On sediment	1	0.18	0.05	0.05	0.24	
Signal crayfish	On sediment	1	0.008	0.002	0.002	2E–05	
European crayfish	On sediment	1	0.004	0.004	0.0025	2E–05	
Bagous binodulus	In water	1	–	–	–	–	RO dimensions
Bagous petro	In water	1	–	–	–	–	RO dimensions
Donacia brevitarsis	In water	1	–	–	–	–	RO dimensions
Macroplea appendiculata	In water	1	–	–	–	–	RO dimensions
Sigara hellensii	On water	1	–	–	–	–	RO dimensions
Hydaticus continentalis	On water	1	–	–	–	–	RO dimensions
Hydrochus megaphallus	On water	1	–	–	–	–	RO dimensions
Cloeon schoenemundi	On sediment	1	–	–	–	–	RO dimensions
Donacia dentata	On sediment	1	–	–	–	–	RO dimensions

Table B-3. Continued.

Species	Habitat[a]	Occupancy ratio	length (cm)	Width (cm)	Height (cm)	Mass (kg)	Notes[b]
Pygmy damselfly	On sediment	1	–	–	–	–	RO dimensions
Clubbed general	On sediment	1	–	–	–	–	RO dimensions
Three-lined soldier	On sediment	1	–	–	–	–	RO dimensions
Tanypodinae sp.	On sediment	1	–	–	–	–	RO dimensions
Vimba bream	On sediment/ in water	0.5/0.5	0.2174	0.0219	0.0487	0.121	
Sheatfish	On sediment /in water	0.5/0.5	–	–	–	–	RO dimensions
Ruffe	On sediment /in water	0.5/0.5	0.086	0.0063	0.0211	0.121	
Asp	In water	1	0.2174	0.0219	0.0487	0.121	
Burbot	In water	1	0.2174	0.0219	0.0487	0.121	
European eel	In water	1	0.2174	0.0219	0.0487	0.121	
Common roach	In water	1	0.125	0.0134	0.0313	0.121	
Tench	In water	1	0.44	0.082	0.163	0.121	
European perch	In water	1	0.2174	0.0219	0.0487	0.121	
Northern pike	In water	1	0.484	0.0401	0.0687	0.121	
Pool frog	In water/ on soil (TE)	0.47/0.53	0.07	0.02	0.025	0.018	
Northern crested newt	In soil (TE)/ in water/ on soil (TE)	0.53/0.23/ 0.23	0.13	0.03	0.04	0.082	
Common pochard	On water/in water	0.8/0.2	–	–	–	–	RO dimensions
Horned grebe	On water/ in water	0.8/0.2	–	–	–	–	RO dimensions
Common kingfisher	In air (TE) /in water/ in soil (TE)	0.7/0.2/0.1	0.165	0.02	0.02	0.035	
Black tern	On water/ in water/ in air (TE)	0.2/0.2/0.6	0.23	0.02	0.025	0.06	
European otter	On soil (TE)/ on water/ in water	0.6/0.1/0.3	0.75	0.13	0.13	6.6	

[a] TE refers to occupancy within the terrestrial ecosystem for semi-aquatic species.

[b] RO refers to reference organism.

Table B-4. Size, mass and habitat occupancy data for representative species in terrestrial ecosystems.

Species	Habitat[a]	Occupancy ratio	length (cm)	Width (cm)	Height (cm)	Mass (kg)	Notes[b]
Dwarf neckera	In air	1	0.0401	0.00229	0.00229	0.0001	
Nephroma laevigatum	In air	1	0.0401	0.00229	0.00229	0.0001	
Slender green feather moss	On soil	1	0.0401	0.00229	0.00229	0.0001	
Scapania apiculata	On soil	1	0.0401	0.00229	0.00229	0.0001	
Sphagnum sp.	On soil	1	0.0401	0.00229	0.00229	0.0001	
Knowlton's thread-moss	On soil	1	0.0401	0.00229	0.00229	1.10E–04	Minimum mass values for plants used. Geometry estimated
Omphalina philonotis	On soil	1	0.02	0.1	0.02	1.70E–04	Minimum mass values for plants used. Geometry estimated
Yellow foot	On soil	1	0.02	0.1	0.02	1.70E–04	

Table B-4. Continued.

Species	Habitat[a]	Occupancy ratio	length (cm)	Width (cm)	Height (cm)	Mass (kg)	Notes[b]
Yellow widelip orchid	On soil	1	–	–	–	0.00262	Dimensions calculated by ERICA based on mass
Flea sedge	On soil	1	–	–	–	0.00262	Dimensions calculated by ERICA based on mass
Bottle sedge	On soil	1	–	–	–	0.00262	Dimensions calculated by ERICA based on mass
Common reed	On soil	1	0.01	0.005	3	0.079	
Cloudberry	On soil	1	0.2	0.01	0.01	0.01047	
Cranberry	On soil	1	0.2	0.01	0.01	0.01047	
European alder	On soil	1	10	0.3	0.3	471	
Silver birch	On soil	1	10	0.3	0.3	471	
Scots pine	On soil	1	10	0.3	0.3	471	
Norway spruce	On soil	1	10	0.3	0.3	471	
Geyer's whorl snail	On soil	1	–	–	–	0.00017	RO dimensions
Lumbricus sp.	On soil	1	–	–	–	0.00017	RO dimensions
Pygmy damselfly	In air	1	–	–	–	0.00017	Minimum mass values for plants used. Geo-metry estimated
Marsh fritillary	In air	1	–	–	–	0.0014	Minimum mass values for plants used. Geo-metry estimated
Chlaenius sulcicollis	In air	1	–	–	–	0.000589	RO dimensions
Large gold grasshopper	In air	1	–	–	–	0.000589	RO dimensions
Singa nitidula	In soil	1	–	–	–	0.00524	RO dimensions
Pool frog	In water (FW)/ in soil	0.47/0.53	0.07	0.02	0.025	0.018	
Common toad	In water (FW)/ on soil/in soil	0.3/0.3/0.4	0.085	0.035	0.035	0.055	
Grass snake	On soil	1	–	–	–	0.744	RO dimensions
Ruff	On soil	1	0.26	0.03	0.03	0.12	
Eurasian bittern	On soil	1	–	–	–	1.26	RO dimensions
Spotted crake	On soil	1	–	–	–	1.26	RO dimensions
Common grasshopper warbler	In air	1	0.13	0.015	0.015	0.015	
Short-eared owl	On soil/in air	0.1/0.9	0.04	0.07	0.28	0.411	
Natterer's bat	In air	1	0.045	0.02	0.02	0.0094	
European water vole	In soil/on soil/ in water (FW)	0.83/0.08/ 0.08	0.18	0.05	0.05	0.12	
Eurasian lynx	On soil	1	0.8	0.1	0.6	25	
Roe deer	On soil	1	0.9	0.18	0.34	28	
Eurasian elk (U.S.: Moose)	On soil	1	1.8	0.49	1.08	500	
Mountain hare	On soil	1	–	–	–	–	RO dimensions
European hare	On soil	1	–	–	–	–	RO dimensions
Red fox	On soil/in soil	0.5/0.5	0.69	0.08	0.25	6.6	

[a] FW refers to occupancy within the freshwater ecosystem.

[b] RO refers to reference organism.

Table B-5. Size, mass and habitat occupancy data for representative species in marine ecosystems.

Species	Habitat	Occupancy ratio	length (cm)	Width (cm)	Height (cm)	Mass (kg)	Notes
RS-Phytoplankton	In water	1	–	–	–	–	RO dimensions
Stypocaulon scoparium	On sediment	1	0.1	0.001	0.001	5.24E–05	
Bristly stonewort	On sediment	1	0.1	0.002	0.002	2.09E–04	
Bladderwrack	On sediment	1	0.2	0.01	0.002	0.002094	
Grasswrack pondweed	On sediment	1	0.2	0.002	0.002	4.19E–04	
Water pygmyweed	On sediment	1	0.2	0.002	0.002	4.19E–04	
Elatine orthosperma	On sediment	1	0.2	0.002	0.002	4.19E–04	
Alisma wahlenbergii	On sediment	1	0.2	0.002	0.002	4.19E–04	
Flat-stalked pondweed	On sediment	1	0.2	0.002	0.002	4.19E–04	
Water mudwort	On sediment	1	0.2	0.002	0.002	4.19E–04	
RS-Zooplankton	In water	1	–	–	–	–	RO dimensions
Baltic macoma	In sediment	1	0.027	0.019	0.0096	0.00258	
Polychaete worms	In water	1	–	–	–	–	RO dimensions
Idothea baltica	In sediment	1	0.03	0.01	0.005	0.0173	
Vimba bream	On sediment /in water	0.5/0.5	0.0168	0.017	0.0382	0.0573	
Viviparous eelpout	On sediment /in water	0.5/0.5	0.0168	0.017	0.0382	0.0573	
Burbot	In water	1	0.0168	0.017	0.0382	0.0573	
Lumpsucker	In water	1	0.0168	0.017	0.0382	0.0573	
European eel	In water	1	0.0168	0.017	0.0382	0.0573	
Atlantic herring	In water	1	0.0168	0.017	0.0382	0.0573	
European sprat	In water	1	0.0168	0.017	0.0382	0.0573	
European perch	In water	1	0.0168	0.017	0.0382	0.0573	
Northern pike	In water	1	0.484	0.04	0.0687	0.0573	
Atlantic salmon	In water	1	0.0168	0.017	0.0382	0.0573	
Brown trout	In water	1	0.0168	0.017	0.0382	0.0573	
Zander	In water	1	0.0168	0.017	0.0382	0.0573	
Coregonus sp	In water	1	0.0168	0.017	0.0382	0.0573	
Greater scaup	On soil (TE)/ on water/in water	0.2/0.6/0.2	–	–	–	–	RO dimensions
Common eider	On soil (TE)/ on water/in water	0.2/0.6/0.2	–	–	–	–	RO dimensions
European herring gull	On soil (TE)/ on water/in water	0.2/0.6/0.2	–	–	–	–	RO dimensions
Horned grebe	On soil (TE)/ on water/in water	0.2/0.6/0.2	–	–	–	–	RO dimensions
Black guillemot	On soil (TE)/ on water/in water	0.2/0.6/0.2	–	–	–	–	RO dimensions
Ruddy turnstone	On soil (TE)	1	0.23	0.05	0.1	0.6	
White-tailed eagle	On soil (TE)/ in water/in air (TE)	0.3/0.2/0.5	0.125	0.125	0.7	5.7	
European otter	On soil (TE)/ in water/in air (TE)	0.6/0.1/0.3	0.75	0.13	0.13	6.6	
Ringed seal	On soil (TE)/ on water/in water	0.4/0.1/0.5	1.5	0.3	0.3	71	

[a] TE refers to occupancy within the terrestrial ecosystem.

[b] RO refers to reference organism.

Table B-6. Comparison of size of reference organisms and representative species in terms of volume and potential for differences in dose rate estimations due to variability in size (RS refers to representative species, RO refers to reference organism).

Reference Organism (RO)	RO volume (m^3)	Greatest size difference of a RS relative to RO	Size difference of the average of RS relative to RO	n=	RO within size-range of RS?	RS < cm-scale and < RO
Freshwater						
Phytoplankton	1.64E–14	*	*	*	*	*
Vascular plant	8.38E–6	5.00E0	3.15E0	2	No	YES
Zooplankton	1.88E–8	*	*	*	*	*
Bivalve mollusc	5.65E–4	1.08E0	1.08E0	1	*	No
Gastropod	2.83E–5	2.11E2	1.88E2	2	No	YES
Insect larvae	1.42E–7	*	*	*	*	*
Crustacean	1.26E–7	6.67E–5	6.67E–5	1	*	No
Benthic fish	1.18E–2	2.46E2	2.31E1	2	Yes	No
Pelagic fish	1.01E–2	4.59E1	2.06E0	4	Yes	No
Amphibian (Frog)	2.51E–4	3.84E–1	6.27E–1	2	Yes	No
Bird (Duck)	1.01E–2	3.65E1	2.66E1	2	No	No
Mammal	3.11E–2	5.86E–1	5.86E–1	1	*	No
Marine						
Phytoplankton	5.24E–13	*	*	*	*	*
Macroalgae	5.24E–5	1.25E2	8.33E0	3	No	YES
Vascular plant	2.09E–4	6.25E1	6.25E1	1	*	YES
Zooplankton	4.90E–7	*	*	*	*	*
Benthic mollusc	1.31E–4	6.35E0	6.35E0	1	*	No
Polychaete worm	1.39E–4	*	*	*	*	*
Crustacean	6.03E–3	9.60E2	9.60E2	1	*	No
Benthic fish	1.04E–2	2.28E2	2.28E2	1	*	No
Pelagic fish	4.52E–3	9.82E1	8.23E0	2	Yes	No
Bird (Duck)	1.01E–2	2.20E–1	4.00E–1	2	Yes	No
Mammal	1.45E0	2.24E1	4.70E0	2	No	No
Terrestrial (Wetland)						
Lichen and bryophytes	8.80E–7	*	*	*	*	*
Grasses and herbs	2.09E–5	3.33E–2	3.33E–2	1	*	No
Shrub (No RO geometry)	*	*	*	2	*	*
Tree	3.77E0	*	*	*	*	*
Detritivorous invertebrate	1.36E–6	*	*	*	*	*
Gastropod	1.12E–5	*	*	*	*	*
Flying invertebrate	4.73E–6	*	*	*	*	*
soil invertebrate	4.19E–5	*	*	*	*	*
Amphibian (Frog)	2.51E–4	5.76E–1	8.61E–1	2	Yes	No
Reptile	5.91E–3	*	*	*	*	*
Bird (Duck)	1.01E–2	8.23E1	6.89E0	3	No	No
Bird egg	4.02E–4	*	*	*	*	*
Small mammal	2.51E–3	3.33E1	2.56E0	2	No	No
Large mammal	4.68E–1	4.91E–1	1.75E0	3	Yes	No

* No data/not described/not applicable.

Difference (factor of):
<10
10–100
100–1.000
1.000–10.000
10.000–100.000

B3 Concentration ratios

Reference organism CR data and their source for the radionuclides Ac-227, Pd-107 and Pa-231, for which ERICA default values are not available, are presented in Tables B-19 to B-21. Concentration ratios and their source for each representative species are presented in Table B-22 and results of an analysis of the relative difference in concentration ratios between representative species and their corresponding reference organism is presented in Table B-23.

Table B-7. Concentration ratios for Ac-227 in reference organisms. Units are (Bq kg^{-1} fw)/(Bq kg^{-1} dw) for terrestrial (TE) organisms and (Bq kg^{-1} fw)/(Bq l^{-1}) for freshwater (FW) and marine (MA) organisms.

Reference organism	Ecosystem	CR	source	comments
Amphibian	TE	1.00E–01	WTDB	Data for Am in ICRP Frog
Amphibian	FW	2.40E+01	WTDB	Data for Am
Benthic fish	MA	1.90E+02	WTDB	Data for Am in ICRP Flatfish
Benthic fish	FW	5.70E+02	WTDB	same as pelagic fish
Benthic mollusc	MA	6.70E+03	WTDB	Data for Am in Mollusc
Bird	FW	2.00E+00	ERICA	Data for Am
Bird	MA	2.30E+02	WTDB	Same as pelagic fish (ERICA applies 1.5E2 from Pu as actinide analogue – fish is more conservative
Bird	TE	2.80E–02	WTDB	Data for Am
Bird egg	TE	2.80E–02	WTDB	same as bird
Bivalve mollusc	FW	6.60E+03	WTDB	Data for Am in mollusc
Crustacean	FW	9.70E+01	ERICA	Data for Am
Crustacean	MA	5.00E+02	WTDB	Data for Am
Detritivorous invertebrate	TE	4.00E–02	WTDB	Data for Am in Arthropod
Flying insect	TE	1.27E–01	ERICA	Data for Am from CR review
Gastropod	TE	1.00E–01	WTDB	Data for Am
Gastropod	FW	6.60E+03	WTDB	Data for Am in mollusc
Grasses and herbs	TE	2.50E–02	WTDB	Data for Ac
Insect larvae	FW	1.70E+03	WTDB	Data for Am
Large mammal	TE	1.30E–01	WTDB	Data for Am in Rangifer
Lichen and bryophytes	TE	6.90E–01	WTDB	Data for Am
Macroalgae	MA	2.10E+02	WTDB	Data for Am
Mammal	FW	5.70E+02	WTDB	Data for pelagic fish (vertebrate). ERICA applies bird – 2E0, which is less conservative)
Mammal	MA	2.30E+02	WTDB	Data for pelagic fish (vertebrate). ERICA applies Pu as actinide analogue with value of 2.8E2)
Pelagic fish	FW	5.70E+02	WTDB	Data for Am in Fish
Pelagic fish	MA	2.30E+02	WTDB	Data for Am in Fish
Phytoplankton	FW	6.20E+02	WTDB	Vascular plant Am data used as analogue (ERICA applied default data from EA R&D128 – 4.0E4)
Phytoplankton	MA	1.50E+05	WTDB	Data for Am
Polchaete worm	MA	6.70E+03	WTDB	Same as benthic mollusc – same analogue as applied in ERICA (value 8.1E3)
Reptile	TE	5.50E–02	WTDB	Data for Am
Shrub	TE	1.70E–02	WTDB	Data for Am
Small mammal	TE	9.80E–03	WTDB	Data for Am in mammal
Soil invertebrate (worm)	TE	9.00E–02	WTDB	Data for Am
Tree	TE	1.70E–02	WTDB	Assumed same as shrub (ERICA uses allometric, use of shrub more conservative)
vascular plant	FW	6.20E+02	WTDB	Data for Am
vascular plant	MA	2.10E+02	WTDB	Same as macroalgae – same analogue as applied in ERICA (value 8.3E2)
zooplankton	FW	1.70E+03	WTDB	insect larve Am used as analogue (ERICA applies value of 4E2 from EA R&D128)
zooplankton	MA	4.00E+03	ERICA	IAEA 2004

Table B-8. Concentration ratios for Pd-107 in reference organisms. Units are (Bq kg^{-1} fw)/(Bq kg^{-1} dw) for terrestrial (TE) organisms and (Bq kg^{-1} fw)/(Bq l^{-1}) for freshwater (FW) and marine (MA) organisms.

Reference organism	Ecosystem	CR	source	comments
Amphibian	TE	7.20E–02	WTPD	same as mammal (same analogue as applied in ERICA)
Amphibian	FW	1.20E+02	WTPD	same as fish (same analogue as applied in ERICA)
Benthic fish	MA	2.70E+02	WTPD	Data for Ni in ICRP flatfish
Benthic fish	FW	1.20E+02	WTPD	same as pelagic fish
Benthic mollusc	MA	2.80E+03	WTPD	Data for Ni in mollusc
Bird	FW	1.20E+02	WTPD	same as pelagic fish (same analogue as applied in ERICA)
Bird	MA	2.00E+02	WTPD	same as pelagic fish (same analogue as applied in ERICA)
Bird	TE	7.20E–02	WTPD	same as mammal (same analogue as applied in ERICA)
Bird egg	TE	7.20E–02	WTPD	same as mammal (same analogue as applied in ERICA)
Bivalve mollusc	FW	1.20E+02	WTPD	Data for Ni in mollusc
Crustacean	FW	5.50E+02	ERICA	Data for Ni in marine crustacean
Crustacean	MA	5.50E+02	ERICA	Data for Ni from ERICA
Detritivorous invertebrate	TE	8.60E–03	WTPD	Data for Ni in Arthropod
Flying insect	TE	8.60E–03	WTPD	same as detritivorous invertebrate
Gastropod	TE	7.70E–04	WTPD	Data for Ni
Gastropod	FW	1.20E+02	WTPD	Data for Ni in mollusc
Grasses and herbs	TE	6.70E–02	WTPD	Data for Ni
Insect larvae	FW	5.50E+02	ERICA	Data for Ni in marine crustacean
Large mammal	TE	7.20E–02	WTPD	Data for Ni in Mammal
Lichen and bryophytes	TE	2.60E–01	WTPD	Data for Ni
Macroalgae	MA	6.90E+02	WTPD	Data for Ni
Mammal	FW	1.20E+02	WTPD	Data for pelagic fish (same analogue as applied in ERICA)
Mammal	MA	2.00E+02	WTPD	same as pelagic fish (same analogue as applied in ERICA)
Pelagic fish	FW	1.20E+02	WTPD	Data for Ni in fish
Pelagic fish	MA	2.00E+02	WTPD	Data for Ni in fish
Phytoplankton	FW	5.00E+03	ERICA	Data for Ni (from ERICA)
Phytoplankton	MA	3.50E+02	WTPD	Data for Ni
Polchaete worm	MA	4.20E+03	WTPD	Data for Ni
Reptile	TE	3.00E–01	WTPD	Data for Ni
Shrub	TE	2.70E–01	WTPD	Data for Ni
Small mammal	TE	7.20E–02	WTPD	Data for Ni in Mammal
Soil invertebrate (worm)	TE	7.40E–03	WTPD	Data for Ni in Annelid
Tree	TE	1.80E–02	WTPD	Data for Ni
vascular plant	FW	5.00E+01	WTPD	Data for Ni
vascular plant	MA	5.80E+02	WTPD	Data for Ni in estuary
zooplankton	FW	5.00E+03	ERICA	Data for phytoplankton (same analogue as applied in ERICA)
zooplankton	MA	5.00E+02	WTPD	Data for Ni

Table B-9. Concentration ratios for Pa-231 in reference organisms. Units are (Bq kg^{-1} fw)/(Bq kg^{-1} dw) for terrestrial (TE) organisms and (Bq kg^{-1} fw)/(Bq l^{-1}) for freshwater (FW) and marine (MA) organisms.

Reference organism	Ecosystem	CR	source	comments
Amphibian	TE	1.00E–01	WTPD	Data for Am in ICRP Frog (Use of Am to address Cm data gap consistent with ERICA)
Amphibian	FW	3.10E–01	WTPD	Data for Cm
Benthic fish	MA	1.00E+02	ERICA	Data for Cm from IAEA (2004)
Benthic fish	FW	5.60E–02	WTPD	Data for Cm in fish
Benthic mollusc	MA	2.40E+04	WTPD	Data for Cm in mollusc
Bird	FW	5.60E–02	WTPD	Data for Cm in fish (same analogue as applied in ERICA for Cm)
Bird	MA	1.50E+02	ERICA	Data for Pu (actinide analogue) – data value from ERICA
Bird	TE	2.80E–02	WTPD	Data for Am (Use of Am data consistent with ERICA in addressing Cm data gap)
Bird egg	TE	2.80E–02	WTPD	Data for Am (Use of Am data consistent with ERICA in addressing Cm data gap)
Bivalve mollusc	FW	1.70E+01	WTPD	Data for Cm in mollusc
Crustacean	FW	9.70E+01	ERICA	Data for Am (actinide analogue) – data value from ERICA
Crustacean	MA	5.00E+02	WTPD	Data for Am (actinide analogue) –
Detritivorous invertebrate	TE	1.37E–01	ERICA	Data for Cm (CR review)
Flying insect	TE	1.37E–01	ERICA	Same as detritivorous invertebrate (assumption consistent with ERICA for addressing data gap)
Gastropod	TE	1.37E–01	ERICA	Same as detritivorous invertebrate (assumption consistent with ERICA for addressing data gap)
Gastropod	FW	1.70E+01	WTPD	Data for Cm in mollusc
Grasses and herbs	TE	5.00E–04	WTPD	Data for Cm in grass
Insect larvae	FW	2.50E+02	WTPD	Data for Cm
Large mammal	TE	1.30E–01	WTPD	Data for Am in Rangifer (Use of Am in mammal consistent with ERICA in addressing Cm data gap)
Lichen and bryophytes	TE	6.90E–01	WTPD	Data for Am (ERICA uses Th as analogue, but use of Am is more conservative and consistent for addressing other Cm data gaps)
Macroalgae	MA	8.20E+03	WTPD	Data for Cm
Mammal	FW	5.60E–02	WTPD	Data for Cm in fish (same analogue as ERICA for addressing data gap)
Mammal	MA	9.20E+02	WTPD	Data for Pu (actinide analogue) – ERICA analogue, updated with new info in database
Pelagic fish	FW	5.60E–02	WTPD	Data for Cm
Pelagic fish	MA	1.00E+02	ERICA	Data for Cm from IAEA (2004)
Phytoplankton	FW	1.93E+04	ERICA	Data for Cm (empirical)
Phytoplankton	MA	2.10E+05	WTPD	Data for Cm
Polchaete worm	MA	8.40E+02	WTPD	Data for Pu (actinide analogue) – ERICA analogue, updated with new info in database
Reptile	TE	9.80E–03	WTPD	Data for Am in mammal (use of Am in mammal consistent with ERICA for addressing Cm data gap)
Shrub	TE	9.40E–03	WTPD	Data for Cm in tree (use of tree consistent with ERICA approach for addressing Cm data gap)
Small mammal	TE	9.80E–03	WTPD	Data for Am in mammal (use of Am in mammal consistent with ERICA for addressing Cm data gap)
Soil invertebrate (worm)	TE	1.37E–01	ERICA	Same as detritivorous invertebrate (assumption consistent with ERICA for addressing data gap)
Tree	TE	9.40E–03	WTPD	Data for Cm
vascular plant	FW	6.30E–01	WTPD	Data for Cm
vascular plant	MA	8.20E+03	WTPD	Same as macroalgae (same analogue as applied in ERICA)
zooplankton	FW	1.93E+04	ERICA	Data for Cm in phytoplankton (same analogue as applied in ERICA for data gap – more conservative than use of insect larvae)
zooplankton	MA	4.50E+03	WTPD	Data for Pu (actinide analogue) – ERICA analogue, updated with new info in database

Table B-10. Concentration ratios applied to representative species in freshwater (FW), marine (MA) and terrestrial (TE) ecosystems in units of (Bq kg^{-1} fw)/(Bq l^{-1}) for aquatic species and (Bq kg^{-1} fw)/(Bq kg^{-1} dw) for terrestrial species. The cells are shaded according to the applied data source. A key to the colour scheme applied is provided at the end of the table.

Habitat	Representative species	Ac	Ag	Am	C	Ca	Cl	Cm	Cs	Ho	I	Nb	Ni	Np	Pa	Pb	Pd	Po	Pu	Ra	Se	Sm	Sn	Sr	Tc	Th	U	Zr
FW	Pool frog	3E+0	1E+2	3E+0	7E+3	9E+2	2E+1	3E+0	1E+3	1E+1	7E+1	1E+1	9E+0	1E+2	3E+0	5E+0	9E+0	2E+2	2E+1	2E+1	7E+2	3E+0	6E+1	1E+2	3E+1	8E+1	2E–1	6E+1
FW	Northern crested newt	3E+0	1E+2	3E+0	7E+3	9E+2	2E+1	3E+0	1E+3	1E+1	7E+1	1E+1	9E+0	1E+2	3E+0	5E+0	9E+0	2E+2	2E+1	2E+1	7E+2	3E+0	6E+1	1E+2	3E+1	8E+1	2E–1	6E+1
FW	Water pygmy-weed	4E+3	2E+3	4E+3	5E+3	7E+2	7E+0	4E+3	8E+2	2E+3	4E+2	3E+3	8E+2	4E+3	4E+3	6E+3	8E+2	2E+3	3E+4	1E+3	5E+2	2E+3	5E+2	3E+2	6E+0	9E+2	2E+2	5E+2
FW	*Elatine orthos-perma*	4E+3	2E+3	4E+3	5E+3	7E+2	7E+0	4E+3	8E+2	2E+3	4E+2	3E+3	8E+2	4E+3	4E+3	6E+3	8E+2	2E+3	3E+4	1E+3	5E+2	2E+3	5E+2	3E+2	6E+0	9E+2	2E+2	5E+2
FW	Spatulaleaf loosestrife	4E+3	2E+3	4E+3	5E+3	7E+2	7E+0	4E+3	8E+2	2E+3	4E+2	3E+3	8E+2	4E+3	4E+3	6E+3	8E+2	2E+3	3E+4	1E+3	5E+2	2E+3	5E+2	3E+2	6E+0	9E+2	2E+2	5E+2
FW	*Alisma wahlen-bergii*	4E+3	2E+3	4E+3	5E+3	7E+2	7E+0	4E+3	8E+2	2E+3	4E+2	3E+3	8E+2	4E+3	4E+3	6E+3	8E+2	2E+3	3E+4	1E+3	5E+2	2E+3	5E+2	3E+2	6E+0	9E+2	2E+2	5E+2
FW	Bittercress	4E+3	2E+3	4E+3	5E+3	7E+2	7E+0	4E+3	8E+2	2E+3	4E+2	3E+3	8E+2	4E+3	4E+3	6E+3	8E+2	2E+3	3E+4	1E+3	5E+2	2E+3	5E+2	3E+2	6E+0	9E+2	2E+2	5E+2
FW	Shetland pond-weed	4E+3	2E+3	4E+3	5E+3	7E+2	7E+0	4E+3	8E+2	2E+3	4E+2	3E+3	8E+2	4E+3	4E+3	6E+3	8E+2	2E+3	3E+4	1E+3	5E+2	2E+3	5E+2	3E+2	6E+0	9E+2	2E+2	5E+2
FW	Flat-stalked pondweed	4E+3	2E+3	4E+3	5E+3	7E+2	7E+0	4E+3	8E+2	2E+3	4E+2	3E+3	8E+2	4E+3	4E+3	6E+3	8E+2	2E+3	3E+4	1E+3	5E+2	2E+3	5E+2	3E+2	6E+0	9E+2	2E+2	5E+2
FW	Water mudwort	4E+3	2E+3	4E+3	5E+3	7E+2	7E+0	4E+3	8E+2	2E+3	4E+2	3E+3	8E+2	4E+3	4E+3	6E+3	8E+2	2E+3	3E+4	1E+3	5E+2	2E+3	5E+2	3E+2	6E+0	9E+2	2E+2	5E+2
FW	*Persicaria foliosa*	4E+3	2E+3	4E+3	5E+3	7E+2	7E+0	4E+3	8E+2	2E+3	4E+2	3E+3	8E+2	4E+3	4E+3	6E+3	8E+2	2E+3	3E+4	1E+3	5E+2	2E+3	5E+2	3E+2	6E+0	9E+2	2E+2	5E+2
FW	*Chara sp.*	4E+3	2E+3	4E+3	5E+3	7E+2	7E+0	4E+3	8E+2	2E+3	4E+2	3E+3	8E+2	4E+3	4E+3	6E+3	8E+2	2E+3	3E+4	1E+3	5E+2	2E+3	5E+2	3E+2	6E+0	9E+2	2E+2	5E+2
FW	Least stonewort	4E+3	2E+3	4E+3	5E+3	7E+2	7E+0	4E+3	8E+2	2E+3	4E+2	3E+3	8E+2	4E+3	4E+3	6E+3	8E+2	2E+3	3E+4	1E+3	5E+2	2E+3	5E+2	3E+2	6E+0	9E+2	2E+2	5E+2
FW	Rugged stone-wort	4E+3	2E+3	4E+3	5E+3	7E+2	7E+0	4E+3	8E+2	2E+3	4E+2	3E+3	8E+2	4E+3	4E+3	6E+3	8E+2	2E+3	3E+4	1E+3	5E+2	2E+3	5E+2	3E+2	6E+0	9E+2	2E+2	5E+2
FW	Slender stone-wort	4E+3	2E+3	4E+3	5E+3	7E+2	7E+0	4E+3	8E+2	2E+3	4E+2	3E+3	8E+2	4E+3	4E+3	6E+3	8E+2	2E+3	3E+4	1E+3	5E+2	2E+3	5E+2	3E+2	6E+0	9E+2	2E+2	5E+2
FW	Starry stone-wort	4E+3	2E+3	4E+3	5E+3	7E+2	7E+0	4E+3	8E+2	2E+3	4E+2	3E+3	8E+2	4E+3	4E+3	6E+3	8E+2	2E+3	3E+4	1E+3	5E+2	2E+3	5E+2	3E+2	6E+0	9E+2	2E+2	5E+2
FW	Pointed stone-wort	4E+3	2E+3	4E+3	5E+3	7E+2	7E+0	4E+3	8E+2	2E+3	4E+2	3E+3	8E+2	4E+3	4E+3	6E+3	8E+2	2E+3	3E+4	1E+3	5E+2	2E+3	5E+2	3E+2	6E+0	9E+2	2E+2	5E+2
FW	Slimy-fruited stonewort	4E+3	2E+3	4E+3	5E+3	7E+2	7E+0	4E+3	8E+2	2E+3	4E+2	3E+3	8E+2	4E+3	4E+3	6E+3	8E+2	2E+3	3E+4	1E+3	5E+2	2E+3	5E+2	3E+2	6E+0	9E+2	2E+2	5E+2
FW	Grasswrack pondweed	4E+3	2E+3	4E+3	5E+3	7E+2	7E+0	4E+3	8E+2	2E+3	4E+2	3E+3	8E+2	4E+3	4E+3	6E+3	8E+2	2E+3	3E+4	1E+3	5E+2	2E+3	5E+2	3E+2	6E+0	9E+2	2E+2	5E+2
FW	RS-Phytoplank-ton	4E+3	6E+4	4E+3	2E+3	7E+2	7E+0	4E+3	8E+2	2E+3	4E+2	3E+3	8E+2	4E+3	4E+3	6E+3	8E+2	3E+4	5E+3	1E+3	5E+2	2E+3	5E+2	3E+2	8E+0	9E+2	2E+2	5E+2
FW	Micro-phyto-benthos	4E+3	6E+4	4E+3	2E+3	7E+2	7E+0	4E+3	8E+2	2E+3	4E+2	3E+3	8E+2	4E+3	4E+3	6E+3	8E+2	3E+4	5E+3	1E+3	5E+2	2E+3	5E+2	3E+2	8E+0	9E+2	2E+2	5E+2
FW	Vimba bream	3E+0	1E+2	3E+0	5E+3	4E+2	2E+1	3E+0	1E+3	1E+1	7E+1	1E+1	9E+0	3E+0	3E+0	4E+2	9E+0	2E+2	2E+1	2E+1	7E+2	3E+0	6E+1	1E+2	3E+1	8E+1	2E–1	6E+1

Table B-10. Continued.

Habitat	Representative species	Ac	Ag	Am	C	Ca	Cl	Cm	Cs	Ho	I	Nb	Ni	Np	Pa	Pb	Pd	Po	Pu	Ra	Se	Sm	Sn	Sr	Tc	Th	U	Zr
FW	Asp	3E+0	1E+2	3E+0	5E+3	4E+2	2E+1	3E+0	1E+3	1E+1	7E+1	1E+1	9E+0	3E+0	3E+0	4E+2	9E+0	2E+2	2E+1	2E+1	7E+2	3E+0	6E+1	1E+2	3E+1	8E+1	2E–1	6E+1
FW	Sheatfish	3E+0	1E+2	3E+0	5E+3	4E+2	2E+1	3E+0	1E+3	1E+1	7E+1	1E+1	9E+0	3E+0	3E+0	4E+2	9E+0	2E+2	2E+1	2E+1	7E+2	3E+0	6E+1	1E+2	3E+1	8E+1	2E–1	6E+1
FW	Ruffe	3E+0	1E+2	3E+0	5E+3	4E+2	2E+1	3E+0	1E+3	1E+1	7E+1	1E+1	9E+0	3E+0	3E+0	4E+2	9E+0	2E+2	2E+1	2E+1	7E+2	3E+0	6E+1	1E+2	3E+1	8E+1	2E–1	6E+1
FW	Burbot	3E+0	1E+2	3E+0	5E+3	4E+2	2E+1	3E+0	1E+3	1E+1	7E+1	1E+1	9E+0	3E+0	3E+0	4E+2	9E+0	2E+2	2E+1	2E+1	7E+2	3E+0	6E+1	1E+2	3E+1	8E+1	2E–1	6E+1
FW	European eel	3E+0	1E+2	3E+0	5E+3	4E+2	2E+1	3E+0	1E+3	1E+1	7E+1	1E+1	9E+0	3E+0	3E+0	4E+2	9E+0	2E+2	2E+1	2E+1	7E+2	3E+0	6E+1	1E+2	3E+1	8E+1	2E–1	6E+1
FW	Common roach	3E+0	1E+2	3E+0	5E+3	4E+2	2E+1	3E+0	1E+3	1E+1	7E+1	1E+1	9E+0	3E+0	3E+0	4E+2	9E+0	2E+2	2E+1	2E+1	7E+2	3E+0	6E+1	1E+2	3E+1	8E+1	2E–1	6E+1
FW	Tench	3E+0	1E+2	3E+0	5E+3	4E+2	2E+1	3E+0	1E+3	1E+1	7E+1	1E+1	9E+0	3E+0	3E+0	4E+2	9E+0	2E+2	2E+1	2E+1	7E+2	3E+0	6E+1	1E+2	3E+1	8E+1	2E–1	6E+1
FW	European perch	3E+0	1E+2	3E+0	5E+3	4E+2	2E+1	3E+0	1E+3	1E+1	7E+1	1E+1	9E+0	3E+0	3E+0	4E+2	9E+0	2E+2	2E+1	2E+1	7E+2	3E+0	6E+1	1E+2	3E+1	8E+1	2E–1	6E+1
FW	Northern pike	3E+0	1E+2	3E+0	5E+3	4E+2	2E+1	3E+0	1E+3	1E+1	7E+1	1E+1	9E+0	3E+0	3E+0	4E+2	9E+0	2E+2	2E+1	2E+1	7E+2	3E+0	6E+1	1E+2	3E+1	8E+1	2E–1	6E+1
FW	Common pochard	3E+0	1E+2	3E+0	7E+3	4E+2	2E+1	3E+0	1E+3	1E+1	7E+1	1E+1	9E+0	1E+2	3E+0	4E+2	9E+0	2E+2	2E+0	2E+1	7E+2	3E+0	6E+1	1E+2	3E+1	8E+1	2E–1	6E+1
FW	Horned grebe	3E+0	1E+2	3E+0	7E+3	4E+2	2E+1	3E+0	1E+3	1E+1	7E+1	1E+1	9E+0	1E+2	3E+0	4E+2	9E+0	2E+2	2E+0	2E+1	7E+2	3E+0	6E+1	1E+2	3E+1	8E+1	2E–1	6E+1
FW	Common kingfisher	3E+0	1E+2	3E+0	7E+3	4E+2	2E+1	3E+0	1E+3	1E+1	7E+1	1E+1	9E+0	1E+2	3E+0	4E+2	9E+0	2E+2	2E+0	2E+1	7E+2	3E+0	6E+1	1E+2	3E+1	8E+1	2E–1	6E+1
FW	Black tern	3E+0	1E+2	3E+0	7E+3	4E+2	2E+1	3E+0	1E+3	1E+1	7E+1	1E+1	9E+0	1E+2	3E+0	4E+2	9E+0	2E+2	2E+0	2E+1	7E+2	3E+0	6E+1	1E+2	3E+1	8E+1	2E–1	6E+1
FW	Depressed river mussel	2E+3	3E+3	2E+3	7E+3	3E+2	2E+1	2E+3	3E+2	3E+2	2E+2	7E+2	3E+2	2E+3	2E+3	6E+3	3E+2	2E+4	8E+2	3E+3	3E+3	5E+2	1E+2	3E+2	3E+1	3E+2	2E+1	1E+2
FW	Thick shelled river mussel	2E+3	3E+3	2E+3	7E+3	3E+2	2E+1	2E+3	3E+2	3E+2	2E+2	7E+2	3E+2	2E+3	2E+3	6E+3	3E+2	2E+4	8E+2	3E+3	3E+3	5E+2	1E+2	3E+2	3E+1	3E+2	2E+1	1E+2
FW	Painter's mussel	2E+3	3E+3	2E+3	7E+3	3E+2	2E+1	2E+3	3E+2	3E+2	2E+2	7E+2	3E+2	2E+3	2E+3	6E+3	3E+2	2E+4	8E+2	3E+3	3E+3	5E+2	1E+2	3E+2	3E+1	3E+2	2E+1	1E+2
FW	Duck mussel	2E+3	3E+3	2E+3	7E+3	3E+2	2E+1	2E+3	3E+2	3E+2	2E+2	7E+2	3E+2	2E+3	2E+3	6E+3	3E+2	2E+4	8E+2	3E+3	3E+3	5E+2	1E+2	3E+2	3E+1	3E+2	2E+1	1E+2
FW	*Tanymastix stagnalis*	2E+3	3E+3	2E+3	7E+3	3E+2	2E+1	2E+3	3E+2	3E+2	2E+2	7E+2	3E+2	2E+3	2E+3	6E+3	3E+2	1E+4	1E+3	1E+3	3E+3	5E+2	1E+2	3E+2	1E+1	3E+2	2E+1	1E+2
FW	Clam shrimp	2E+3	3E+3	2E+3	7E+3	3E+2	2E+1	2E+3	3E+2	3E+2	2E+2	7E+2	3E+2	2E+3	2E+3	6E+3	3E+2	1E+4	1E+3	1E+3	3E+3	5E+2	1E+2	3E+2	1E+1	3E+2	2E+1	1E+2
FW	Tadpole shrimp	2E+3	3E+3	2E+3	7E+3	3E+2	2E+1	2E+3	3E+2	3E+2	2E+2	7E+2	3E+2	2E+3	2E+3	6E+3	3E+2	1E+4	1E+3	1E+3	3E+3	5E+2	1E+2	3E+2	1E+1	3E+2	2E+1	1E+2
FW	Signal crayfish	2E+3	3E+3	2E+3	7E+3	3E+2	2E+1	2E+3	3E+2	3E+2	2E+2	7E+2	3E+2	2E+3	2E+3	6E+3	3E+2	1E+4	1E+3	1E+3	3E+3	5E+2	1E+2	3E+2	1E+1	3E+2	2E+1	1E+2
FW	European crayfish	2E+3	3E+3	2E+3	7E+3	3E+2	2E+1	2E+3	3E+2	3E+2	2E+2	7E+2	3E+2	2E+3	2E+3	6E+3	3E+2	1E+4	1E+3	1E+3	3E+3	5E+2	1E+2	3E+2	1E+1	3E+2	2E+1	1E+2
FW	*Anisus spirorbis*	2E+3	3E+3	2E+3	7E+3	3E+2	2E+1	2E+3	3E+2	3E+2	2E+2	7E+2	3E+2	2E+3	2E+3	6E+3	3E+2	1E+4	8E+2	7E+2	3E+3	5E+2	1E+2	3E+2	2E+1	3E+2	2E+1	1E+2
FW	Large mouthed valve snail	2E+3	3E+3	2E+3	7E+3	3E+2	2E+1	2E+3	3E+2	3E+2	2E+2	7E+2	3E+2	2E+3	2E+3	6E+3	3E+2	1E+4	8E+2	7E+2	3E+3	5E+2	1E+2	3E+2	2E+1	3E+2	2E+1	1E+2
FW	*Bagous binodulus*	2E+3	3E+3	2E+3	7E+3	3E+2	2E+1	2E+3	3E+2	3E+2	2E+2	7E+2	3E+2	2E+3	2E+3	6E+3	3E+2	1E+4	1E+3	1E+3	3E+3	5E+2	1E+2	3E+2	1E+1	3E+2	2E+1	1E+2
FW	*Bagous petro*	2E+3	3E+3	2E+3	7E+3	3E+2	2E+1	2E+3	3E+2	3E+2	2E+2	7E+2	3E+2	2E+3	2E+3	6E+3	3E+2	1E+4	1E+3	1E+3	3E+3	5E+2	1E+2	3E+2	1E+1	3E+2	2E+1	1E+2
FW	*Donacia brevitarsis*	2E+3	3E+3	2E+3	7E+3	3E+2	2E+1	2E+3	3E+2	3E+2	2E+2	7E+2	3E+2	2E+3	2E+3	6E+3	3E+2	1E+4	1E+3	1E+3	3E+3	5E+2	1E+2	3E+2	1E+1	3E+2	2E+1	1E+2
FW	*Macroplea appendiculata*	2E+3	3E+3	2E+3	7E+3	3E+2	2E+1	2E+3	3E+2	3E+2	2E+2	7E+2	3E+2	2E+3	2E+3	6E+3	3E+2	1E+4	1E+3	1E+3	3E+3	5E+2	1E+2	3E+2	1E+1	3E+2	2E+1	1E+2
FW	*Sigara hellensii*	2E+3	3E+3	2E+3	7E+3	3E+2	2E+1	2E+3	3E+2	3E+2	2E+2	7E+2	3E+2	2E+3	2E+3	6E+3	3E+2	1E+4	1E+3	1E+3	3E+3	5E+2	1E+2	3E+2	1E+1	3E+2	2E+1	1E+2

Habitat	Representative species	Ac	Ag	Am	C	Ca	Cl	Cm	Cs	Ho	I	Nb	Ni	Np	Pa	Pb	Pd	Po	Pu	Ra	Se	Sm	Sn	Sr	Tc	Th	U	Zr
FW	*Hydaticus continentalis*	2E+3	3E+3	2E+3	7E+3	3E+2	2E+1	2E+3	3E+2	3E+2	2E+2	7E+2	3E+2	2E+3	2E+3	6E+3	3E+2	1E+4	1E+3	1E+3	3E+3	5E+2	1E+2	3E+2	1E+1	3E+2	2E+1	1E+2
FW	*Hydrochus megaphallus*	2E+3	3E+3	2E+3	7E+3	3E+2	2E+1	2E+3	3E+2	3E+2	2E+2	7E+2	3E+2	2E+3	2E+3	6E+3	3E+2	1E+4	1E+3	1E+3	3E+3	5E+2	1E+2	3E+2	1E+1	3E+2	2E+1	1E+2
FW	*Cloeon schoenemundi*	2E+3	3E+3	2E+3	7E+3	3E+2	2E+1	2E+3	3E+2	3E+2	2E+2	7E+2	3E+2	2E+3	2E+3	6E+3	3E+2	1E+4	1E+3	1E+3	3E+3	5E+2	1E+2	3E+2	1E+1	3E+2	2E+1	1E+2
FW	*Donacia dentata*	2E+3	3E+3	2E+3	7E+3	3E+2	2E+1	2E+3	3E+2	3E+2	2E+2	7E+2	3E+2	2E+3	2E+3	6E+3	3E+2	1E+4	1E+3	1E+3	3E+3	5E+2	1E+2	3E+2	1E+1	3E+2	2E+1	1E+2
FW	Pygmy damselfly	2E+3	3E+3	2E+3	7E+3	3E+2	2E+1	2E+3	3E+2	3E+2	2E+2	7E+2	3E+2	2E+3	2E+3	6E+3	3E+2	1E+4	1E+3	1E+3	3E+3	5E+2	1E+2	3E+2	1E+1	3E+2	2E+1	1E+2
FW	Clubbed general	2E+3	3E+3	2E+3	7E+3	3E+2	2E+1	2E+3	3E+2	3E+2	2E+2	7E+2	3E+2	2E+3	2E+3	6E+3	3E+2	1E+4	1E+3	1E+3	3E+3	5E+2	1E+2	3E+2	1E+1	3E+2	2E+1	1E+2
FW	Three-lined soldier	2E+3	3E+3	2E+3	7E+3	3E+2	2E+1	2E+3	3E+2	3E+2	2E+2	7E+2	3E+2	2E+3	2E+3	6E+3	3E+2	1E+4	1E+3	1E+3	3E+3	5E+2	1E+2	3E+2	1E+1	3E+2	2E+1	1E+2
FW	*Tanypodinae sp.*	2E+3	3E+3	2E+3	7E+3	3E+2	2E+1	2E+3	3E+2	3E+2	2E+2	7E+2	3E+2	2E+3	2E+3	6E+3	3E+2	1E+4	1E+3	1E+3	3E+3	5E+2	1E+2	3E+2	1E+1	3E+2	2E+1	1E+2
FW	European otter	3E+0	1E+2	3E+0	7E+3	4E+2	2E+1	3E+0	1E+3	1E+1	7E+1	1E+1	9E+0	1E+2	3E+0	4E+2	9E+0	2E+2	2E+2	2E+1	7E+2	3E+0	6E+1	1E+2	3E+1	8E+1	2E−1	6E+1
FW	RS-Zooplankton	3E+4	2E+4	3E+4	4E+3	3E+2	2E+1	3E+4	1E+3	6E+3	9E+2	1E+1	3E+3	3E+4	3E+4	3E+4	3E+3	3E+4	4E+2	3E+1	3E+4	2E+4	6E+1	3E+2	2E+1	5E+3	4E+1	2E+4
FW	European water vole (FW)	3E+0	1E+2	3E+0	7E+3	4E+2	2E+1	3E+0	1E+3	1E+1	7E+1	1E+1	9E+0	1E+2	3E+0	4E+2	9E+0	2E+2	2E+2	2E+1	7E+2	3E+0	6E+1	1E+2	3E+1	8E+1	2E−1	6E+1
FW	Common toad (FW)	3E+0	1E+2	3E+0	7E+3	9E+2	2E+1	3E+0	1E+3	1E+1	7E+1	1E+1	9E+0	1E+2	3E+0	5E+0	9E+0	2E+2	2E+1	2E+1	7E+2	3E+0	6E+1	1E+2	3E+1	8E+1	2E−1	6E+1
MA	Vimba bream	3E+0	2E+3	3E+0	1E+4	9E+1	1E−1	3E+0	2E+2	3E+0	3E+1	2E+1	2E+1	1E+0	3E+0	2E+2	2E+1	1E+4	2E+1	2E+1	4E+3	2E+1	4E+2	1E+0	2E+1	7E+2	2E−1	4E+2
MA	Burbot	3E+0	2E+3	3E+0	1E+4	9E+1	1E−1	3E+0	2E+2	3E+0	3E+1	2E+1	2E+1	1E+0	3E+0	2E+2	2E+1	1E+4	2E+1	2E+1	4E+3	2E+1	4E+2	1E+0	2E+1	7E+2	2E−1	4E+2
MA	Viviparous eelpout	3E+0	2E+3	3E+0	1E+4	9E+1	1E−1	3E+0	2E+2	3E+0	3E+1	2E+1	2E+1	1E+0	3E+0	2E+2	2E+1	1E+4	2E+1	2E+1	4E+3	2E+1	4E+2	1E+0	2E+1	7E+2	2E−1	4E+2
MA	Lumpsucker	3E+0	2E+3	3E+0	1E+4	9E+1	1E−1	3E+0	2E+2	3E+0	3E+1	2E+1	2E+1	1E+0	3E+0	2E+2	2E+1	1E+4	2E+1	2E+1	4E+3	2E+1	4E+2	1E+0	2E+1	7E+2	2E−1	4E+2
MA	European eel	3E+0	2E+3	3E+0	1E+4	9E+1	1E−1	3E+0	2E+2	3E+0	3E+1	2E+1	2E+1	1E+0	3E+0	2E+2	2E+1	1E+4	2E+1	2E+1	4E+3	2E+1	4E+2	1E+0	2E+1	7E+2	2E−1	4E+2
MA	Atlantic herring	3E+0	2E+3	3E+0	1E+4	9E+1	1E−1	3E+0	2E+2	3E+0	3E+1	2E+1	2E+1	1E+0	3E+0	2E+2	2E+1	1E+4	2E+1	2E+1	4E+3	2E+1	4E+2	1E+0	2E+1	7E+2	2E−1	4E+2
MA	European sprat	3E+0	2E+3	3E+0	1E+4	9E+1	1E−1	3E+0	2E+2	3E+0	3E+1	2E+1	2E+1	1E+0	3E+0	2E+2	2E+1	1E+4	2E+1	2E+1	4E+3	2E+1	4E+2	1E+0	2E+1	7E+2	2E−1	4E+2
MA	European perch	3E+0	2E+3	3E+0	1E+4	9E+1	1E−1	3E+0	2E+2	3E+0	3E+1	2E+1	2E+1	1E+0	3E+0	2E+2	2E+1	1E+4	2E+1	2E+1	4E+3	2E+1	4E+2	1E+0	2E+1	7E+2	2E−1	4E+2
MA	Northern pike	3E+0	2E+3	3E+0	1E+4	9E+1	1E−1	3E+0	2E+2	3E+0	3E+1	2E+1	2E+1	1E+0	3E+0	2E+2	2E+1	1E+4	2E+1	2E+1	4E+3	2E+1	4E+2	1E+0	2E+1	7E+2	2E−1	4E+2
MA	Atlantic salmon	3E+0	2E+3	3E+0	1E+4	9E+1	1E−1	3E+0	2E+2	3E+0	3E+1	2E+1	2E+1	1E+0	3E+0	2E+2	2E+1	1E+4	2E+1	2E+1	4E+3	2E+1	4E+2	1E+0	2E+1	7E+2	2E−1	4E+2
MA	Brown trout	3E+0	2E+3	3E+0	1E+4	9E+1	1E−1	3E+0	2E+2	3E+0	3E+1	2E+1	2E+1	1E+0	3E+0	2E+2	2E+1	1E+4	2E+1	2E+1	4E+3	2E+1	4E+2	1E+0	2E+1	7E+2	2E−1	4E+2
MA	Zander	3E+0	2E+3	3E+0	1E+4	9E+1	1E−1	3E+0	2E+2	3E+0	3E+1	2E+1	2E+1	1E+0	3E+0	2E+2	2E+1	1E+4	2E+1	2E+1	4E+3	2E+1	4E+2	1E+0	2E+1	7E+2	2E−1	4E+2
MA	*Coregonus sp.*	3E+0	2E+3	3E+0	1E+4	9E+1	1E−1	3E+0	2E+2	3E+0	3E+1	2E+1	2E+1	1E+0	3E+0	2E+2	2E+1	1E+4	2E+1	2E+1	4E+3	2E+1	4E+2	1E+0	2E+1	7E+2	2E−1	4E+2
MA	Baltic macoma	4E+3	2E+4	4E+3	1E+4	3E+3	1E−1	4E+3	2E+2	4E+2	5E+1	3E+2	4E+2	3E+2	4E+3	1E+3	4E+2	2E+4	7E+2	5E+1	7E+2	2E+3	5E+2	3E+3	6E+3	1E+4	3E+2	6E+3
MA	Greater scaup	3E+0	2E+4	3E+0	2E+4	9E+1	1E−1	3E+0	2E+2	3E+0	3E+1	2E+1	2E+1	4E+0	3E+0	2E+2	2E+1	1E−4	1E+2	2E+1	4E+3	2E+1	4E+2	1E+0	2E+1	7E+2	4E+0	4E+2
MA	Common eider	3E+0	2E+4	3E+0	2E+4	9E+1	1E−1	3E+0	2E+2	3E+0	3E+1	2E+1	2E+1	4E+0	3E+0	2E+2	2E+1	1E−4	1E+2	2E+1	4E+3	2E+1	4E+2	1E+0	2E+1	7E+2	4E+0	4E+2

Table B-10. Continued.

Habitat	Representative species	Ac	Ag	Am	C	Ca	Cl	Cm	Cs	Ho	I	Nb	Ni	Np	Pa	Pb	Pd	Po	Pu	Ra	Se	Sm	Sn	Sr	Tc	Th	U	Zr
MA	European herring gull	3E+0	2E+4	3E+0	2E+4	9E+1	1E–1	3E+0	2E+2	3E+0	3E+1	2E+1	2E+1	4E+0	3E+0	2E+2	2E+1	1E–4	1E+2	2E+1	4E+3	2E+1	4E+2	1E+0	2E+1	7E+2	4E+0	4E+2
MA	Horned grebe	3E+0	2E+4	3E+0	2E+4	9E+1	1E–1	3E+0	2E+2	3E+0	3E+1	2E+1	2E+1	4E+0	3E+0	2E+2	2E+1	1E–4	1E+2	2E+1	4E+3	2E+1	4E+2	1E+0	2E+1	7E+2	4E+0	4E+2
MA	Black guillemot	3E+0	2E+4	3E+0	2E+4	9E+1	1E–1	3E+0	2E+2	3E+0	3E+1	2E+1	2E+1	4E+0	3E+0	2E+2	2E+1	1E–4	1E+2	2E+1	4E+3	2E+1	4E+2	1E+0	2E+1	7E+2	4E+0	4E+2
MA	Ruddy turnstone	3E+0	2E+4	3E+0	2E+4	9E+1	1E–1	3E+0	2E+2	3E+0	3E+1	2E+1	2E+1	4E+0	3E+0	2E+2	2E+1	1E–4	1E+2	2E+1	4E+3	2E+1	4E+2	1E+0	2E+1	7E+2	4E+0	4E+2
MA	White-tailed eagle	3E+0	2E+4	3E+0	2E+4	9E+1	1E–1	3E+0	2E+2	3E+0	3E+1	2E+1	2E+1	4E+0	3E+0	2E+2	2E+1	1E–4	1E+2	2E+1	4E+3	2E+1	4E+2	1E+0	2E+1	7E+2	4E+0	4E+2
MA	*Idotea balthica*	8E+3	2E+4	8E+3	1E+4	4E+3	6E–2	8E+3	6E+2	1E+3	4E+0	1E+2	6E+3	1E+2	8E+3	5E+3	6E+3	4E+4	1E+2	1E+2	2E+3	2E+3	4E+2	4E+3	2E+4	2E+4	1E+1	1E+4
MA	European otter	3E+0	2E+4	3E+0	2E+4	9E+1	1E–1	3E+0	2E+2	3E+0	3E+1	2E+1	2E+1	4E–1	3E+0	2E+2	2E+1	6E+3	2E+2	6E+1	4E+3	2E+1	4E+2	1E+0	2E+1	7E+2	4E–1	4E+2
MA	Ringed seal	3E+0	2E+4	3E+0	2E+4	9E+1	1E–1	3E+0	2E+2	3E+0	3E+1	2E+1	2E+1	4E–1	3E+0	2E+2	2E+1	6E+3	2E+2	6E+1	4E+3	2E+1	4E+2	1E+0	2E+1	7E+2	4E–1	4E+2
MA	RS-Phytoplankton	3E+2	4E+4	3E+2	6E+3	2E+1	2E+0	3E+2	2E+3	7E+1	8E+2	1E+3	2E+3	1E+2	3E+2	3E+3	2E+3	2E+4	8E+4	9E+2	6E+2	2E+2	8E+2	5E+1	2E+0	7E+4	9E+1	4E+4
MA	*Stypocaulon scoparium*	3E+2	2E+3	3E+2	8E+3	2E+1	2E+0	3E+2	2E+3	7E+1	8E+2	1E+3	2E+3	5E+1	3E+2	3E+3	2E+3	8E+2	2E+3	9E+2	6E+2	2E+2	8E+2	5E+1	4E+4	7E+4	9E+1	4E+4
MA	Bristly stonewort	3E+2	2E+3	3E+2	8E+3	2E+1	2E+0	3E+2	2E+3	7E+1	8E+2	1E+3	2E+3	5E+1	3E+2	3E+3	2E+3	8E+2	2E+3	9E+2	6E+2	2E+2	8E+2	5E+1	4E+4	7E+4	9E+1	4E+4
MA	Bladderwrack	3E+2	2E+3	3E+2	8E+3	2E+1	2E+0	3E+2	2E+3	7E+1	8E+2	1E+3	2E+3	5E+1	3E+2	3E+3	2E+3	8E+2	2E+3	9E+2	6E+2	2E+2	8E+2	5E+1	4E+4	7E+4	9E+1	4E+4
MA	Grasswrack pondweed	3E+2	2E+3	3E+2	8E+3	2E+1	2E+0	3E+2	2E+3	7E+1	8E+2	1E+3	2E+3	5E+1	3E+2	3E+3	2E+3	8E+2	2E+3	9E+2	6E+2	2E+2	8E+2	5E+1	4E+4	7E+4	9E+1	4E+4
MA	Water pygmyweed	3E+2	2E+3	3E+2	8E+3	2E+1	2E+0	3E+2	2E+3	7E+1	8E+2	1E+3	2E+3	5E+1	3E+2	3E+3	2E+3	8E+2	2E+3	9E+2	6E+2	2E+2	8E+2	5E+1	4E+4	7E+4	9E+1	4E+4
MA	*Elatine orthosperma*	3E+2	2E+3	3E+2	8E+3	2E+1	2E+0	3E+2	2E+3	7E+1	8E+2	1E+3	2E+3	5E+1	3E+2	3E+3	2E+3	8E+2	2E+3	9E+2	6E+2	2E+2	8E+2	5E+1	4E+4	7E+4	9E+1	4E+4
MA	*Alisma wahlenbergii*	3E+2	2E+3	3E+2	8E+3	2E+1	2E+0	3E+2	2E+3	7E+1	8E+2	1E+3	2E+3	5E+1	3E+2	3E+3	2E+3	8E+2	2E+3	9E+2	6E+2	2E+2	8E+2	5E+1	4E+4	7E+4	9E+1	4E+4
MA	*Potamogeton friesii*	3E+2	2E+3	3E+2	8E+3	2E+1	2E+0	3E+2	2E+3	7E+1	8E+2	1E+3	2E+3	5E+1	3E+2	3E+3	2E+3	8E+2	2E+3	9E+2	6E+2	2E+2	8E+2	5E+1	4E+4	7E+4	9E+1	4E+4
MA	Water mudwort	3E+2	2E+3	3E+2	8E+3	2E+1	2E+0	3E+2	2E+3	7E+1	8E+2	1E+3	2E+3	5E+1	3E+2	3E+3	2E+3	8E+2	2E+3	9E+2	6E+2	2E+2	8E+2	5E+1	4E+4	7E+4	9E+1	4E+4
MA	Polychaete worms	4E+3	3E+4	4E+3	1E+4	3E+3	1E–1	4E+3	1E+2	4E+2	5E+1	3E+2	4E+3	3E+2	4E+3	1E+3	4E+3	2E+4	8E+2	1E+2	5E+3	2E+3	5E+2	3E+3	2E+4	1E+4	3E+2	6E+3
MA	RS-Zooplankton	3E+4	2E+4	3E+4	1E+4	3E+2	1E+0	3E+4	5E+1	6E+3	1E+3	2E+4	3E+3	3E+4	3E+4	2E+4	3E+3	5E+4	5E+3	7E+1	3E+4	2E+4	2E+4	3E+2	1E+2	5E+3	3E+1	2E+4
TE	*Omphalina philonotis*	1E–4	3E–1	1E–4	9E+2	2E–3	2E+1	1E–4	1E+0	3E–4	3E–3	4E–4	1E–2	1E–4	1E–4	1E–3	1E–2	3E–4	4E–4	3E–3	3E–3	1E–4	5E–4	3E–3	3E–3	5E–4	4E–4	1E–3
TE	Yellow foot	1E–4	3E–1	1E–4	9E+2	2E–3	2E+1	1E–4	1E+0	3E–4	3E–3	4E–4	1E–2	1E–4	1E–4	1E–3	1E–2	3E–4	4E–4	3E–3	3E–3	1E–4	5E–4	3E–3	3E–3	5E–4	4E–4	1E–3
TE	Pool frog	7E–5	3E–1	7E–5	1E+3	1E+0	2E+1	7E–5	3E–1	7E–5	3E–2	6E–4	8E–3	7E–5	7E–5	3E–3	8E–3	2E–3	2E–2	6E–2	6E–2	2E–4	2E–2	1E+0	4E–1	3E–3	3E–4	8E–3
TE	Common toad	7E–5	3E–1	7E–5	1E+3	1E+0	2E+1	7E–5	3E–1	7E–5	3E–2	6E–4	8E–3	7E–5	7E–5	3E–3	8E–3	2E–3	2E–2	6E–2	6E–2	2E–4	2E–2	1E+0	4E–1	3E–3	3E–4	8E–3
TE	Ruff	7E–5	3E–1	7E–5	1E+3	3E–3	2E+1	7E–5	2E–1	7E–5	3E–2	2E–1	8E–3	7E–5	7E–5	3E–3	8E–3	2E–3	1E–2	6E–2	6E–2	2E–4	2E–2	1E–1	2E–1	4E–4	5E–4	8E–3
TE	Eurasian bittern	7E–5	3E–1	7E–5	1E+3	3E–3	2E+1	7E–5	2E–1	7E–5	3E–2	2E–1	8E–3	7E–5	7E–5	3E–3	8E–3	2E–3	1E–2	6E–2	6E–2	2E–4	2E–2	1E–1	2E–1	4E–4	5E–4	8E–3
TE	Spotted crake	7E–5	3E–1	7E–5	1E+3	3E–3	2E+1	7E–5	2E–1	7E–5	3E–2	2E–1	8E–3	7E–5	7E–5	3E–3	8E–3	2E–3	1E–2	6E–2	6E–2	2E–4	2E–2	1E–1	2E–1	4E–4	5E–4	8E–3

Habitat	Representative species	Ac	Ag	Am	C	Ca	Cl	Cm	Cs	Ho	I	Nb	Ni	Np	Pa	Pb	Pd	Po	Pu	Ra	Se	Sm	Sn	Sr	Tc	Th	U	Zr
TE	Common grasshopper warbler	7E–5	3E–1	7E–5	1E+3	3E–3	2E+1	7E–5	2E–1	7E–5	3E–2	2E–1	8E–3	7E–5	7E–5	3E–3	8E–3	2E–3	1E–2	6E–2	6E–2	2E–4	2E–2	1E–1	2E–1	4E–4	5E–4	8E–3
TE	Short-eared owl	7E–5	3E–1	7E–5	1E+3	3E–3	2E+1	7E–5	2E–1	7E–5	3E–2	2E–1	8E–3	7E–5	7E–5	3E–3	8E–3	2E–3	1E–2	6E–2	6E–2	2E–4	2E–2	1E–1	2E–1	4E–4	5E–4	8E–3
TE	*Chlaenius sulcicollis*	1E+0	7E–1	4E–2	4E+2	8E–2	2E–1	1E–1	5E–2	4E–2	1E–1	5E–4	2E–2	2E–1	1E+0	6E–1	2E–2	1E–1	2E–2	9E–2	1E+0	4E–2	5E–4	8E–2	4E–1	9E–3	9E–3	5E–4
TE	Large gold grasshopper	1E+0	7E–1	4E–2	4E+2	8E–2	2E–1	1E–1	5E–2	4E–2	1E–1	5E–4	2E–2	2E–1	1E+0	6E–1	2E–2	1E–1	2E–2	9E–2	1E+0	4E–2	5E–4	8E–2	4E–1	9E–3	9E–3	5E–4
TE	*Singa nitidula*	1E+0	7E–1	4E–2	4E+2	8E–2	2E–1	1E–1	5E–2	4E–2	1E–1	5E–4	2E–2	2E–1	1E+0	6E–1	2E–2	1E–1	2E–2	9E–2	1E+0	4E–2	5E–4	8E–2	4E–1	9E–3	9E–3	5E–4
TE	Pygmy damselfly	4E–2	7E–1	4E–2	4E+2	6E–2	2E–1	1E–1	1E–2	4E–2	3E–1	5E–4	9E–3	4E–2	4E–2	6E–2	9E–3	1E–1	1E–2	9E–2	1E+0	4E–2	5E–4	6E–2	4E–1	9E–3	9E–3	5E–4
TE	Marsh fritillary	4E–2	7E–1	4E–2	4E+2	6E–2	2E–1	1E–1	1E–2	4E–2	3E–1	5E–4	9E–3	4E–2	4E–2	6E–2	9E–3	1E–1	1E–2	9E–2	1E+0	4E–2	5E–4	6E–2	4E–1	9E–3	9E–3	5E–4
TE	Geyer's whorl snail	2E–1	7E–1	2E–1	4E+2	9E–2	1E–1	1E–1	4E–2	2E–1	2E–1	5E–4	2E–2	6E–2	2E–1	4E–3	2E–2	1E–1	9E–2	3E–2	3E–2	2E–1	5E–4	9E–2	4E–1	9E–3	9E–3	5E–4
TE	Yellow widelip orchid	3E–4	5E–3	7E–5	9E+2	1E–1	5E+1	3E–4	4E–2	8E–4	2E–2	1E–3	1E–2	3E–4	3E–4	4E–3	1E–2	7E–4	1E–4	7E–3	6E–3	3E–4	2E–2	1E–1	8E–3	1E–3	1E–4	3E–3
TE	Cloudberry	3E–4	5E–3	3E–4	9E+2	1E–1	5E+1	3E–4	4E–2	8E–4	2E–2	1E–3	1E–2	3E–4	3E–4	4E–3	1E–2	7E–4	1E–4	7E–3	6E–3	3E–4	2E–2	1E–1	8E–3	1E–3	1E–4	3E–3
TE	European alder	3E–4	5E–3	3E–4	1E+3	1E–1	5E+1	3E–4	4E–2	8E–4	2E–2	1E–3	1E–2	3E–4	3E–4	4E–3	1E–2	7E–4	1E–4	7E–3	6E–3	3E–4	2E–2	1E–1	8E–3	1E–3	1E–4	3E–3
TE	Flea sedge	3E–4	5E–3	7E–5	9E+2	1E–1	5E+1	3E–4	4E–2	8E–4	2E–2	1E–3	1E–2	3E–4	3E–4	4E–3	1E–2	7E–4	1E–4	7E–3	6E–3	3E–4	2E–2	1E–1	8E–3	1E–3	1E–4	3E–3
TE	Bottle sedge	3E–4	5E–3	7E–5	9E+2	1E–1	5E+1	3E–4	4E–2	8E–4	2E–2	1E–3	1E–2	3E–4	3E–4	4E–3	1E–2	7E–4	1E–4	7E–3	6E–3	3E–4	2E–2	1E–1	8E–3	1E–3	1E–4	3E–3
TE	Common reed	3E–4	5E–3	7E–5	9E+2	1E–1	5E+1	3E–4	4E–2	8E–4	2E–2	1E–3	1E–2	3E–4	3E–4	4E–3	1E–2	7E–4	1E–4	7E–3	6E–3	3E–4	2E–2	1E–1	8E–3	1E–3	1E–4	3E–3
TE	Cranberry	3E–4	5E–3	3E–4	9E+2	1E–1	5E+1	3E–4	4E–2	8E–4	2E–2	1E–3	1E–2	3E–4	3E–4	4E–3	1E–2	7E–4	1E–4	7E–3	6E–3	3E–4	2E–2	1E–1	8E–3	1E–3	1E–4	3E–3
TE	Silver birch	3E–4	5E–3	3E–4	1E+3	1E–1	5E+1	3E–4	4E–2	8E–4	2E–2	1E–3	1E–2	3E–4	3E–4	4E–3	1E–2	7E–4	1E–4	7E–3	6E–3	3E–4	2E–2	1E–1	8E–3	1E–3	1E–4	3E–3
TE	Scots pine	3E–4	5E–3	3E–4	1E+3	1E–1	5E+1	3E–4	4E–2	8E–4	2E–2	1E–3	1E–2	3E–4	3E–4	4E–3	1E–2	7E–4	1E–4	7E–3	6E–3	3E–4	2E–2	1E–1	8E–3	1E–3	1E–4	3E–3
TE	Norway spruce	3E–4	5E–3	3E–4	1E+3	1E–1	5E+1	3E–4	4E–2	8E–4	2E–2	1E–3	1E–2	3E–4	3E–4	4E–3	1E–2	7E–4	1E–4	7E–3	6E–3	3E–4	2E–2	1E–1	8E–3	1E–3	1E–4	3E–3
TE	Dwarf neckera	1E–2	3E–1	1E–2	9E+2	2E–1	1E+1	1E–2	1E–1	1E–2	7E–2	4E–2	4E–2	1E–2	1E–2	1E–1	4E–2	6E+0	3E–2	3E–2	1E–1	1E–2	9E–2	2E–1	2E+1	1E–2	3E–2	1E–1
TE	*Nephroma laevigatum*	1E–2	3E–1	1E–2	9E+2	2E–1	1E+1	1E–2	1E–1	1E–2	7E–2	4E–2	4E–2	1E–2	1E–2	1E–1	4E–2	6E+0	3E–2	3E–2	1E–1	1E–2	9E–2	2E–1	2E+1	1E–2	3E–2	1E–1
TE	Slender green feather moss	1E–2	3E–1	1E–2	9E+2	2E–1	1E+1	1E–2	1E–1	1E–2	7E–2	4E–2	4E–2	1E–2	1E–2	1E–1	4E–2	6E+0	3E–2	3E–2	1E–1	1E–2	9E–2	2E–1	2E+1	1E–2	3E–2	1E–1
TE	*Scapania apiculata*	1E–2	3E–1	1E–2	9E+2	2E–1	1E+1	1E–2	1E–1	1E–2	7E–2	4E–2	4E–2	1E–2	1E–2	1E–1	4E–2	6E+0	3E–2	3E–2	1E–1	1E–2	9E–2	2E–1	2E+1	1E–2	3E–2	1E–1
TE	*Sphagnum sp*	1E–2	3E–1	1E–2	9E+2	2E–1	1E+1	1E–2	1E–1	1E–2	7E–2	4E–2	4E–2	1E–2	1E–2	1E–1	4E–2	6E+0	3E–2	3E–2	1E–1	1E–2	9E–2	2E–1	2E+1	1E–2	3E–2	1E–1
TE	*Sphagnum sp.* (Subm)	4E+0	2E+0	4E+0	5E+3	7E–1	7E–3	4E+0	8E–1	2E+0	4E–1	3E+0	8E–1	7E+0	4E+0	6E+0	8E–1	2E+0	3E+1	1E+0	5E–1	2E+0	5E–1	3E–1	6E–3	9E–1	2E–1	5E–1
TE	Knowlton's thread-moss	1E–2	3E–1	1E–2	9E+2	2E–1	1E+1	1E–2	1E–1	1E–2	7E–2	4E–2	4E–2	1E–2	1E–2	1E–1	4E–2	6E+0	3E–2	3E–2	1E–1	1E–2	9E–2	2E–1	2E+1	1E–2	3E–2	1E–1
TE	Eurasian lynx	7E–5	3E–1	7E–5	1E+3	1E–2	2E+1	7E–5	1E–1	7E–5	3E–2	6E–4	8E–3	7E–5	7E–5	1E–2	8E–3	2E–3	9E–4	6E–2	6E–2	2E–4	2E–2	3E–3	4E–1	3E–3	3E–4	8E–3
TE	Natterer's bat	7E–5	3E–1	7E–5	1E+3	1E–2	2E+1	7E–5	1E–1	7E–5	3E–2	6E–4	8E–3	7E–5	7E–5	1E–2	8E–3	2E–3	2E–2	6E–2	6E–2	2E–4	2E–2	3E–3	4E–1	3E–3	3E–4	8E–3
TE	European water vole	7E–5	3E–1	7E–5	1E+3	1E–2	2E+1	7E–5	1E–1	7E–5	3E–2	6E–4	8E–3	7E–5	7E–5	1E–2	8E–3	2E–3	2E–2	6E–2	6E–2	2E–4	2E–2	3E–3	4E–1	3E–3	3E–4	8E–3

Table B-10. Continued.

Habitat	Representative species	Ac	Ag	Am	C	Ca	Cl	Cm	Cs	Ho	I	Nb	Ni	Np	Pa	Pb	Pd	Po	Pu	Ra	Se	Sm	Sn	Sr	Tc	Th	U	Zr
TE	Roe deer	7E–5	3E–1	7E–5	1E+3	1E–2	2E+1	7E–5	1E–1	7E–5	3E–2	6E–4	8E–3	7E–5	7E–5	1E–2	8E–3	2E–3	9E–4	6E–2	6E–2	2E–4	2E–2	3E–3	4E–1	3E–3	3E–4	8E–3
TE	Eurasian elk (U.S.: Moose)	7E–5	3E–1	7E–5	1E+3	1E–2	2E+1	7E–5	1E–1	7E–5	3E–2	6E–4	8E–3	7E–5	7E–5	1E–2	8E–3	2E–3	9E–4	6E–2	6E–2	2E–4	2E–2	3E–3	4E–1	3E–3	3E–4	8E–3
TE	Mountain hare	7E–5	3E–1	7E–5	1E+3	1E–2	2E+1	7E–5	1E–1	7E–5	3E–2	6E–4	8E–3	7E–5	7E–5	1E–2	8E–3	2E–3	9E–4	6E–2	6E–2	2E–4	2E–2	3E–3	4E–1	3E–3	3E–4	8E–3
TE	European hare	7E–5	3E–1	7E–5	1E+3	1E–2	2E+1	7E–5	1E–1	7E–5	3E–2	6E–4	8E–3	7E–5	7E–5	1E–2	8E–3	2E–3	9E–4	6E–2	6E–2	2E–4	2E–2	3E–3	4E–1	3E–3	3E–4	8E–3
TE	Red fox	7E–5	3E–1	7E–5	1E+3	1E–2	2E+1	7E–5	1E–1	7E–5	3E–2	6E–4	8E–3	7E–5	7E–5	1E–2	8E–3	2E–3	9E–4	6E–2	6E–2	2E–4	2E–2	3E–3	4E–1	3E–3	3E–4	8E–3
TE	Grass snake	7E–5	3E–1	7E–5	1E+3	1E–2	2E+1	7E–5	1E–1	7E–5	3E–2	6E–4	8E–3	7E–5	7E–5	1E–2	8E–3	2E–3	2E–2	6E–2	6E–2	2E–4	2E–2	3E–3	4E–1	3E–3	3E–4	8E–3
TE	*Lumbricus sp.*	6E–2	7E–1	6E–2	4E+2	9E–3	2E–1	1E–1	4E–2	6E–2	1E–1	5E–4	5E–2	6E–2	6E–2	2E–2	5E–2	1E–1	2E–2	9E–2	1E+0	6E–2	5E–4	9E–3	4E–1	9E–3	9E–3	5E–4
TE	Northern crested newt (TE)	7E–5	3E–1	7E–5	1E+3	1E+0	2E+1	7E–5	3E–1	7E–5	3E–2	6E–4	8E–3	7E–5	7E–5	3E–3	8E–3	2E–3	2E–2	6E–2	6E–2	2E–4	2E–2	1E+0	4E–1	3E–3	3E–4	8E–3
TE	Common kingfisher (TE)	7E–5	3E–1	7E–5	1E+3	3E–3	2E+1	7E–5	2E–1	7E–5	3E–2	2E–1	8E–3	7E–5	7E–5	3E–3	8E–3	2E–3	1E–2	6E–2	6E–2	2E–4	2E–2	1E–1	2E–1	4E–4	5E–4	8E–3
TE	Black tern (TE)	7E–5	3E–1	7E–5	1E+3	3E–3	2E+1	7E–5	2E–1	7E–5	3E–2	2E–1	8E–3	7E–5	7E–5	3E–3	8E–3	2E–3	1E–2	6E–2	6E–2	2E–4	2E–2	1E–1	2E–1	4E–4	5E–4	8E–3
TE	Sea birds' (TE)	7E–5	3E–1	7E–5	1E+3	3E–3	2E+1	7E–5	2E–1	7E–5	3E–2	2E–1	8E–3	7E–5	7E–5	3E–3	8E–3	2E–3	1E–2	6E–2	6E–2	2E–4	2E–2	1E–1	2E–1	4E–4	5E–4	8E–3
TE	Ruddy turnstone (TE)	7E–5	3E–1	7E–5	1E+3	3E–3	2E+1	7E–5	2E–1	7E–5	3E–2	2E–1	8E–3	7E–5	7E–5	3E–3	8E–3	2E–3	1E–2	6E–2	6E–2	2E–4	2E–2	1E–1	2E–1	4E–4	5E–4	8E–3
TE	White-tailed eagle (TE)	7E–5	3E–1	7E–5	1E+3	3E–3	2E+1	7E–5	2E–1	7E–5	3E–2	2E–1	8E–3	7E–5	7E–5	3E–3	8E–3	2E–3	1E–2	6E–2	6E–2	2E–4	2E–2	1E–1	2E–1	4E–4	5E–4	8E–3
TE	European otter (TE)	7E–5	3E–1	7E–5	1E+3	1E–2	2E+1	7E–5	1E–1	7E–5	3E–2	6E–4	8E–3	7E–5	7E–5	1E–2	8E–3	2E–3	9E–4	6E–2	6E–2	2E–4	2E–2	3E–3	4E–1	3E–3	3E–4	8E–3
TE	Ringed seal (TE)	7E–5	3E–1	7E–5	1E+3	1E–2	2E+1	7E–5	1E–1	7E–5	3E–2	6E–4	8E–3	7E–5	7E–5	1E–2	8E–3	2E–3	9E–4	6E–2	6E–2	2E–4	2E–2	3E–3	4E–1	3E–3	3E–4	8E–3

Coloured cells indicate application of different data sources:

- Site data for radionuclide of interest
- Site data applied as analogue
- Literature data (ERICA)
- Literature data (Other)

Table B-11. Results of a comparison of representative species concentration ratios relative to those for their comparative reference organism. Values in bold indicate that use of the reference organism CR may result in an under estimation of dose rate compared with that derived from the application of site data. A key to the order of magnitude shading scheme applied is provided at the end of the table.

Habitat	RO	Ac	Ag	Am	C	Ca	Cl	Cm	Cs	Ho	I	Nb	Ni	Np	Pa	Pb	Pd	Po	Pu	Ra	Se	Sm	Sn	Sr	Tc	Th	U	Zr
FW	Phytoplankton	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
FW	RS-Phytoplankton	7E+0	1E+0	1E–1	1E+0	2E+1	2E–2	2E–1	2E–1	5E–2	2E–1	3E+0	2E–1	1E–1	2E–1	1E–2	2E–1	1E+0	8E–1	1E+0	1E–1	6E–2	1E–2	8E+0	1E+0	2E–1	2E+0	1E–2
FW	Microphytoben-thos	7E+0	1E+0	1E–1	1E+0	2E+1	2E–2	2E–1	2E–1	5E–2	2E–1	3E+0	2E–1	1E–1	2E–1	1E–2	2E–1	1E+0	8E–1	1E+0	1E–1	6E–2	1E–2	8E+0	1E+0	2E–1	2E+0	1E–2
FW	Vascular plant	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
FW	Grasswrack pondweed	7E+0	1E+0	1E+0	1E+0	3E+0	2E–2	1E+1	7E–1	5E–1	1E+0	4E+0	2E+1	1E+0	7E+3	6E+0	2E+1	6E–1	1E+1	7E–1	5E–1	6E–1	2E–1	1E+0	4E–3	7E–1	6E–2	2E–1
FW	Water pygmyweed	7E+0	1E+0	1E+0	1E+0	3E+0	2E–2	1E+1	7E–1	5E–1	1E+0	4E+0	2E+1	1E+0	7E+3	6E+0	2E+1	6E–1	1E+1	7E–1	5E–1	6E–1	2E–1	1E+0	4E–3	7E–1	6E–2	2E–1
FW	Elatine orthosperma	7E+0	1E+0	1E+0	1E+0	3E+0	2E–2	1E+1	7E–1	5E–1	1E+0	4E+0	2E+1	1E+0	7E+3	6E+0	2E+1	6E–1	1E+1	7E–1	5E–1	6E–1	2E–1	1E+0	4E–3	7E–1	6E–2	2E–1
FW	Spatulaleaf loosestrife	7E+0	1E+0	1E+0	1E+0	3E+0	2E–2	1E+1	7E–1	5E–1	1E+0	4E+0	2E+1	1E+0	7E+3	6E+0	2E+1	6E–1	1E+1	7E–1	5E–1	6E–1	2E–1	1E+0	4E–3	7E–1	6E–2	2E–1
FW	Alisma wahlen-bergii	7E+0	1E+0	1E+0	1E+0	3E+0	2E–2	1E+1	7E–1	5E–1	1E+0	4E+0	2E+1	1E+0	7E+3	6E+0	2E+1	6E–1	1E+1	7E–1	5E–1	6E–1	2E–1	1E+0	4E–3	7E–1	6E–2	2E–1
FW	Bittercress	7E+0	1E+0	1E+0	1E+0	3E+0	2E–2	1E+1	7E–1	5E–1	1E+0	4E+0	2E+1	1E+0	7E+3	6E+0	2E+1	6E–1	1E+1	7E–1	5E–1	6E–1	2E–1	1E+0	4E–3	7E–1	6E–2	2E–1
FW	Shetland pondweed	7E+0	1E+0	1E+0	1E+0	3E+0	2E–2	1E+1	7E–1	5E–1	1E+0	4E+0	2E+1	1E+0	7E+3	6E+0	2E+1	6E–1	1E+1	7E–1	5E–1	6E–1	2E–1	1E+0	4E–3	7E–1	6E–2	2E–1
FW	Flat-stalked pondweed	7E+0	1E+0	1E+0	1E+0	3E+0	2E–2	1E+1	7E–1	5E–1	1E+0	4E+0	2E+1	1E+0	7E+3	6E+0	2E+1	6E–1	1E+1	7E–1	5E–1	6E–1	2E–1	1E+0	4E–3	7E–1	6E–2	2E–1
FW	Water mudwort	7E+0	1E+0	1E+0	1E+0	3E+0	2E–2	1E+1	7E–1	5E–1	1E+0	4E+0	2E+1	1E+0	7E+3	6E+0	2E+1	6E–1	1E+1	7E–1	5E–1	6E–1	2E–1	1E+0	4E–3	7E–1	6E–2	2E–1
FW	Persicaria foliosa	7E+0	1E+0	1E+0	1E+0	3E+0	2E–2	1E+1	7E–1	5E–1	1E+0	4E+0	2E+1	1E+0	7E+3	6E+0	2E+1	6E–1	1E+1	7E–1	5E–1	6E–1	2E–1	1E+0	4E–3	7E–1	6E–2	2E–1
FW	Chara sp.	7E+0	1E+0	1E+0	1E+0	3E+0	2E–2	1E+1	7E–1	5E–1	1E+0	4E+0	2E+1	1E+0	7E+3	6E+0	2E+1	6E–1	1E+1	7E–1	5E–1	6E–1	2E–1	1E+0	4E–3	7E–1	6E–2	2E–1
FW	Least stonewort	7E+0	1E+0	1E+0	1E+0	3E+0	2E–2	1E+1	7E–1	5E–1	1E+0	4E+0	2E+1	1E+0	7E+3	6E+0	2E+1	6E–1	1E+1	7E–1	5E–1	6E–1	2E–1	1E+0	4E–3	7E–1	6E–2	2E–1
FW	Rugged stonewort	7E+0	1E+0	1E+0	1E+0	3E+0	2E–2	1E+1	7E–1	5E–1	1E+0	4E+0	2E+1	1E+0	7E+3	6E+0	2E+1	6E–1	1E+1	7E–1	5E–1	6E–1	2E–1	1E+0	4E–3	7E–1	6E–2	2E–1
FW	Slender stonewort	7E+0	1E+0	1E+0	1E+0	3E+0	2E–2	1E+1	7E–1	5E–1	1E+0	4E+0	2E+1	1E+0	7E+3	6E+0	2E+1	6E–1	1E+1	7E–1	5E–1	6E–1	2E–1	1E+0	4E–3	7E–1	6E–2	2E–1
FW	Starry stonewort	7E+0	1E+0	1E+0	1E+0	3E+0	2E–2	1E+1	7E–1	5E–1	1E+0	4E+0	2E+1	1E+0	7E+3	6E+0	2E+1	6E–1	1E+1	7E–1	5E–1	6E–1	2E–1	1E+0	4E–3	7E–1	6E–2	2E–1
FW	Pointed stonewort	7E+0	1E+0	1E+0	1E+0	3E+0	2E–2	1E+1	7E–1	5E–1	1E+0	4E+0	2E+1	1E+0	7E+3	6E+0	2E+1	6E–1	1E+1	7E–1	5E–1	6E–1	2E–1	1E+0	4E–3	7E–1	6E–2	2E–1
FW	Slimy-fruited stonewort	7E+0	1E+0	1E+0	1E+0	3E+0	2E–2	1E+1	7E–1	5E–1	1E+0	4E+0	2E+1	1E+0	7E+3	6E+0	2E+1	6E–1	1E+1	7E–1	5E–1	6E–1	2E–1	1E+0	4E–3	7E–1	6E–2	2E–1
FW	Zooplankton	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
FW	RS-Zooplankton	2E+1	1E+0	8E+1	1E+0	5E+0	6E–2	2E+0	6E–1	1E+1	7E–1	1E–2	6E–1	7E+1	2E+0	1E+0	6E–1	1E+0	9E–1	3E–2	4E+0	5E+1	2E–3	5E+0	1E+0	2E+0	9E–1	6E–1
FW	Bivalve mollusc	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
FW	Depressed river mussel	2E–1	8E–2	3E+0	1E+0	1E+0	4E–1	5E+0	7E–1	6E–1	9E+0	2E+0	4E–2	2E+0	9E+1	4E+0	2E+0	6E–1	1E+0	2E+0	6E–1	1E+0	4E–1	9E–1	1E+0	3E+0	1E–1	4E–1
FW	Thick shelled river mussel	2E–1	8E–2	3E+0	1E+0	1E+0	4E–1	5E+0	7E–1	6E–1	9E+0	2E+0	4E–2	2E+0	9E+1	4E+0	2E+0	6E–1	1E+0	2E+0	6E–1	1E+0	4E–1	9E–1	1E+0	3E+0	1E–1	4E–1
FW	Painter's mussel	2E–1	8E–2	3E+0	1E+0	1E+0	4E–1	5E+0	7E–1	6E–1	9E+0	2E+0	4E–2	2E+0	9E+1	4E+0	2E+0	6E–1	1E+0	2E+0	6E–1	1E+0	4E–1	9E–1	1E+0	3E+0	1E–1	4E–1

Table B-11. Continued.

Habitat	RO	Ac	Ag	Am	C	Ca	Cl	Cm	Cs	Ho	I	Nb	Ni	Np	Pa	Pb	Pd	Po	Pu	Ra	Se	Sm	Sn	Sr	Tc	Th	U	Zr
FW	Duck mussel	2E–1	8E–2	3E+0	1E+0	1E+0	4E–1	5E+0	7E–1	6E–1	9E+0	2E+0	4E–2	2E+0	9E+1	4E+0	2E+0	6E–1	1E+0	2E+0	6E–1	1E+0	4E–1	9E–1	1E+0	3E+0	1E–1	4E–1
FW	Gastropod	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
FW	Anisus spirorbis	2E–1	8E–2	8E+0	1E+0	1E+0	4E–1	5E+0	1E–1	1E+0	9E+0	2E+0	4E–2	2E+0	9E+1	1E–1	2E+0	6E–1	1E+0	7E–1	6E–1	3E+0	4E–1	9E–1	1E+0	3E+0	1E–1	4E–1
FW	Large mouthed valve snail	2E–1	8E–2	8E+0	1E+0	1E+0	4E–1	5E+0	1E–1	1E+0	9E+0	2E+0	4E–2	2E+0	9E+1	1E–1	2E+0	6E–1	1E+0	7E–1	6E–1	3E+0	4E–1	9E–1	1E+0	3E+0	1E–1	4E–1
FW	Crustacean	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
FW	Tanymastix stagnalis	2E+1	2E–1	2E+1	1E+0	1E+0	4E–1	2E+1	3E–2	3E+0	5E–1	2E+0	5E–1	1E+0	2E+1	6E–1	5E–1	1E+0	9E–1	8E–1	4E–1	5E+0	5E–1	1E+0	1E+0	3E+0	4E–2	5E–1
FW	Clam shrimp	2E+1	2E–1	2E+1	1E+0	1E+0	4E–1	2E+1	3E–2	3E+0	5E–1	2E+0	5E–1	1E+0	2E+1	6E–1	5E–1	1E+0	9E–1	8E–1	4E–1	5E+0	5E–1	1E+0	1E+0	3E+0	4E–2	5E–1
FW	Tadpole shrimp	2E+1	2E–1	2E+1	1E+0	1E+0	4E–1	2E+1	3E–2	3E+0	5E–1	2E+0	5E–1	1E+0	2E+1	6E–1	5E–1	1E+0	9E–1	8E–1	4E–1	5E+0	5E–1	1E+0	1E+0	3E+0	4E–2	5E–1
FW	Signal crayfish	2E+1	2E–1	2E+1	1E+0	1E+0	4E–1	2E+1	3E–2	3E+0	5E–1	2E+0	5E–1	1E+0	2E+1	6E–1	5E–1	1E+0	9E–1	8E–1	4E–1	5E+0	5E–1	1E+0	1E+0	3E+0	4E–2	5E–1
FW	European crayfish	2E+1	2E–1	2E+1	1E+0	1E+0	4E–1	2E+1	3E–2	3E+0	5E–1	2E+0	5E–1	1E+0	2E+1	6E–1	5E–1	1E+0	9E–1	8E–1	4E–1	5E+0	5E–1	1E+0	1E+0	3E+0	4E–2	5E–1
FW	Insect larvae	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
FW	Bagous binodulus	9E–1	2E–1	8E–2	1E+0	1E+0	4E–1	1E+0	3E–2	1E–2	5E–1	2E+0	5E–1	8E–2	6E+0	6E–1	5E–1	1E+0	9E–1	8E–1	4E–1	2E–2	1E+0	1E+0	1E+0	3E+0	4E–2	1E+0
FW	Bagous petro	9E–1	2E–1	8E–2	1E+0	1E+0	4E–1	1E+0	3E–2	1E–2	5E–1	2E+0	5E–1	8E–2	6E+0	6E–1	5E–1	1E+0	9E–1	8E–1	4E–1	2E–2	1E+0	1E+0	1E+0	3E+0	4E–2	1E+0
FW	Donacia brevi-tarsis	9E–1	2E–1	8E–2	1E+0	1E+0	4E–1	1E+0	3E–2	1E–2	5E–1	2E+0	5E–1	8E–2	6E+0	6E–1	5E–1	1E+0	9E–1	8E–1	4E–1	2E–2	1E+0	1E+0	1E+0	3E+0	4E–2	1E+0
FW	Macroplea appendiculata	9E–1	2E–1	8E–2	1E+0	1E+0	4E–1	1E+0	3E–2	1E–2	5E–1	2E+0	5E–1	8E–2	6E+0	6E–1	5E–1	1E+0	9E–1	8E–1	4E–1	2E–2	1E+0	1E+0	1E+0	3E+0	4E–2	1E+0
FW	Sigara hellensii	9E–1	2E–1	8E–2	1E+0	1E+0	4E–1	1E+0	3E–2	1E–2	5E–1	2E+0	5E–1	8E–2	6E+0	6E–1	5E–1	1E+0	9E–1	8E–1	4E–1	2E–2	1E+0	1E+0	1E+0	3E+0	4E–2	1E+0
FW	Hydaticus continentalis	9E–1	2E–1	8E–2	1E+0	1E+0	4E–1	1E+0	3E–2	1E–2	5E–1	2E+0	5E–1	8E–2	6E+0	6E–1	5E–1	1E+0	9E–1	8E–1	4E–1	2E–2	1E+0	1E+0	1E+0	3E+0	4E–2	1E+0
FW	Hydrochus megaphallus	9E–1	2E–1	8E–2	1E+0	1E+0	4E–1	1E+0	3E–2	1E–2	5E–1	2E+0	5E–1	8E–2	6E+0	6E–1	5E–1	1E+0	9E–1	8E–1	4E–1	2E–2	1E+0	1E+0	1E+0	3E+0	4E–2	1E+0
FW	Cloeon schoen-emundi	9E–1	2E–1	8E–2	1E+0	1E+0	4E–1	1E+0	3E–2	1E–2	5E–1	2E+0	5E–1	8E–2	6E+0	6E–1	5E–1	1E+0	9E–1	8E–1	4E–1	2E–2	1E+0	1E+0	1E+0	3E+0	4E–2	1E+0
FW	Donacia dentata	9E–1	2E–1	8E–2	1E+0	1E+0	4E–1	1E+0	3E–2	1E–2	5E–1	2E+0	5E–1	8E–2	6E+0	6E–1	5E–1	1E+0	9E–1	8E–1	4E–1	2E–2	1E+0	1E+0	1E+0	3E+0	4E–2	1E+0
FW	Pygmy damselfly	9E–1	2E–1	8E–2	1E+0	1E+0	4E–1	1E+0	3E–2	1E–2	5E–1	2E+0	5E–1	8E–2	6E+0	6E–1	5E–1	1E+0	9E–1	8E–1	4E–1	2E–2	1E+0	1E+0	1E+0	3E+0	4E–2	1E+0
FW	Clubbed general	9E–1	2E–1	8E–2	1E+0	1E+0	4E–1	1E+0	3E–2	1E–2	5E–1	2E+0	5E–1	8E–2	6E+0	6E–1	5E–1	1E+0	9E–1	8E–1	4E–1	2E–2	1E+0	1E+0	1E+0	3E+0	4E–2	1E+0
FW	Three-lined soldier	9E–1	2E–1	8E–2	1E+0	1E+0	4E–1	1E+0	3E–2	1E–2	5E–1	2E+0	5E–1	8E–2	6E+0	6E–1	5E–1	1E+0	9E–1	8E–1	4E–1	2E–2	1E+0	1E+0	1E+0	3E+0	4E–2	1E+0
FW	Tanypodinae sp.	9E–1	2E–1	8E–2	1E+0	1E+0	4E–1	1E+0	3E–2	1E–2	5E–1	2E+0	5E–1	8E–2	6E+0	6E–1	5E–1	1E+0	9E–1	8E–1	4E–1	2E–2	1E+0	1E+0	1E+0	3E+0	4E–2	1E+0
FW	Benthic fish	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
FW	Vimba bream	5E–3	1E+0	8E–3	1E+0	3E+1	3E–1	2E–2	2E–1	4E–2	4E–1	4E–2	9E–2	2E–2	5E+1	1E+0	7E–2	6E–1	3E–1	3E–1	4E+0	8E–3	2E–1	7E+0	8E–1	7E–1	6E–3	2E–1
FW	Sheatfish	5E–3	1E+0	8E–3	1E+0	3E+1	3E–1	2E–2	2E–1	4E–2	4E–1	4E–2	9E–2	2E–2	5E+1	1E+0	7E–2	6E–1	3E–1	3E–1	4E+0	8E–3	2E–1	7E+0	8E–1	7E–1	6E–3	2E–1
FW	Ruffe	5E–3	1E+0	8E–3	1E+0	3E+1	3E–1	2E–2	2E–1	4E–2	4E–1	4E–2	9E–2	2E–2	5E+1	1E+0	7E–2	6E–1	3E–1	3E–1	4E+0	8E–3	2E–1	7E+0	8E–1	7E–1	6E–3	2E–1
FW	Pelagic fish	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
FW	Asp	5E–3	1E+0	1E+0	1E+0	3E+1	3E–1	2E–2	2E–1	7E+0	4E–1	4E–2	9E–2	2E–2	5E+1	1E+0	7E–2	6E–1	3E–1	3E–1	4E+0	2E+0	2E–1	7E+0	8E–1	7E–1	6E–3	2E–1
FW	Burbot	5E–3	1E+0	1E+0	1E+0	3E+1	3E–1	2E–2	2E–1	7E+0	4E–1	4E–2	9E–2	2E–2	5E+1	1E+0	7E–2	6E–1	3E–1	3E–1	4E+0	2E+0	2E–1	7E+0	8E–1	7E–1	6E–3	2E–1
FW	European eel	5E–3	1E+0	1E+0	1E+0	3E+1	3E–1	2E–2	2E–1	7E+0	4E–1	4E–2	9E–2	2E–2	5E+1	1E+0	7E–2	6E–1	3E–1	3E–1	4E+0	2E+0	2E–1	7E+0	8E–1	7E–1	6E–3	2E–1

Table B-11. Continued.

Habitat	RO	Ac	Ag	Am	C	Ca	Cl	Cm	Cs	Ho	I	Nb	Ni	Np	Pa	Pb	Pd	Po	Pu	Ra	Se	Sm	Sn	Sr	Tc	Th	U	Zr
FW	Common roach	5E–3	1E+0	1E+0	1E+0	3E+1	3E–1	2E–2	2E–1	7E+0	4E–1	4E–2	9E–2	2E–2	5E+1	1E+0	7E–2	6E–1	3E–1	3E–1	4E+0	2E+0	2E–1	7E+0	8E–1	7E–1	6E–3	2E–1
FW	Tench	5E–3	1E+0	1E+0	1E+0	3E+1	3E–1	2E–2	2E–1	7E+0	4E–1	4E–2	9E–2	2E–2	5E+1	1E+0	7E–2	6E–1	3E–1	3E–1	4E+0	2E+0	2E–1	7E+0	8E–1	7E–1	6E–3	2E–1
FW	European perch	5E–3	1E+0	1E+0	1E+0	3E+1	3E–1	2E–2	2E–1	7E+0	4E–1	4E–2	9E–2	2E–2	5E+1	1E+0	7E–2	6E–1	3E–1	3E–1	4E+0	2E+0	2E–1	7E+0	8E–1	7E–1	6E–3	2E–1
FW	Northern pike	5E–3	1E+0	1E+0	1E+0	3E+1	3E–1	2E–2	2E–1	7E+0	4E–1	4E–2	9E–2	2E–2	5E+1	1E+0	7E–2	6E–1	3E–1	3E–1	4E+0	2E+0	2E–1	7E+0	8E–1	7E–1	6E–3	2E–1
FW	Amphibian	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
FW	Pool frog	1E–1	1E+0	1E+0	1E+0	5E+1	3E–1	3E–1	1E–1	7E+0	5E–1	4E–2	9E–2	7E–1	8E+0	2E–2	7E–2	6E–1	9E–2	3E–1	4E+0	1E+0	2E–1	7E+0	8E–1	7E–1	6E–3	2E–1
FW	Northern crested newt	1E–1	1E+0	1E+0	1E+0	5E+1	3E–1	3E–1	1E–1	7E+0	5E–1	4E–2	9E–2	7E–1	8E+0	2E–2	7E–2	6E–1	9E–2	3E–1	4E+0	1E+0	2E–1	7E+0	8E–1	7E–1	6E–3	2E–1
FW	Bird	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
FW	Common pochard	1E+0	1E+0	1E+0	1E+0	3E+1	3E–1	2E–2	4E–1	7E+0	5E–1	4E–2	9E–2	7E–1	5E+1	1E+0	7E–2	6E–1	1E+0	3E–1	4E+0	1E+0	2E–1	7E+0	8E–1	7E–1	6E–3	2E–1
FW	Horned grebe	1E+0	1E+0	1E+0	1E+0	3E+1	3E–1	2E–2	4E–1	7E+0	5E–1	4E–2	9E–2	7E–1	5E+1	1E+0	7E–2	6E–1	1E+0	3E–1	4E+0	1E+0	2E–1	7E+0	8E–1	7E–1	6E–3	2E–1
FW	Common kingfisher	1E+0	1E+0	1E+0	1E+0	3E+1	3E–1	2E–2	4E–1	7E+0	5E–1	4E–2	9E–2	7E–1	5E+1	1E+0	7E–2	6E–1	1E+0	3E–1	4E+0	1E+0	2E–1	7E+0	8E–1	7E–1	6E–3	2E–1
FW	Black tern	1E+0	1E+0	1E+0	1E+0	3E+1	3E–1	2E–2	4E–1	7E+0	5E–1	4E–2	9E–2	7E–1	5E+1	1E+0	7E–2	6E–1	1E+0	3E–1	4E+0	1E+0	2E–1	7E+0	8E–1	7E–1	6E–3	2E–1
FW	Mammal	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
FW	European otter	5E–3	1E+0	1E+0	1E+0	3E+1	3E–1	2E–2	1E–1	7E+0	5E–1	4E–2	9E–2	7E–1	5E+1	1E+0	7E–2	6E–1	1E+0	3E–1	4E+0	1E+0	2E–1	7E+0	8E–1	7E–1	6E–3	2E–1
MA	Phytoplankton	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MA	RS-Phytoplankton	2E–3	7E–1	1E–3	1E+0	1E–1	2E+0	1E–3	1E+1	3E–4	8E–1	1E+0	1E+0	9E–1	1E–3	7E–3	5E+0	6E–1	7E–1	9E–1	2E–1	8E–4	2E–2	2E–1	6E–1	9E–2	7E–1	1E+0
MA	Macroalgae	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MA	Stypocaulon scoparium	1E+0	1E+0	4E–1	1E+0	6E–1	2E+0	2E–2	1E+1	9E–2	2E–1	2E+0	2E+0	1E+0	4E–2	3E+0	3E+0	8E–1	6E–1	1E+1	3E+0	2E–1	5E–1	1E+0	1E+0	3E+1	8E–1	2E+1
MA	Bristly stonewort	1E+0	1E+0	4E–1	1E+0	6E–1	2E+0	2E–2	1E+1	9E–2	2E–1	2E+0	2E+0	1E+0	4E–2	3E+0	3E+0	8E–1	6E–1	1E+1	3E+0	2E–1	5E–1	1E+0	1E+0	3E+1	8E–1	2E+1
MA	Bladderwrack	1E+0	1E+0	4E–1	1E+0	6E–1	2E+0	2E–2	1E+1	9E–2	2E–1	2E+0	2E+0	1E+0	4E–2	3E+0	3E+0	8E–1	6E–1	1E+1	3E+0	2E–1	5E–1	1E+0	1E+0	3E+1	8E–1	2E+1
MA	Vascular plant	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MA	Grasswrack pondweed	1E+0	1E+0	4E–1	1E+0	6E–1	2E+0	2E–2	7E+1	9E–2	2E–1	2E+0	2E+0	1E+0	4E–2	3E+0	3E+0	8E–1	6E–1	1E+1	3E+0	2E–1	7E–1	1E+0	1E+0	3E+1	4E–1	3E+1
MA	Water pygmyweed	1E+0	1E+0	4E–1	1E+0	6E–1	2E+0	2E–2	7E+1	9E–2	2E–1	2E+0	2E+0	1E+0	4E–2	3E+0	3E+0	8E–1	6E–1	1E+1	3E+0	2E–1	7E–1	1E+0	1E+0	3E+1	4E–1	3E+1
MA	Elatine orthosperma	1E+0	1E+0	4E–1	1E+0	6E–1	2E+0	2E–2	7E+1	9E–2	2E–1	2E+0	2E+0	1E+0	4E–2	3E+0	3E+0	8E–1	6E–1	1E+1	3E+0	2E–1	7E–1	1E+0	1E+0	3E+1	4E–1	3E+1
MA	Alisma wahlenbergii	1E+0	1E+0	4E–1	1E+0	6E–1	2E+0	2E–2	7E+1	9E–2	2E–1	2E+0	2E+0	1E+0	4E–2	3E+0	3E+0	8E–1	6E–1	1E+1	3E+0	2E–1	7E–1	1E+0	1E+0	3E+1	4E–1	3E+1
MA	Potamogeton friesii	1E+0	1E+0	4E–1	1E+0	6E–1	2E+0	2E–2	7E+1	9E–2	2E–1	2E+0	2E+0	1E+0	4E–2	3E+0	3E+0	8E–1	6E–1	1E+1	3E+0	2E–1	7E–1	1E+0	1E+0	3E+1	4E–1	3E+1
MA	Water mudwort	1E+0	1E+0	4E–1	1E+0	6E–1	2E+0	2E–2	7E+1	9E–2	2E–1	2E+0	2E+0	1E+0	4E–2	3E+0	3E+0	8E–1	6E–1	1E+1	3E+0	2E–1	7E–1	1E+0	1E+0	3E+1	4E–1	3E+1
MA	Zooplankton	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MA	RS-Zooplankton	8E+0	1E+0	8E+0	1E+0	6E+1	1E+0	4E+0	5E–1	1E+0	4E–1	9E–1	3E+0	2E+3	7E+0	7E–1	6E+0	7E–1	6E–1	9E–1	4E+0	5E+0	9E–1	6E+1	1E+0	7E–1	1E+0	9E–1
MA	Benthic mollusc	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MA	Baltic macoma	6E–1	6E–1	5E–1	1E+0	2E+1	3E+0	1E–1	3E+0	5E–2	3E+0	3E–1	7E–2	7E–1	2E–1	7E–1	2E–1	7E–1	6E–1	7E–1	1E–1	3E–1	1E–1	2E+1	7E–1	2E+1	8E+0	1E+0
MA	Polychaete worm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MA	Polychaete worms	6E–1	1E+0	5E–1	1E+0	6E+3	3E+0	3E+0	7E–1	5E–2	3E+0	3E–1	1E+0	7E–1	5E+0	1E–1	1E+0	1E+0	6E–1	8E–1	1E+0	3E–1	1E–1	6E+3	7E–1	2E+1	8E+0	1E+0

Table B-11. Continued.

Habitat	RO	Ac	Ag	Am	C	Ca	Cl	Cm	Cs	Ho	I	Nb	Ni	Np	Pa	Pb	Pd	Po	Pu	Ra	Se	Sm	Sn	Sr	Tc	Th	U	Zr
MA	Crustacean	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MA	Idotea balthica	2E+1	1E+0	6E+0	1E+0	3E+2	1E+0	6E+0	1E+1	1E+0	1E+0	1E+0	1E+1	1E+0	2E+1	5E–1	1E+1	7E–1	8E–1	8E–1	2E–1	2E+0	2E+0	3E+2	7E–1	2E+1	1E+0	5E+1
MA	Benthic fish	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MA	Vimba bream	2E–2	6E–1	5E–2	1E+0	4E+0	2E+0	3E–2	3E+0	5E–2	7E+0	2E–1	1E–1	1E+0	3E–2	8E–1	8E–2	8E–1	6E–3	6E–2	5E–1	3E–1	5E+0	4E–2	5E–1	1E+0	1E–2	5E+0
MA	Viviparous eelpout	2E–2	6E–1	5E–2	1E+0	4E+0	2E+0	3E–2	3E+0	5E–2	7E+0	2E–1	1E–1	1E+0	3E–2	8E–1	8E–2	8E–1	6E–3	6E–2	5E–1	3E–1	5E+0	4E–2	5E–1	1E+0	1E–2	5E+0
MA	Pelagic fish	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MA	Burbot	1E–2	6E–1	5E–2	1E+0	4E+0	2E+0	3E–2	3E+0	5E–2	7E+0	2E–1	1E–1	1E+0	3E–2	8E–1	1E–1	8E–1	6E–3	6E–2	5E–1	3E–1	5E+0	4E–2	5E–1	1E+0	1E–2	5E+0
MA	Lumpsucker	1E–2	6E–1	5E–2	1E+0	4E+0	2E+0	3E–2	3E+0	5E–2	7E+0	2E–1	1E–1	1E+0	3E–2	8E–1	1E–1	8E–1	6E–3	6E–2	5E–1	3E–1	5E+0	4E–2	5E–1	1E+0	1E–2	5E+0
MA	European eel	1E–2	6E–1	5E–2	1E+0	4E+0	2E+0	3E–2	3E+0	5E–2	7E+0	2E–1	1E–1	1E+0	3E–2	8E–1	1E–1	8E–1	6E–3	6E–2	5E–1	3E–1	5E+0	4E–2	5E–1	1E+0	1E–2	5E+0
MA	Atlantic herring	1E–2	6E–1	5E–2	1E+0	4E+0	2E+0	3E–2	3E+0	5E–2	7E+0	2E–1	1E–1	1E+0	3E–2	8E–1	1E–1	8E–1	6E–3	6E–2	5E–1	3E–1	5E+0	4E–2	5E–1	1E+0	1E–2	5E+0
MA	European sprat	1E–2	6E–1	5E–2	1E+0	4E+0	2E+0	3E–2	3E+0	5E–2	7E+0	2E–1	1E–1	1E+0	3E–2	8E–1	1E–1	8E–1	6E–3	6E–2	5E–1	3E–1	5E+0	4E–2	5E–1	1E+0	1E–2	5E+0
MA	European perch	1E–2	6E–1	5E–2	1E+0	4E+0	2E+0	3E–2	3E+0	5E–2	7E+0	2E–1	1E–1	1E+0	3E–2	8E–1	1E–1	8E–1	6E–3	6E–2	5E–1	3E–1	5E+0	4E–2	5E–1	1E+0	1E–2	5E+0
MA	Northern pike	1E–2	6E–1	5E–2	1E+0	4E+0	2E+0	3E–2	3E+0	5E–2	7E+0	2E–1	1E–1	1E+0	3E–2	8E–1	1E–1	8E–1	6E–3	6E–2	5E–1	3E–1	5E+0	4E–2	5E–1	1E+0	1E–2	5E+0
MA	Atlantic salmon	1E–2	6E–1	5E–2	1E+0	4E+0	2E+0	3E–2	3E+0	5E–2	7E+0	2E–1	1E–1	1E+0	3E–2	8E–1	1E–1	8E–1	6E–3	6E–2	5E–1	3E–1	5E+0	4E–2	5E–1	1E+0	1E–2	5E+0
MA	Brown trout	1E–2	6E–1	5E–2	1E+0	4E+0	2E+0	3E–2	3E+0	5E–2	7E+0	2E–1	1E–1	1E+0	3E–2	8E–1	1E–1	8E–1	6E–3	6E–2	5E–1	3E–1	5E+0	4E–2	5E–1	1E+0	1E–2	5E+0
MA	Zander	1E–2	6E–1	5E–2	1E+0	4E+0	2E+0	3E–2	3E+0	5E–2	7E+0	2E–1	1E–1	1E+0	3E–2	8E–1	1E–1	8E–1	6E–3	6E–2	5E–1	3E–1	5E+0	4E–2	5E–1	1E+0	1E–2	5E+0
MA	Coregonus sp.	1E–2	6E–1	5E–2	1E+0	4E+0	2E+0	3E–2	3E+0	5E–2	7E+0	2E–1	1E–1	1E+0	3E–2	8E–1	1E–1	8E–1	6E–3	6E–2	5E–1	3E–1	5E+0	4E–2	5E–1	1E+0	1E–2	5E+0
MA	Bird	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MA	Greater scaup	1E–2	1E+0	2E–2	1E+0	6E+1	4E+0	2E–2	5E–1	2E–2	4E+1	2E–1	1E–1	1E+0	2E–2	9E–3	1E–1	1E–8	9E–1	6E–2	5E–1	1E–1	5E+0	7E–1	5E–1	2E+1	1E+0	5E+0
MA	Common eider	1E–2	1E+0	2E–2	1E+0	6E+1	4E+0	2E–2	5E–1	2E–2	4E+1	2E–1	1E–1	1E+0	2E–2	9E–3	1E–1	1E–8	9E–1	6E–2	5E–1	1E–1	5E+0	7E–1	5E–1	2E+1	1E+0	5E+0
MA	European herring gull	1E–2	1E+0	2E–2	1E+0	6E+1	4E+0	2E–2	5E–1	2E–2	4E+1	2E–1	1E–1	1E+0	2E–2	9E–3	1E–1	1E–8	9E–1	6E–2	5E–1	1E–1	5E+0	7E–1	5E–1	2E+1	1E+0	5E+0
MA	Horned grebe	1E–2	1E+0	2E–2	1E+0	6E+1	4E+0	2E–2	5E–1	2E–2	4E+1	2E–1	1E–1	1E+0	2E–2	9E–3	1E–1	1E–8	9E–1	6E–2	5E–1	1E–1	5E+0	7E–1	5E–1	2E+1	1E+0	5E+0
MA	Black guillemot	1E–2	1E+0	2E–2	1E+0	6E+1	4E+0	2E–2	5E–1	2E–2	4E+1	2E–1	1E–1	1E+0	2E–2	9E–3	1E–1	1E–8	9E–1	6E–2	5E–1	1E–1	5E+0	7E–1	5E–1	2E+1	1E+0	5E+0
MA	Ruddy turnstone	1E–2	1E+0	2E–2	1E+0	6E+1	4E+0	2E–2	5E–1	2E–2	4E+1	2E–1	1E–1	1E+0	2E–2	9E–3	1E–1	1E–8	9E–1	6E–2	5E–1	1E–1	5E+0	7E–1	5E–1	2E+1	1E+0	5E+0
MA	White-tailed eagle	1E–2	1E+0	2E–2	1E+0	6E+1	4E+0	2E–2	5E–1	2E–2	4E+1	2E–1	1E–1	1E+0	2E–2	9E–3	1E–1	1E–8	9E–1	6E–2	5E–1	1E–1	5E+0	7E–1	5E–1	2E+1	1E+0	5E+0
MA	Mammal	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MA	European otter	1E–2	7E–1	1E–2	1E+0	6E+1	4E+0	1E–2	1E+0	1E–2	4E+1	2E–1	1E–1	1E+0	3E–3	9E–3	1E–1	6E–1	9E–1	1E+0	5E–1	5E–2	5E+0	7E–1	1E+0	4E+0	1E+0	5E+0
MA	Ringed seal	1E–2	7E–1	1E–2	1E+0	6E+1	4E+0	1E–2	1E+0	1E–2	4E+1	2E–1	1E–1	1E+0	3E–3	9E–3	1E–1	6E–1	9E–1	1E+0	5E–1	5E–2	5E+0	7E–1	1E+0	4E+0	1E+0	5E+0
TE	Lichen & bryophytes	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TE	Dwarf neckera	2E–2	3E+0	1E–1	1E+0	2E–2	1E+1	1E–1	2E–2	1E–1	2E–1	2E+0	5E–1	1E–1	2E–2	2E–2	2E–1	9E–1	3E–1	1E–1	5E–3	1E–1	5E+0	3E–2	1E+0	1E–1	4E–1	8E+0
TE	Nephroma laevigatum	2E–2	3E+0	1E–1	1E+0	2E–2	1E+1	1E–1	2E–2	1E–1	2E–1	2E+0	5E–1	1E–1	2E–2	2E–2	2E–1	9E–1	3E–1	1E–1	5E–3	1E–1	5E+0	3E–2	1E+0	1E–1	4E–1	8E+0
TE	Slender green feather moss	2E–2	3E+0	1E–1	1E+0	2E–2	1E+1	1E–1	2E–2	1E–1	2E–1	2E+0	5E–1	1E–1	2E–2	2E–2	2E–1	9E–1	3E–1	1E–1	5E–3	1E–1	5E+0	3E–2	1E+0	1E–1	4E–1	8E+0
TE	Scapania apiculata	2E–2	3E+0	1E–1	1E+0	2E–2	1E+1	1E–1	2E–2	1E–1	2E–1	2E+0	5E–1	1E–1	2E–2	2E–2	2E–1	9E–1	3E–1	1E–1	5E–3	1E–1	5E+0	3E–2	1E+0	1E–1	4E–1	8E+0
TE	Sphagnum sp	2E–2	3E+0	1E–1	1E+0	2E–2	1E+1	1E–1	2E–2	1E–1	2E–1	2E+0	5E–1	1E–1	2E–2	2E–2	2E–1	9E–1	3E–1	1E–1	5E–3	1E–1	5E+0	3E–2	1E+0	1E–1	4E–1	8E+0

Table B-11. Continued.

Habitat	RO	Ac	Ag	Am	C	Ca	Cl	Cm	Cs	Ho	I	Nb	Ni	Np	Pa	Pb	Pd	Po	Pu	Ra	Se	Sm	Sn	Sr	Tc	Th	U	Zr
TE	Sphagnum sp. (Subm)	6E+0	2E+1	4E+1	5E+0	8E–2	7E–3	4E+1	1E–1	2E+1	1E+0	2E+2	9E+0	7E+1	6E+0	1E+0	3E+0	4E–1	3E+2	6E+0	3E–2	2E+1	3E+1	4E–2	3E–4	8E+0	3E+0	3E+1
TE	Knowlton's thread-moss	2E–2	3E+0	1E–1	1E+0	2E–2	1E+1	1E–1	2E–2	1E–1	2E–1	2E+0	5E–1	1E–1	2E–2	2E–2	2E–1	9E–1	3E–1	1E–1	5E–3	1E–1	5E+0	3E–2	1E+0	1E–1	4E–1	8E+0
TE	Mushroom (No RO mushroom)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TE	Omphalina philonotis	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TE	Yellow foot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TE	Grasses & Herbs	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TE	Yellow widelip orchid	1E–2	2E–3	1E–2	1E+0	6E–1	3E+0	9E–1	6E–2	2E–1	1E–1	2E–2	8E–2	1E–2	5E–1	6E–2	2E–1	6E–3	9E–3	2E–1	1E–2	7E–2	3E+1	6E–1	4E–4	3E–2	9E–3	6E+0
TE	Flea sedge	1E–2	2E–3	1E–2	1E+0	6E–1	3E+0	9E–1	6E–2	2E–1	1E–1	2E–2	8E–2	1E–2	5E–1	6E–2	2E–1	6E–3	9E–3	2E–1	1E–2	7E–2	3E+1	6E–1	4E–4	3E–2	9E–3	6E+0
TE	Bottle sedge	1E–2	2E–3	1E–2	1E+0	6E–1	3E+0	9E–1	6E–2	2E–1	1E–1	2E–2	8E–2	1E–2	5E–1	6E–2	2E–1	6E–3	9E–3	2E–1	1E–2	7E–2	3E+1	6E–1	4E–4	3E–2	9E–3	6E+0
TE	Common reed	1E–2	2E–3	1E–2	1E+0	6E–1	3E+0	9E–1	6E–2	2E–1	1E–1	2E–2	8E–2	1E–2	5E–1	6E–2	2E–1	6E–3	9E–3	2E–1	1E–2	7E–2	3E+1	6E–1	4E–4	3E–2	9E–3	6E+0
TE	Shrub	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TE	Cloudberry	1E–2	7E–4	5E–2	1E+0	2E+0	5E+1	3E–2	1E–2	2E–1	1E–1	3E–2	4E–1	8E–4	3E–2	1E–2	5E–2	7E–3	4E–3	3E–1	3E–3	7E–2	2E+2	2E+0	4E–4	9E–2	2E–2	3E+1
TE	Cranberry	1E–2	7E–4	5E–2	1E+0	2E+0	5E+1	3E–2	1E–2	2E–1	1E–1	3E–2	4E–1	8E–4	3E–2	1E–2	5E–2	7E–3	4E–3	3E–1	3E–3	7E–2	2E+2	2E+0	4E–4	9E–2	2E–2	3E+1
TE	Tree	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TE	European alder	1E–2	7E–4	2E+0	1E+0	2E–1	3E+1	3E–2	3E–1	7E+0	1E–1	3E–2	8E–1	8E–4	3E–2	5E–2	8E–1	2E–2	4E–3	1E+1	3E–3	3E+0	7E+1	2E–1	3E–2	1E+0	2E–2	1E+1
TE	Silver birch	1E–2	7E–4	2E+0	1E+0	2E–1	3E+1	3E–2	3E–1	7E+0	1E–1	3E–2	8E–1	8E–4	3E–2	5E–2	8E–1	2E–2	4E–3	1E+1	3E–3	3E+0	7E+1	2E–1	3E–2	1E+0	2E–2	1E+1
TE	Scots pine	1E–2	7E–4	2E+0	1E+0	2E–1	3E+1	3E–2	3E–1	7E+0	1E–1	3E–2	8E–1	8E–4	3E–2	5E–2	8E–1	2E–2	4E–3	1E+1	3E–3	3E+0	7E+1	2E–1	3E–2	1E+0	2E–2	1E+1
TE	Norway spruce	1E–2	7E–4	2E+0	1E+0	2E–1	3E+1	3E–2	3E–1	7E+0	1E–1	3E–2	8E–1	8E–4	3E–2	5E–2	8E–1	2E–2	4E–3	1E+1	3E–3	3E+0	7E+1	2E–1	3E–2	1E+0	2E–2	1E+1
TE	Gastropod	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TE	Geyer's whorl snail	2E+0	1E+0	8E–1	1E+0	9E–1	8E–1	9E–1	8E–1	8E–1	1E+0	1E+0	9E–1	3E–1	1E+0	5E–1	2E+1	3E+1	8E–1	7E–1	7E–1	8E–1	1E+0	9E–1	1E+0	1E+0	1E+0	1E+0
TE	Soil Invertebrate (worm)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TE	Lumbricus sp.	7E–1	1E+0	6E–1	1E+0	1E+0	9E–1	9E–1	5E–1	6E–1	9E–1	1E+0	7E–1	6E–1	5E–1	5E–1	6E+0	3E+1	7E–1	1E+0	1E+0	6E–1	1E+0	1E+0	1E+0	1E+0	1E+0	1E+0
TE	Flying insects	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TE	Pygmy damselfly	3E–1	1E+0	3E–1	1E+0	1E+0	6E–1	9E–1	2E–1	3E–1	1E+0	1E+0	1E+0	3E–1	3E–1	1E+0	1E+0	3E+1	7E–1	1E+0	1E+0	3E–1	1E+0	1E+0	1E+0	1E+0	1E+0	1E+0
TE	Marsh fritillary	3E–1	1E+0	3E–1	1E+0	1E+0	6E–1	9E–1	2E–1	3E–1	1E+0	1E+0	1E+0	3E–1	3E–1	1E+0	1E+0	3E+1	7E–1	1E+0	1E+0	3E–1	1E+0	1E+0	1E+0	1E+0	1E+0	1E+0
TE	Detritivorous invertebrate	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TE	Chlaenius sulcicollis	3E+1	1E+0	4E–1	1E+0	2E–1	6E–1	9E–1	4E–1	4E–1	5E–1	1E+0	3E+0	2E+0	8E+0	8E–1	3E+0	3E+1	5E–1	1E+0	1E+0	4E–1	1E+0	2E–1	1E+0	1E+0	1E+0	1E+0
TE	Large gold grasshopper	3E+1	1E+0	4E–1	1E+0	2E–1	6E–1	9E–1	4E–1	4E–1	5E–1	1E+0	3E+0	2E+0	8E+0	8E–1	3E+0	3E+1	5E–1	1E+0	1E+0	4E–1	1E+0	2E–1	1E+0	1E+0	1E+0	1E+0
TE	Singa nitidula	3E+1	1E+0	4E–1	1E+0	2E–1	6E–1	9E–1	4E–1	4E–1	5E–1	1E+0	3E+0	2E+0	8E+0	8E–1	3E+0	3E+1	5E–1	1E+0	1E+0	4E–1	1E+0	2E–1	1E+0	1E+0	1E+0	1E+0
TE	Amphibian	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table B-11. Continued.

Habitat	RO	Ac	Ag	Am	C	Ca	Cl	Cm	Cs	Ho	I	Nb	Ni	Np	Pa	Pb	Pd	Po	Pu	Ra	Se	Sm	Sn	Sr	Tc	Th	U	Zr
TE	Pool frog	7E–4	1E+0	2E–3	1E+0	1E+0	3E+0	2E–3	5E–1	2E–3	8E–2	3E–3	1E–1	2E–3	7E–4	2E–2	1E–1	9E–1	8E–1	2E+0	1E+0	6E–3	1E+3	1E+0	7E–1	7E+0	7E–1	7E+2
TE	Common toad	7E–4	1E+0	2E–3	1E+0	1E+0	3E+0	2E–3	5E–1	2E–3	8E–2	3E–3	1E–1	2E–3	7E–4	2E–2	1E–1	9E–1	8E–1	2E+0	1E+0	6E–3	1E+3	1E+0	7E–1	7E+0	7E–1	7E+2
TE	Reptile	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TE	Grass snake	1E–3	1E+0	2E–3	1E+0	1E–3	3E+0	2E–3	3E–2	2E–3	8E–2	3E–3	1E–1	2E–3	7E–3	2E–1	3E–2	9E–1	8E–1	2E+0	1E+0	6E–3	1E+3	3E–4	1E+0	7E+0	7E–1	7E+2
TE	Bird	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TE	Ruff	2E–3	1E+0	2E–3	1E+0	6E–3	3E+0	2E–3	3E–1	2E–3	8E–2	1E+0	1E–1	2E–3	2E–3	4E–2	1E–1	9E–1	4E–1	2E+0	1E+0	6E–3	1E+3	2E–1	6E–1	1E+0	1E+0	7E+2
TE	Eurasian bittern	2E–3	1E+0	2E–3	1E+0	6E–3	3E+0	2E–3	3E–1	2E–3	8E–2	1E+0	1E–1	2E–3	2E–3	4E–2	1E–1	9E–1	4E–1	2E+0	1E+0	6E–3	1E+3	2E–1	6E–1	1E+0	1E+0	7E+2
TE	Spotted crake	2E–3	1E+0	2E–3	1E+0	6E–3	3E+0	2E–3	3E–1	2E–3	8E–2	1E+0	1E–1	2E–3	2E–3	4E–2	1E–1	9E–1	4E–1	2E+0	1E+0	6E–3	1E+3	2E–1	6E–1	1E+0	1E+0	7E+2
TE	Common grass-hopper warbler	2E–3	1E+0	2E–3	1E+0	6E–3	3E+0	2E–3	3E–1	2E–3	8E–2	1E+0	1E–1	2E–3	2E–3	4E–2	1E–1	9E–1	4E–1	2E+0	1E+0	6E–3	1E+3	2E–1	6E–1	1E+0	1E+0	7E+2
TE	Short-eared owl	2E–3	1E+0	2E–3	1E+0	6E–3	3E+0	2E–3	3E–1	2E–3	8E–2	1E+0	1E–1	2E–3	2E–3	4E–2	1E–1	9E–1	4E–1	2E+0	1E+0	6E–3	1E+3	2E–1	6E–1	1E+0	1E+0	7E+2
TE	Bird egg	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TE	Mammal (Rat)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TE	Natterer's bat	7E–3	1E+0	2E–3	1E+0	8E–3	3E+0	2E–3	3E–2	2E–3	8E–2	3E–3	1E–1	2E–3	7E–3	3E–1	1E–1	9E–1	8E–1	2E+0	1E+0	6E–3	1E+3	2E–3	1E+0	2E+1	3E+0	7E+2
TE	European water vole	7E–3	1E+0	2E–3	1E+0	8E–3	3E+0	2E–3	3E–2	2E–3	8E–2	3E–3	1E–1	2E–3	7E–3	3E–1	1E–1	9E–1	8E–1	2E+0	1E+0	6E–3	1E+3	2E–3	1E+0	2E+1	3E+0	7E+2
TE	Mammal (Deer)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TE	Eurasian lynx	5E–4	1E+0	2E–3	1E+0	8E–3	3E+0	2E–3	3E–2	2E–3	8E–2	3E–3	1E–1	2E–3	5E–4	3E–1	1E–1	9E–1	4E–2	2E+0	1E+0	6E–3	1E+3	2E–3	1E+0	2E+1	3E+0	7E+2
TE	Roe deer	5E–4	1E+0	2E–3	1E+0	8E–3	3E+0	2E–3	3E–2	2E–3	8E–2	3E–3	1E–1	2E–3	5E–4	3E–1	1E–1	9E–1	4E–2	2E+0	1E+0	6E–3	1E+3	2E–3	1E+0	2E+1	3E+0	7E+2
TE	Eurasian elk (U.S.: Moose)	5E–4	1E+0	2E–3	1E+0	8E–3	3E+0	2E–3	3E–2	2E–3	8E–2	3E–3	1E–1	2E–3	5E–4	3E–1	1E–1	9E–1	4E–2	2E+0	1E+0	6E–3	1E+3	2E–3	1E+0	2E+1	3E+0	7E+2
TE	Mountain hare	5E–4	1E+0	2E–3	1E+0	8E–3	3E+0	2E–3	3E–2	2E–3	8E–2	3E–3	1E–1	2E–3	5E–4	3E–1	1E–1	9E–1	4E–2	2E+0	1E+0	6E–3	1E+3	2E–3	1E+0	2E+1	3E+0	7E+2
TE	European hare	5E–4	1E+0	2E–3	1E+0	8E–3	3E+0	2E–3	3E–2	2E–3	8E–2	3E–3	1E–1	2E–3	5E–4	3E–1	1E–1	9E–1	4E–2	2E+0	1E+0	6E–3	1E+3	2E–3	1E+0	2E+1	3E+0	7E+2
TE	Red fox	5E–4	1E+0	2E–3	1E+0	8E–3	3E+0	2E–3	3E–2	2E–3	8E–2	3E–3	1E–1	2E–3	5E–4	3E–1	1E–1	9E–1	4E–2	2E+0	1E+0	6E–3	1E+3	2E–3	1E+0	2E+1	3E+0	7E+2

Shaded cells indicate difference between representative species CR and reference organism CR by a factor of:

<10	10.000–100.000
10–100	100.000–1.000.000
100–1.000	1.000.000–10.000.000
1.000–10.000	10.000.000–100.000.000

Appendix C

Results of the central corrosion base case

Detailed results from the central corrosion base case are presented in this appendix. Total dose rates (the sum of internal and external exposure) for each assessment species across all radionuclides, both representative species and reference organisms, in freshwater, marine and terrestrial ecosystems are presented in Table C-1. Tables C-2 to C-4 provide the total dose rate (the sum of internal and external exposure) per radionuclide in freshwater, terrestrial and marine ecosystems, respectively. The exposure of each species in terms of relative internal and external dose rates is illustrated in Figures C-1 to C-3 for freshwater, terrestrial and marine ecosystems, respectively.

Table C-1. Total dose rate (µGy/h) for reference organisms and representative species in freshwater, marine and terrestrial ecosystems.

Freshwater	Total dose (µGy/h)	Marine	Total dose (µGy/h)	Terrestrial	Total dose (µGy/h)
Phytoplankton	4.70E-2	Phytoplankton	1.11E-4	Lichen and bryophytes	1.55E-2
RS-Phytoplankton	1.78E-2	RS-Phytoplankton	7.67E-5	Dwarf neckera	1.18E-2
Microphytobenthos	4.57E-2	Macroalgae	5.28E-5	Nephroma laevigatum	1.18E-2
Vascular plant	1.03E-2	Stypocaulon scoparium	8.79E-5	Slender green feather moss	1.18E-2
Grasswrack pondweed	1.78E-2	Bristly stonewort	8.45E-5	Scapania apiculata	1.18E-2
Water pygmyweed	1.78E-2	Bladderwrack	8.10E-5	Sphagnum sp.	1.18E-2
Elatine orthosperma	1.78E-2	Vascular plant	4.70E-5	*Sphagnum sp.* (Subm.)	1.79E-2
Spatulaleaf loosestrife	1.78E-2	Grasswrack pondweed	8.42E-5	Knowlton's thread-moss	1.18E-2
Alisma wahlenbergii	1.78E-2	Water pygmyweed	8.42E-5	Omphalina philonotis	2.78E-4
Bittercress	1.78E-2	Elatine orthosperma	8.42E-5	Yellow foot	2.78E-4
Shetland pondweed	1.78E-2	Alisma wahlenbergii	8.42E-5	Grasses and Herbs	1.29E-3
Flat-stalked pondweed	1.78E-2	Flat-stalked pondweed	8.42E-5	Yellow widelip orchid	3.15E-4
Water mudwort	1.78E-2	Water mudwort	8.42E-5	Flea sedge	3.15E-4
Persicaria foliosa	1.78E-2	Zooplankton	1.22E-5	Bottle sedge	3.15E-4
Chara sp.	1.78E-2	RS-Zooplankton	7.93E-4	Common reed	3.15E-4
Least stonewort	1.78E-2	Benthic mollusc	5.59E-5	Shrub	1.40E-3
Rugged stonewort	1.78E-2	Baltic macoma	7.67E-5	Cloudberry	2.79E-4
Slender stonewort	1.78E-2	Polychaete worm	9.12E-5	Cranberry	2.79E-4
Starry stonewort	1.78E-2	Polychaete worms	8.46E-5	Tree	9.92E-4
Pointed stonewort	1.78E-2	Crustacean	4.22E-5	European alder	2.51E-4
Slimy-fruited stonewort	1.78E-2	Idotea balthica	2.22E-5	Silver birch	2.51E-4
Zooplankton	5.68E-3	Benthic fish	3.53E-5	Scots pine	2.51E-4
RS-Zooplankton	3.76E-2	Vimba bream	1.47E-5	Norway spruce	2.51E-4
Bivalve mollusc	9.52E-3	Viviparous eelpout	1.47E-5	Gastropod	1.22E-3
Depressed river mussel	9.85E-3	Pelagic fish	9.61E-6	Geyer's whorl snail	9.75E-4
Thick shelled river mussel	9.85E-3	Burbot	9.85E-7	Soil Invertebrate (worm)	1.74E-3
Painter's mussel	9.85E-3	Lumpsucker	9.85E-7	Lumbricus sp.	1.82E-3
Duck mussel	9.85E-3	European eel	9.85E-7	Flying insects	1.34E-3
Gastropod	7.53E-3	Atlantic herring	9.85E-7	Pygmy damselfly	1.34E-3
Anisus spirorbis	6.99E-3	European sprat	9.85E-7	Marsh fritillary	1.34E-3
Large mouthed valve snail	6.90E-3	European perch	9.85E-7	Detritivorous invertebrate	1.66E-3
Crustacean	7.05E-3	Northern pike	9.85E-7	Chlaenius sulcicollis	1.68E-3
Tanymastix stagnalis	9.47E-3	Atlantic salmon	9.85E-7	Large gold grasshopper	1.68E-3
Clam shrimp	7.13E-3	Brown trout	9.85E-7	Singa nitidula	1.68E-3
Tadpole shrimp	7.13E-3	Zander	9.85E-7	Amphibian	7.94E-4
Signal crayfish	7.13E-3	Coregonus sp.	9.85E-7	Pool frog	6.38E-4
European crayfish	5.67E-3	Bird	7.75E-6	Common toad	7.26E-4
Insect larvae	2.94E-2	Greater scaup	3.74E-5	Reptile	7.86E-4
Bagous binodulus	4.01E-3	Common eider	3.74E-5	Grass snake	7.72E-4
Bagous petro	4.01E-3	European herring gull	3.74E-5	Bird	8.22E-4
Donacia brevitarsis	4.01E-3	Horned grebe	3.74E-5	Ruff	7.47E-4

Table C-1. Continued.

Freshwater	Total dose (µGy/h)	Marine	Total dose (µGy/h)	Terrestrial	Total dose (µGy/h)
Macroplea appendiculata	4.01E-3	Black guillemot	3.74E-5	Eurasian bittern	7.44E-4
Sigara hellensii	4.01E-3	Ruddy turnstone	1.91E-4	Spotted crake	7.44E-4
Hydaticus continentalis	4.01E-3	White-tailed eagle	1.28E-4	Common grasshopper warbler	7.39E-4
Hydrochus megaphallus	4.01E-3	Mammal	2.36E-6	Short-eared owl	7.18E-4
Cloeon schoenemundi	7.10E-3	European otter	1.01E-4	Bird egg	8.75E-4
Donacia dentata	7.10E-3	Ringed seal	5.15E-5	Small Mammal	1.02E-3
Pygmy damselfly	7.09E-3			Natterer's bat	7.73E-4
Clubbed general	7.10E-3			European water vole	1.01E-3
Three-lined soldier	7.10E-3			Large Mammal	6.70E-4
Chironomidae sp.	7.10E-3			Eurasian lynx	6.98E-4
Benthic fish	1.82E-3			Roe deer	6.97E-4
Vimba bream	9.09E-4			Eurasian elk (U.S.: Moose)	6.30E-4
Sheatfish	8.11E-4			Mountain hare	6.67E-4
Ruffe	1.45E-3			European hare	6.67E-4
Pelagic fish	2.93E-4			Red fox	8.30E-4
Asp	4.66E-5				
Burbot	4.66E-5				
European eel	4.66E-5				
Common roach	1.75E-3				
Tench	4.66E-5				
European perch	4.66E-5				
Northern pike	4.66E-5				
Amphibian	3.47E-4				
Pool frog	6.38E-4				
Northern crested newt	7.24E-4				
Bird	2.73E-4				
Common pochard	1.49E-4				
Horned grebe	1.49E-4				
Common kingfisher	3.00E-4				
Black tern	2.67E-4				
Mammal	3.52E-4				
European otter	3.27E-4				

Table C-2. Total dose rate per radionuclide (µGy/h) to biota in the freshwater ecosystem under the central corrosion base case.

Radionuclide	European perch	Duck mussel	Amphibian	Asp	Bagous binodulus	Bagous petro	Grasswrack pondweed	Benthic fish	Bird	Bivalve mollusc	Donacia brevitarsis	Three-lined soldier	Common pochard	Sigara hellensii
Ac-227	3.61E-14	2.11E-11	3.30E-13	3.61E-14	2.08E-11	2.08E-11	5.92E-11	8.01E-12	2.75E-14	9.10E-11	2.08E-11	2.12E-11	3.61E-14	2.08E-11
Ag-108m	4.10E-34	9.75E-29	3.31E-34	4.10E-34	2.33E-33	2.33E-33	6.95E-29	5.90E-29	6.77E-34	6.49E-29	2.33E-33	7.02E-29	7.31E-34	2.32E-33
Am-241	1.28E-15	7.89E-13	9.77E-16	1.28E-15	7.38E-13	7.38E-13	2.13E-12	1.98E-13	9.77E-16	2.64E-13	7.38E-13	7.83E-13	1.28E-15	7.38E-13
Am-243	9.16E-13	7.91E-10	6.98E-13	9.16E-13	5.27E-10	5.27E-10	1.70E-9	2.76E-10	6.98E-13	3.39E-10	5.27E-10	7.38E-10	9.16E-13	5.27E-10
C-14	6.55E-11	1.04E-10	1.02E-10	6.55E-11	1.01E-10	1.01E-10	6.45E-11	6.63E-11	1.05E-10	1.02E-10	1.01E-10	1.01E-10	1.04E-10	1.01E-10
Ca-41	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Cl-36	1.28E-9	1.14E-9	4.76E-9	1.28E-9	7.64E-10	7.64E-10	8.14E-10	4.78E-9	4.76E-9	2.95E-9	7.64E-10	1.43E-9	1.29E-9	7.55E-10
Cm-244	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Cm-245	1.83E-14	1.53E-11	6.98E-14	1.83E-14	1.06E-11	1.06E-11	3.35E-11	3.83E-12	1.05E-12	5.48E-12	1.06E-11	1.42E-11	1.83E-14	1.06E-11
Cm-246	4.32E-33	2.50E-30	1.65E-32	4.32E-33	2.49E-30	2.49E-30	7.07E-30	2.50E-31	2.47E-31	5.50E-31	2.49E-30	2.51E-30	4.32E-33	2.49E-30
Cs-135	3.59E-9	2.24E-9	2.61E-8	3.59E-9	8.28E-10	8.28E-10	1.53E-8	1.80E-8	8.42E-9	2.14E-9	8.28E-10	1.77E-8	3.59E-9	8.28E-10
Cs-137	2.69E-37	5.96E-34	1.82E-36	2.69E-37	4.09E-38	4.09E-38	4.58E-34	3.59E-34	7.44E-37	3.96E-34	4.09E-38	4.73E-34	3.20E-37	4.07E-38
Ho-166m	2.80E-35	8.79E-30	1.21E-35	2.80E-35	2.25E-34	2.25E-34	6.19E-30	5.34E-30	1.31E-35	5.84E-30	2.25E-34	6.21E-30	3.54E-35	2.20E-34
I-129	1.03E-8	1.93E-6	1.91E-8	1.03E-8	2.99E-8	2.99E-8	1.71E-6	8.66E-7	2.08E-8	1.27E-6	2.99E-8	1.72E-6	1.10E-8	2.99E-8
Nb-94	4.11E-9	1.09E-3	5.42E-8	4.11E-9	1.02E-7	1.02E-7	7.72E-4	6.63E-4	9.06E-8	7.21E-4	1.02E-7	7.75E-4	4.82E-9	1.01E-7
Ni-59	1.62E-6	1.94E-4	1.79E-5	1.62E-6	4.76E-5	4.76E-5	9.93E-4	5.16E-5	1.82E-5	1.23E-3	4.76E-5	1.04E-3	1.62E-6	4.76E-5
Ni-63	6.92E-37	2.50E-35	7.73E-36	6.92E-37	2.18E-35	2.18E-35	7.38E-35	8.52E-36	7.73E-36	4.97E-34	2.18E-35	6.07E-35	6.92E-37	2.18E-35
Np-237	2.66E-6	1.57E-3	1.51E-4	2.66E-6	1.53E-3	1.53E-3	4.36E-3	1.71E-4	1.51E-4	8.51E-4	1.53E-3	1.56E-3	1.11E-4	1.53E-3
Pa-231	1.20E-8	7.14E-6	1.42E-9	1.20E-8	6.90E-6	6.90E-6	1.97E-5	1.31E-7	2.59E-10	2.31E-7	6.90E-6	7.10E-6	1.20E-8	6.90E-6
Pb-210	3.41E-8	1.40E-5	2.78E-8	3.41E-8	3.33E-7	3.33E-7	7.66E-5	3.80E-6	2.90E-8	8.78E-6	3.33E-7	1.09E-4	3.49E-8	3.33E-7
Pd-107	1.28E-10	4.05E-9	1.72E-9	1.28E-10	4.04E-9	4.04E-9	1.09E-8	1.72E-9	1.72E-9	1.72E-9	4.04E-9	4.07E-9	1.28E-10	4.04E-9
Po-210	1.72E-5	2.57E-3	2.69E-5	1.72E-5	1.08E-3	1.08E-3	2.66E-4	2.69E-5	2.69E-5	4.25E-3	1.08E-3	1.08E-3	1.72E-5	1.08E-3
Pu-239	3.21E-6	1.34E-4	3.80E-5	3.21E-6	1.68E-4	1.68E-4	4.26E-3	9.93E-6	3.31E-7	1.36E-4	1.68E-4	1.68E-4	3.27E-7	1.68E-4
Pu-240	1.07E-10	4.49E-9	1.27E-9	1.07E-10	5.60E-9	5.60E-9	1.42E-7	3.32E-10	1.10E-11	4.52E-9	5.60E-9	5.61E-9	1.09E-11	5.60E-9
Pu-242	3.58E-6	1.50E-4	4.20E-5	3.58E-6	1.87E-4	1.87E-4	4.75E-3	1.10E-5	3.65E-7	1.50E-4	1.87E-4	1.87E-4	3.65E-7	1.87E-4
Ra-226	1.74E-5	4.09E-3	6.78E-5	1.74E-5	9.85E-4	9.85E-4	2.22E-3	8.61E-4	7.19E-5	2.14E-3	9.85E-4	2.13E-3	1.74E-5	9.85E-4
Se-79	4.43E-8	1.92E-7	1.24E-8	4.43E-8	1.82E-7	1.82E-7	6.70E-8	1.35E-8	1.24E-8	3.13E-7	1.82E-7	2.33E-7	4.44E-8	1.82E-7
Sm-151	3.70E-39	1.06E-36	2.66E-39	3.70E-39	6.26E-37	6.26E-37	4.95E-36	5.77E-37	2.66E-39	9.03E-37	6.26E-37	4.14E-36	3.70E-39	6.26E-37
Sn-126	6.02E-9	3.21E-5	2.73E-8	6.02E-9	4.47E-9	4.47E-9	2.60E-5	1.92E-5	3.40E-8	2.13E-5	4.47E-9	2.77E-5	7.14E-9	4.36E-9
Sr-90	4.77E-34	1.65E-33	6.97E-35	4.77E-34	3.65E-34	3.65E-34	3.32E-33	2.37E-34	7.41E-35	1.50E-33	3.65E-34	3.82E-33	5.02E-34	3.64E-34
Tc-99	2.78E-7	2.55E-7	3.66E-7	2.78E-7	1.11E-7	1.11E-7	2.17E-7	3.70E-7	3.66E-7	2.29E-7	1.11E-7	2.85E-7	2.79E-7	1.10E-7
Th-229	2.77E-7	4.31E-6	3.91E-7	2.77E-7	9.70E-7	9.70E-7	5.69E-6	2.33E-6	3.91E-7	2.57E-6	9.70E-7	3.58E-6	2.77E-7	9.70E-7
Th-230	1.42E-10	5.04E-10	2.02E-10	1.42E-10	4.99E-10	4.99E-10	1.61E-9	2.04E-10	2.02E-10	1.87E-10	4.99E-10	5.07E-10	1.42E-10	4.99E-10
Th-232	3.56E-16	1.26E-15	5.02E-16	3.56E-16	1.25E-15	1.25E-15	4.03E-15	5.05E-16	5.02E-16	4.61E-16	1.25E-15	1.26E-15	3.56E-16	1.25E-15
U-233	6.65E-9	8.27E-7	1.18E-6	6.65E-9	7.60E-7	7.60E-7	7.20E-6	1.21E-6	1.18E-6	7.13E-6	7.60E-7	8.57E-7	6.65E-9	7.60E-7
U-234	9.91E-12	1.19E-9	1.80E-9	9.91E-12	1.13E-9	1.13E-9	1.07E-8	1.81E-9	1.80E-9	1.08E-8	1.13E-9	1.25E-9	9.91E-12	1.13E-9
U-235	1.13E-12	1.45E-9	1.99E-10	1.13E-12	1.27E-10	1.27E-10	2.19E-9	9.75E-10	1.99E-10	2.07E-9	1.27E-10	1.15E-9	1.12E-12	1.27E-10
U-236	5.98E-12	7.16E-10	1.06E-9	5.98E-12	6.84E-10	6.84E-10	6.45E-9	1.07E-9	1.06E-9	6.40E-9	6.84E-10	7.49E-10	5.98E-12	6.84E-10
U-238	3.83E-12	4.55E-10	6.76E-10	3.83E-12	4.37E-10	4.37E-10	4.12E-9	6.81E-10	6.76E-10	4.07E-9	4.37E-10	4.75E-10	3.83E-12	4.37E-10
Zr-93	2.74E-7	5.93E-7	1.31E-6	2.74E-7	4.49E-7	4.49E-7	2.72E-6	1.35E-6	1.31E-6	1.19E-6	4.49E-7	2.18E-6	2.74E-7	4.49E-7

Table C-2 continued.

Radionuclide	Cloeon sch-oenemundi	Crustacean	Donacia dentata	Pygmy damselfly	Least stonewort	European eel	Depressed river mussel	European crayfish	Water pygmyweed	Gastropod	Clubbed general	Northern pike	Ruffe	Pool frog
Ac-227	2.12E-11	1.70E-12	2.12E-11	2.12E-11	5.92E-11	3.61E-14	2.11E-11	2.10E-11	5.92E-11	9.10E-11	2.12E-11	3.61E-14	1.98E-13	2.96E-14
Ag-108m	7.02E-29	7.03E-29	7.02E-29	7.02E-29	6.96E-29	4.10E-34	9.75E-29	6.28E-29	6.95E-29	6.76E-29	7.02E-29	4.04E-34	3.48E-29	1.23E-30
Am-241	7.83E-13	9.19E-14	7.83E-13	7.83E-13	2.13E-12	1.28E-15	7.89E-13	7.69E-13	2.13E-12	1.27E-13	7.83E-13	1.28E-15	2.34E-14	1.82E-15
Am-243	7.38E-10	2.47E-10	7.38E-10	7.38E-10	1.70E-9	9.16E-13	7.91E-10	6.95E-10	1.70E-9	2.49E-10	7.38E-10	9.16E-13	1.03E-10	4.81E-12
C-14	1.01E-10	1.02E-10	1.01E-10	1.01E-10	6.45E-11	6.55E-11	1.04E-10	1.04E-10	6.45E-11	1.02E-10	1.01E-10	6.55E-11	6.47E-11	5.20E-11
Ca-41	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Cl-36	1.43E-9	2.73E-9	1.43E-9	1.43E-9	8.00E-10	1.28E-9	1.14E-9	1.11E-9	8.14E-10	2.83E-9	1.43E-9	1.28E-9	1.26E-9	4.73E-8
Cm-244	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Cm-245	1.42E-11	4.32E-12	1.42E-11	1.42E-11	3.35E-11	1.83E-14	1.53E-11	1.36E-11	3.35E-11	5.69E-12	1.42E-11	1.83E-14	1.81E-12	1.51E-13
Cm-246	2.51E-30	1.80E-31	2.51E-30	2.51E-30	7.07E-30	4.32E-33	2.50E-30	2.50E-30	7.07E-30	5.56E-31	2.51E-30	4.32E-33	1.35E-32	5.17E-33
Cs-135	1.77E-8	4.64E-8	1.77E-8	1.77E-8	1.54E-8	3.59E-9	2.24E-9	1.48E-9	1.53E-8	1.02E-8	1.77E-8	3.59E-9	8.60E-9	4.46E-8
Cs-137	4.73E-34	4.74E-34	4.73E-34	4.73E-34	4.58E-34	2.69E-37	5.96E-34	3.84E-34	4.58E-34	4.22E-34	4.73E-34	2.68E-37	2.26E-34	4.42E-36
Ho-166m	6.21E-30	6.21E-30	6.21E-30	6.21E-30	6.19E-30	2.80E-35	8.79E-30	5.68E-30	6.19E-30	6.06E-30	6.21E-30	2.78E-35	3.09E-30	3.22E-31
I-129	1.72E-6	1.78E-6	1.72E-6	1.72E-6	1.71E-6	1.03E-8	1.93E-6	1.13E-6	1.71E-6	1.50E-6	1.72E-6	1.03E-8	8.26E-7	1.85E-8
Nb-94	7.75E-4	7.80E-4	7.75E-4	7.75E-4	7.72E-4	4.11E-9	1.09E-3	7.01E-4	7.72E-4	7.46E-4	7.75E-4	4.09E-9	3.84E-4	2.25E-4
Ni-59	1.04E-3	1.11E-3	1.04E-3	1.04E-3	1.01E-3	1.62E-6	1.94E-4	1.13E-4	9.93E-4	1.37E-3	1.04E-3	1.62E-6	4.14E-4	1.88E-5
Ni-63	6.07E-35	8.31E-35	6.07E-35	6.07E-35	7.46E-35	6.92E-37	2.50E-35	2.35E-35	7.38E-35	5.01E-34	6.07E-35	6.92E-37	9.13E-36	5.10E-36
Np-237	1.56E-3	1.15E-3	1.56E-3	1.56E-3	4.36E-3	2.66E-6	1.57E-3	1.55E-3	4.36E-3	8.54E-4	1.56E-3	2.66E-6	1.81E-5	5.58E-5
Pa-231	7.10E-6	6.38E-7	7.10E-6	7.10E-6	1.97E-5	1.20E-8	7.14E-6	7.05E-6	1.97E-5	2.47E-7	7.10E-6	1.20E-8	1.07E-7	1.68E-8
Pb-210	1.09E-4	3.62E-5	1.09E-4	1.09E-4	7.80E-5	3.41E-8	1.40E-5	6.72E-6	7.66E-5	2.53E-5	1.09E-4	3.41E-8	3.64E-5	4.06E-8
Pd-107	4.07E-9	7.89E-9	4.07E-9	4.07E-9	1.09E-8	1.28E-10	4.05E-9	4.05E-9	1.09E-8	1.72E-9	4.07E-9	1.28E-10	1.31E-10	1.31E-9
Po-210	1.08E-3	1.11E-3	1.08E-3	1.08E-3	2.66E-4	1.72E-5	2.57E-3	1.08E-3	2.66E-4	2.46E-3	1.08E-3	1.72E-5	1.72E-5	1.10E-5
Pu-239	1.68E-4	1.82E-4	1.68E-4	1.68E-4	4.26E-3	3.21E-6	1.34E-4	1.68E-4	4.26E-3	1.36E-4	1.68E-4	3.21E-6	3.23E-6	6.16E-6
Pu-240	5.61E-9	6.07E-9	5.61E-9	5.61E-9	1.42E-7	1.07E-10	4.49E-9	5.60E-9	1.42E-7	4.53E-9	5.61E-9	1.07E-10	1.10E-10	1.82E-10
Pu-242	1.87E-4	2.01E-4	1.87E-4	1.87E-4	4.75E-3	3.58E-6	1.50E-4	1.87E-4	4.75E-3	1.50E-4	1.87E-4	3.58E-6	3.61E-6	6.93E-6
Ra-226	2.13E-3	2.42E-3	2.13E-3	2.13E-3	2.22E-3	1.74E-5	4.09E-3	1.82E-3	2.22E-3	1.75E-3	2.13E-3	1.74E-5	5.56E-4	3.09E-4
Se-79	2.33E-7	4.82E-7	2.33E-7	2.33E-7	6.66E-8	4.43E-8	1.92E-7	1.90E-7	6.70E-8	3.17E-7	2.33E-7	4.43E-8	5.72E-8	2.60E-8
Sm-151	4.14E-36	3.82E-36	4.14E-36	4.14E-36	4.98E-36	3.70E-39	1.06E-36	8.39E-37	4.95E-36	9.51E-37	4.14E-36	3.70E-39	8.73E-37	1.05E-38
Sn-126	2.77E-5	2.78E-5	2.77E-5	2.77E-5	2.62E-5	6.02E-9	3.21E-5	2.05E-5	2.60E-5	2.29E-5	2.77E-5	5.99E-9	1.31E-5	2.43E-6
Sr-90	3.82E-33	3.78E-33	3.82E-33	3.82E-33	3.42E-33	4.77E-34	1.65E-33	1.34E-33	3.32E-33	1.92E-33	3.82E-33	4.75E-34	1.61E-33	2.00E-33
Tc-99	2.85E-7	2.98E-7	2.85E-7	2.85E-7	2.12E-7	2.78E-7	2.55E-7	1.27E-7	2.17E-7	2.44E-7	2.85E-7	2.78E-7	3.23E-7	2.43E-7
Th-229	3.58E-6	2.97E-6	3.58E-6	3.58E-6	5.69E-6	2.77E-7	4.31E-6	3.09E-6	5.69E-6	2.72E-6	3.58E-6	2.77E-7	1.55E-6	1.23E-6
Th-230	5.07E-10	1.92E-10	5.07E-10	5.07E-10	1.61E-9	1.42E-10	5.04E-10	5.02E-10	1.61E-9	1.88E-10	5.07E-10	1.42E-10	1.46E-10	5.88E-10
Th-232	1.26E-15	4.70E-16	1.26E-15	1.26E-15	4.03E-15	3.56E-16	1.26E-15	1.25E-15	4.03E-15	4.64E-16	1.26E-15	3.56E-16	3.62E-16	1.21E-15
U-233	8.57E-7	1.98E-5	8.57E-7	8.57E-7	7.20E-6	6.65E-9	8.27E-7	7.97E-7	7.20E-6	7.15E-6	8.57E-7	6.65E-9	5.13E-8	1.46E-7
U-234	1.25E-9	3.00E-8	1.25E-9	1.25E-9	1.07E-8	9.91E-12	1.19E-9	1.16E-9	1.07E-8	1.08E-8	1.25E-9	9.91E-12	6.41E-11	2.21E-10
U-235	1.15E-9	4.39E-9	1.15E-9	1.15E-9	2.19E-9	1.13E-12	1.45E-9	9.67E-10	2.19E-9	2.13E-9	1.15E-9	1.13E-12	5.00E-10	2.10E-10
U-236	7.49E-10	1.78E-8	7.49E-10	7.49E-10	6.45E-9	5.98E-12	7.16E-10	6.99E-10	6.45E-9	6.42E-9	7.49E-10	5.98E-12	3.56E-11	1.32E-10
U-238	4.75E-10	1.13E-8	4.75E-10	4.75E-10	4.12E-9	3.83E-12	4.55E-10	4.46E-10	4.12E-9	4.08E-9	4.75E-10	3.83E-12	2.11E-11	8.42E-11
Zr-93	2.18E-6	2.77E-6	2.18E-6	2.18E-6	2.76E-6	2.74E-7	5.93E-7	5.24E-7	2.72E-6	1.39E-6	2.18E-6	2.74E-7	6.54E-7	4.81E-7

Table C-2 continued.

Radionuclide	Hydaticus continentalis	Hydrochus megaphallus	Tanymastix stagnalis	Insect larvae	Chara sp.	Common kingfisher	Burbot	Clam shrimp	Macroplea appendiculata	Sheatfish	Mammal	Micro-phy-tobenthos	Common roach	Elatine orthosperma	Pelagic fish
Ac-227	2.08E-11	2.08E-11	2.15E-11	2.41E-11	5.92E-11	4.14E-14	3.61E-14	2.12E-11	2.08E-11	1.20E-13	7.84E-12	6.13E-11	2.45E-13	5.92E-11	7.84E-12
Ag-108m	2.32E-33	2.32E-33	1.23E-28	1.40E-28	6.96E-29	7.37E-31	4.10E-34	7.03E-29	2.33E-33	2.95E-29	9.16E-34	7.13E-29	6.48E-29	6.95E-29	6.20E-34
Am-241	7.38E-13	7.38E-13	8.17E-13	9.86E-12	2.13E-12	1.81E-15	1.28E-15	7.83E-13	7.38E-13	1.45E-14	9.77E-16	1.00E-11	3.49E-14	2.13E-12	8.79E-16
Am-243	5.27E-10	5.27E-10	9.00E-10	7.39E-9	1.70E-9	3.98E-12	9.16E-13	7.40E-10	5.27E-10	7.80E-11	6.99E-13	1.80E-9	1.76E-10	1.70E-9	6.29E-13
C-14	1.01E-10	1.01E-10	1.01E-10	1.02E-10	6.45E-11	1.04E-10	6.55E-11	1.01E-10	1.01E-10	6.56E-11	1.05E-10	2.38E-12	6.55E-11	6.45E-11	6.63E-11
Ca-41	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Cl-36	7.55E-10	7.55E-10	1.98E-9	3.37E-9	8.00E-10	1.26E-9	1.28E-9	1.45E-9	7.64E-10	1.30E-9	4.76E-9	2.19E-9	1.32E-9	8.14E-10	4.76E-9
Cm-244	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Cm-245	1.06E-11	1.06E-11	1.69E-11	1.49E-11	3.35E-11	1.21E-13	1.83E-14	1.42E-11	1.06E-11	1.41E-12	1.05E-12	3.41E-11	3.19E-12	3.35E-11	1.05E-12
Cm-246	2.49E-30	2.49E-30	2.53E-30	1.85E-30	7.07E-30	4.40E-33	4.32E-33	2.51E-30	2.49E-30	5.86E-33	2.47E-31	7.09E-30	1.15E-32	7.07E-30	2.47E-31
Cs-135	8.28E-10	8.28E-10	3.31E-8	6.18E-8	1.54E-8	3.58E-9	3.59E-9	1.92E-8	8.28E-10	3.76E-9	2.61E-8	3.33E-7	4.34E-9	1.53E-8	1.99E-8
Cs-137	4.07E-38	4.07E-38	8.33E-34	9.47E-34	4.58E-34	2.46E-36	2.69E-37	4.76E-34	4.09E-38	1.81E-34	2.55E-36	6.00E-34	3.96E-34	4.58E-34	1.67E-36
Ho-166m	2.20E-34	2.20E-34	1.09E-29	1.24E-29	6.19E-30	2.00E-31	2.80E-35	6.21E-30	2.25E-34	2.67E-30	1.38E-35	6.38E-30	5.84E-30	6.19E-30	1.25E-35
I-129	2.99E-8	2.99E-8	3.01E-6	3.50E-6	1.71E-6	1.43E-8	1.03E-8	1.73E-6	2.99E-8	4.31E-7	2.17E-8	5.85E-6	1.26E-6	1.71E-6	2.81E-8
Nb-94	1.01E-7	1.01E-7	1.36E-3	1.54E-3	7.72E-4	1.32E-4	4.11E-9	7.76E-4	1.02E-7	3.31E-4	1.19E-7	8.39E-4	7.21E-4	7.72E-4	8.66E-8
Ni-59	4.76E-5	4.76E-5	1.83E-3	2.09E-3	1.01E-3	1.61E-6	1.62E-6	1.07E-3	4.76E-5	1.86E-5	1.82E-5	5.80E-3	8.00E-5	9.93E-4	1.82E-5
Ni-63	2.18E-35	2.18E-35	9.33E-35	1.20E-34	7.46E-35	6.92E-37	6.92E-37	6.26E-35	2.18E-35	1.07E-36	7.73E-36	7.12E-33	2.77E-36	7.38E-35	7.73E-36
Np-237	1.53E-3	1.53E-3	1.59E-3	2.04E-2	4.36E-3	1.11E-4	2.66E-6	1.56E-3	1.53E-3	1.24E-5	1.51E-4	1.18E-2	2.66E-6	4.36E-3	1.51E-4
Pa-231	6.90E-6	6.90E-6	7.25E-6	1.53E-6	1.97E-5	1.84E-8	1.20E-8	7.10E-6	6.90E-6	7.75E-8	2.58E-10	1.98E-5	1.65E-7	1.97E-5	2.59E-10
Pb-210	3.33E-7	3.33E-7	1.97E-4	2.19E-4	7.80E-5	4.40E-8	3.41E-8	1.13E-4	3.33E-7	1.92E-6	2.90E-8	2.48E-4	8.84E-6	7.66E-5	2.90E-8
Pd-107	4.04E-9	4.04E-9	4.09E-9	7.92E-9	1.09E-8	1.28E-10	1.28E-10	4.07E-9	4.04E-9	1.28E-10	1.72E-9	1.13E-8	1.29E-10	1.09E-8	1.72E-9
Po-210	1.08E-3	1.08E-3	1.08E-3	1.11E-3	2.66E-4	1.72E-5	1.72E-5	1.08E-3	1.08E-3	1.72E-5	2.69E-5	3.35E-3	1.72E-5	2.66E-4	2.69E-5
Pu-239	1.68E-4	1.68E-4	1.68E-4	1.82E-4	4.26E-3	3.28E-7	3.21E-6	1.68E-4	1.68E-4	3.22E-6	3.80E-5	4.63E-3	3.23E-6	4.26E-3	9.92E-6
Pu-240	5.60E-9	5.60E-9	5.61E-9	6.08E-9	1.42E-7	1.09E-11	1.07E-10	5.61E-9	5.60E-9	1.08E-10	1.27E-9	1.60E-7	1.09E-10	1.42E-7	3.31E-10
Pu-242	1.87E-4	1.87E-4	1.87E-4	2.01E-4	4.75E-3	3.66E-7	3.58E-6	1.87E-4	1.87E-4	3.59E-6	4.20E-5	4.75E-3	3.60E-6	4.75E-3	1.10E-5
Ra-226	9.85E-4	9.85E-4	2.99E-3	3.55E-3	2.22E-3	3.48E-5	1.74E-5	2.13E-3	9.85E-4	4.11E-4	7.19E-5	1.41E-2	8.84E-4	2.22E-3	7.19E-5
Se-79	1.82E-7	1.82E-7	2.79E-7	5.28E-7	6.66E-8	4.43E-8	4.43E-8	2.37E-7	1.82E-7	4.49E-8	1.24E-8	1.48E-6	4.66E-8	6.70E-8	1.24E-8
Sm-151	6.26E-37	6.26E-37	7.09E-36	3.35E-35	4.98E-36	4.50E-39	3.70E-39	4.32E-36	6.26E-37	5.94E-38	2.66E-39	8.56E-35	2.73E-37	4.95E-36	2.40E-39
Sn-126	4.36E-9	4.36E-9	4.87E-5	5.54E-5	2.62E-5	1.50E-6	6.02E-9	2.78E-5	4.47E-9	9.59E-6	3.81E-8	3.12E-5	2.13E-5	2.60E-5	3.30E-8
Sr-90	3.64E-34	3.64E-34	6.50E-33	7.14E-33	3.42E-33	4.61E-34	4.77E-34	3.87E-33	3.65E-34	5.84E-34	7.52E-35	5.06E-33	8.75E-34	3.32E-33	7.41E-35
Tc-99	1.10E-7	1.10E-7	4.40E-7	4.60E-7	2.12E-7	2.77E-7	2.78E-7	2.98E-7	1.11E-7	2.80E-7	3.66E-7	1.92E-6	2.86E-7	2.17E-7	3.66E-7
Th-229	9.70E-7	9.70E-7	5.55E-6	5.57E-6	5.69E-6	5.02E-7	2.77E-7	3.59E-6	9.70E-7	1.25E-6	3.91E-7	6.54E-6	2.49E-6	5.69E-6	3.91E-7
Th-230	4.99E-10	4.99E-10	5.14E-10	2.00E-10	1.61E-9	1.43E-10	1.42E-10	5.07E-10	4.99E-10	1.43E-10	2.02E-10	2.60E-8	1.46E-10	1.61E-9	2.02E-10
Th-232	1.25E-15	1.25E-15	1.27E-15	4.84E-16	4.03E-15	3.57E-16	3.56E-16	1.26E-15	1.25E-15	3.57E-16	5.02E-16	4.60E-14	3.61E-16	4.03E-15	5.02E-16
U-233	7.60E-7	7.60E-7	9.32E-7	1.99E-5	7.20E-6	8.73E-9	6.65E-9	8.58E-7	7.60E-7	2.11E-8	1.18E-6	7.29E-6	5.02E-8	7.20E-6	1.18E-6
U-234	1.13E-9	1.13E-9	1.34E-9	3.02E-8	1.07E-8	1.14E-11	9.91E-12	1.25E-9	1.13E-9	1.97E-11	1.80E-9	3.65E-7	4.89E-11	1.07E-8	1.80E-9
U-235	1.27E-10	1.27E-10	1.92E-9	5.43E-9	2.19E-9	1.26E-10	1.13E-12	1.15E-9	1.27E-10	3.87E-10	1.97E-10	2.76E-8	8.76E-10	2.19E-9	1.99E-10
U-236	6.84E-10	6.84E-10	7.99E-10	1.79E-8	6.45E-9	7.33E-12	5.98E-12	7.49E-10	6.84E-10	1.06E-11	1.06E-9	6.55E-9	2.61E-11	6.45E-9	1.06E-9
U-238	4.37E-10	4.37E-10	5.04E-10	1.13E-8	4.12E-9	4.21E-12	3.83E-12	4.76E-10	4.37E-10	6.32E-12	6.76E-10	1.30E-7	1.52E-11	4.12E-9	6.76E-10
Zr-93	4.49E-7	4.49E-7	3.62E-6	3.78E-6	2.76E-6	2.74E-7	2.74E-7	2.26E-6	4.49E-7	2.91E-7	1.31E-6	4.80E-5	3.66E-7	2.72E-6	1.31E-6

Table C-2 continued.

Radionuclide	Phyto-plankton	RS-Phyto-plankton	RS-Zoo-plankton	Anisus spirorbis	Spatulaleaf loosestrife	Signal crayfish	Alisma wahlenbergii	Tadpole shrimp	Rugged stonewort	Slender stonewort	Starry stonewort	Bittercress	Shetland pondweed	Northern crested newt	Large mouthed valve snail
Ac-227	8.51E-12	5.88E-11	4.59E-10	2.12E-11	5.92E-11	2.12E-11	5.92E-11	2.12E-11	5.92E-11	5.92E-11	5.92E-11	5.92E-11	5.92E-11	2.44E-14	2.12E-11
Ag-108m	1.82E-32	6.84E-34	1.08E-32	7.01E-29	6.95E-29	7.03E-29	6.95E-29	7.03E-29	6.96E-29	6.96E-29	6.96E-29	6.95E-29	6.95E-29	1.27E-30	7.00E-29
Am-241	1.95E-11	2.09E-12	1.63E-11	7.83E-13	2.13E-12	7.83E-13	2.13E-12	7.83E-13	2.13E-12	2.13E-12	2.13E-12	2.13E-12	2.13E-12	1.72E-15	7.82E-13
Am-243	1.39E-8	1.49E-9	1.16E-8	7.35E-10	1.70E-9	7.40E-10	1.70E-9	7.40E-10	1.70E-9	1.70E-9	1.70E-9	1.70E-9	1.70E-9	4.90E-12	7.33E-10
C-14	1.42E-14	1.43E-14	5.45E-11	1.02E-10	6.45E-11	1.01E-10	6.45E-11	1.01E-10	6.45E-11	6.45E-11	6.45E-11	6.45E-11	6.45E-11	3.13E-11	1.02E-10
Ca-41	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Cl-36	5.81E-11	5.80E-11	6.77E-10	1.41E-9	8.14E-10	1.45E-9	8.14E-10	1.45E-9	8.00E-10	8.00E-10	8.00E-10	8.14E-10	8.14E-10	6.66E-8	1.37E-9
Cm-244	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Cm-245	1.35E-10	2.99E-11	2.33E-10	1.42E-11	3.35E-11	1.42E-11	3.35E-11	1.42E-11	3.35E-11	3.35E-11	3.35E-11	3.35E-11	3.35E-11	1.61E-13	1.42E-11
Cm-246	3.18E-29	7.05E-30	5.49E-29	2.51E-30	7.07E-30	2.51E-30	7.07E-30	2.51E-30	7.07E-30	7.07E-30	7.07E-30	7.07E-30	7.07E-30	5.41E-33	2.51E-30
Cs-135	2.77E-12	2.75E-12	2.55E-9	1.43E-8	1.53E-8	1.92E-8	1.53E-8	1.92E-8	1.54E-8	1.54E-8	1.54E-8	1.53E-8	1.53E-8	6.11E-8	1.27E-8
Cs-137	6.14E-40	6.13E-40	1.00E-37	4.69E-34	4.58E-34	4.76E-34	4.58E-34	4.76E-34	4.58E-34	4.58E-34	4.58E-34	4.58E-34	4.58E-34	4.67E-36	4.64E-34
Ho-166m	2.19E-32	1.08E-33	4.39E-33	6.20E-30	6.19E-30	6.21E-30	6.19E-30	6.21E-30	6.19E-30	6.19E-30	6.19E-30	6.19E-30	6.19E-30	3.27E-31	6.20E-30
I-129	1.52E-10	1.52E-10	1.20E-7	1.70E-6	1.71E-6	1.73E-6	1.71E-6	1.73E-6	1.71E-6	1.71E-6	1.71E-6	1.71E-6	1.71E-6	1.81E-8	1.69E-6
Nb-94	1.76E-9	1.76E-9	2.88E-9	7.73E-4	7.72E-4	7.76E-4	7.72E-4	7.76E-4	7.72E-4	7.72E-4	7.72E-4	7.72E-4	7.72E-4	2.28E-4	7.71E-4
Ni-59	8.03E-8	7.88E-8	5.02E-4	9.81E-4	9.93E-4	1.07E-3	9.93E-4	1.07E-3	1.01E-3	1.01E-3	1.01E-3	9.93E-4	9.93E-4	1.88E-5	9.11E-4
Ni-63	6.31E-38	6.24E-38	2.31E-34	6.10E-35	7.38E-35	6.26E-35	7.38E-35	6.26E-35	7.46E-35	7.46E-35	7.46E-35	7.38E-35	7.38E-35	6.87E-36	5.81E-35
Np-237	4.07E-2	7.32E-3	3.37E-2	1.56E-3	4.36E-3	1.56E-3	4.36E-3	1.56E-3	4.36E-3	4.36E-3	4.36E-3	4.36E-3	4.36E-3	3.37E-5	1.56E-3
Pa-231	8.81E-5	1.95E-5	1.52E-4	7.10E-6	1.97E-5	7.10E-6	1.97E-5	7.10E-6	1.97E-5	1.97E-5	1.97E-5	1.97E-5	1.97E-5	1.51E-8	7.10E-6
Pb-210	1.25E-10	9.33E-11	1.04E-6	1.03E-4	7.66E-5	1.13E-4	7.66E-5	1.13E-4	7.80E-5	7.80E-5	7.80E-5	7.66E-5	7.66E-5	5.04E-8	9.54E-5
Pd-107	6.76E-8	1.02E-8	4.29E-8	4.07E-9	1.09E-8	4.07E-9	1.09E-8	4.07E-9	1.09E-8	1.09E-8	1.09E-8	1.09E-8	1.09E-8	1.78E-9	4.07E-9
Po-210	3.02E-3	2.70E-4	2.91E-3	1.53E-3	2.66E-4	1.08E-3	2.66E-4	1.08E-3	2.66E-4	2.66E-4	2.66E-4	2.66E-4	2.66E-4	8.57E-6	1.53E-3
Pu-239	9.76E-4	4.30E-3	6.62E-5	1.34E-4	4.26E-3	1.68E-4	4.26E-3	1.68E-4	4.26E-3	4.26E-3	4.26E-3	4.26E-3	4.26E-3	7.34E-6	1.34E-4
Pu-240	3.25E-8	1.43E-7	2.21E-9	4.49E-9	1.42E-7	5.61E-9	1.42E-7	5.61E-9	1.42E-7	1.42E-7	1.42E-7	1.42E-7	1.42E-7	2.12E-10	4.49E-9
Pu-242	1.08E-3	4.75E-3	7.38E-5	1.50E-4	4.75E-3	1.87E-4	4.75E-3	1.87E-4	4.75E-3	4.75E-3	4.75E-3	4.75E-3	4.75E-3	8.26E-6	1.50E-4
Ra-226	9.57E-4	1.14E-3	2.94E-5	1.71E-3	2.22E-3	2.13E-3	2.22E-3	2.13E-3	2.22E-3	2.22E-3	2.22E-3	2.22E-3	2.22E-3	4.14E-4	1.70E-3
Se-79	6.12E-11	6.09E-11	1.55E-6	2.24E-7	6.70E-8	2.37E-7	6.70E-8	2.37E-7	6.66E-8	6.66E-8	6.66E-8	6.70E-8	6.70E-8	1.87E-8	2.20E-7
Sm-151	4.58E-35	2.82E-36	2.59E-35	4.13E-36	4.95E-36	4.32E-36	4.95E-36	4.32E-36	4.98E-36	4.98E-36	4.98E-36	4.95E-36	4.95E-36	1.22E-38	3.87E-36
Sn-126	4.33E-7	6.38E-9	2.21E-9	2.75E-5	2.60E-5	2.78E-5	2.60E-5	2.78E-5	2.62E-5	2.62E-5	2.62E-5	2.60E-5	2.60E-5	2.48E-6	2.72E-5
Sr-90	4.49E-36	4.49E-36	2.77E-34	3.75E-33	3.32E-33	3.87E-33	3.32E-33	3.87E-33	3.42E-33	3.42E-33	3.42E-33	3.32E-33	3.32E-33	2.74E-33	3.66E-33
Tc-99	9.15E-9	9.15E-9	1.60E-7	3.51E-7	2.17E-7	2.98E-7	2.17E-7	2.98E-7	2.12E-7	2.12E-7	2.12E-7	2.17E-7	2.17E-7	2.30E-7	3.36E-7
Th-229	1.42E-5	3.12E-6	1.74E-5	3.55E-6	5.69E-6	3.59E-6	5.69E-6	3.59E-6	5.69E-6	5.69E-6	5.69E-6	5.69E-6	5.69E-6	1.51E-6	3.54E-6
Th-230	7.33E-9	1.61E-9	8.96E-9	5.07E-10	1.61E-9	5.07E-10	1.61E-9	5.07E-10	1.61E-9	1.61E-9	1.61E-9	1.61E-9	1.61E-9	7.66E-10	5.07E-10
Th-232	1.83E-14	4.01E-15	2.24E-14	1.26E-15	4.03E-15	1.26E-15	4.03E-15	1.26E-15	4.03E-15	4.03E-15	4.03E-15	4.03E-15	4.03E-15	1.55E-15	1.26E-15
U-233	4.73E-6	7.11E-6	1.66E-6	8.55E-7	7.20E-6	8.58E-7	7.20E-6	8.58E-7	7.20E-6	7.20E-6	7.20E-6	7.20E-6	7.20E-6	2.01E-7	8.53E-7
U-234	7.19E-9	1.08E-8	2.48E-9	1.25E-9	1.07E-8	1.25E-9	1.07E-8	1.25E-9	1.07E-8	1.07E-8	1.07E-8	1.07E-8	1.07E-8	3.04E-10	1.25E-9
U-235	7.72E-10	1.16E-9	2.77E-10	1.14E-9	2.19E-9	1.15E-9	2.19E-9	1.15E-9	2.19E-9	2.19E-9	2.19E-9	2.19E-9	2.19E-9	2.28E-10	1.13E-9
U-236	4.25E-9	6.39E-9	1.50E-9	7.47E-10	6.45E-9	7.49E-10	6.45E-9	7.49E-10	6.45E-9	6.45E-9	6.45E-9	6.45E-9	6.45E-9	1.81E-10	7.46E-10
U-238	2.71E-9	4.07E-9	9.57E-10	4.74E-10	4.12E-9	4.76E-10	4.12E-9	4.76E-10	4.12E-9	4.12E-9	4.12E-9	4.12E-9	4.12E-9	1.16E-10	4.73E-10
Zr-93	1.25E-4	1.77E-6	8.90E-5	2.19E-6	2.72E-6	2.26E-6	2.72E-6	2.26E-6	2.76E-6	2.76E-6	2.76E-6	2.72E-6	2.72E-6	5.65E-7	2.06E-6

Table C-2 continued.

Radionuclide	Tench	Horned grebe	Black tern	Chironomi-dae sp.	Thick shelled river mussel	Flat-stalked pondweed	Pointed stonewort	European otter	Vascular plant	Vimba bream	Slimy-fruited stonewort	Zoo-plankton	Painter's mussel	Water mudwort	Persicaria foliosa
Ac-227	3.61E-14	3.61E-14	4.00E-14	2.12E-11	2.11E-11	5.92E-11	5.92E-11	3.93E-14	8.90E-12	1.41E-13	5.92E-11	2.34E-11	2.11E-11	5.92E-11	5.92E-11
Ag-108m	4.37E-34	7.31E-34	5.51E-31	7.02E-29	9.75E-29	6.95E-29	6.96E-29	4.58E-31	6.98E-29	3.24E-29	6.96E-29	1.08E-32	9.75E-29	6.95E-29	6.95E-29
Am-241	1.28E-15	1.28E-15	1.72E-15	7.83E-13	7.89E-13	2.13E-12	2.13E-12	1.64E-15	2.10E-12	1.81E-14	2.13E-12	1.95E-13	7.89E-13	2.13E-12	2.13E-12
Am-243	9.16E-13	9.16E-13	3.21E-12	7.38E-10	7.91E-10	1.70E-9	1.70E-9	2.78E-12	1.68E-9	8.83E-11	1.70E-9	1.39E-10	7.91E-10	1.70E-9	1.70E-9
C-14	6.55E-11	1.04E-10	1.04E-10	1.01E-10	1.04E-10	6.45E-11	6.45E-11	1.04E-10	6.18E-11	6.55E-11	6.45E-11	5.37E-11	1.04E-10	6.45E-11	6.45E-11
Ca-41	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Cl-36	1.28E-9	1.29E-9	1.27E-9	1.43E-9	1.14E-9	8.14E-10	8.00E-10	1.29E-9	1.51E-8	1.30E-9	8.00E-10	1.05E-8	1.14E-9	8.14E-10	8.14E-10
Cm-244	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Cm-245	1.83E-14	1.83E-14	9.48E-14	1.42E-11	1.53E-11	3.35E-11	3.35E-11	8.06E-14	5.74E-12	1.60E-12	3.35E-11	1.35E-10	1.53E-11	3.35E-11	3.35E-11
Cm-246	4.32E-33	4.32E-33	4.38E-33	2.51E-30	2.50E-30	7.07E-30	7.07E-30	4.37E-33	5.13E-31	7.94E-33	7.07E-30	3.18E-29	2.50E-30	7.07E-30	7.07E-30
Cs-135	3.59E-9	3.59E-9	3.58E-9	1.77E-8	2.24E-9	1.53E-8	1.54E-8	3.59E-9	2.60E-8	3.96E-9	1.54E-8	4.04E-9	2.24E-9	1.53E-8	1.53E-8
Cs-137	2.73E-37	3.20E-37	1.97E-36	4.73E-34	5.96E-34	4.58E-34	4.58E-34	1.79E-36	4.73E-34	1.98E-34	4.58E-34	1.55E-37	5.96E-34	4.58E-34	4.58E-34
Ho-166m	2.88E-35	3.54E-35	1.50E-31	6.21E-30	8.79E-30	6.19E-30	6.19E-30	1.25E-31	6.21E-30	2.92E-30	6.19E-30	3.22E-34	8.79E-30	6.19E-30	6.19E-30
I-129	1.03E-8	1.10E-8	1.37E-8	1.72E-6	1.93E-6	1.71E-6	1.71E-6	1.44E-8	1.76E-6	6.35E-7	1.71E-6	1.78E-7	1.93E-6	1.71E-6	1.71E-6
Nb-94	4.21E-9	4.82E-9	1.03E-4	7.75E-4	1.09E-3	7.72E-4	7.72E-4	8.64E-5	7.80E-4	3.61E-4	7.72E-4	1.22E-7	1.09E-3	7.72E-4	7.72E-4
Ni-59	1.62E-6	1.62E-6	1.61E-6	1.04E-3	1.94E-4	9.93E-4	1.01E-3	1.62E-6	9.52E-4	4.08E-5	1.01E-3	8.49E-4	1.94E-4	9.93E-4	9.93E-4
Ni-63	6.92E-37	6.92E-37	6.92E-37	6.07E-35	2.50E-35	7.38E-35	7.46E-35	6.92E-37	4.86E-35	1.73E-36	7.46E-35	3.82E-34	2.50E-35	7.38E-35	7.38E-35
Np-237	2.66E-6	1.11E-4	1.11E-4	1.56E-3	1.57E-3	4.36E-3	4.36E-3	1.11E-4	4.31E-3	1.47E-5	4.36E-3	4.58E-4	1.57E-3	4.36E-3	4.36E-3
Pa-231	1.20E-8	1.20E-8	1.68E-8	7.10E-6	7.14E-6	1.97E-5	1.97E-5	1.59E-8	1.98E-7	8.85E-8	1.97E-5	8.81E-5	7.14E-6	1.97E-5	1.97E-5
Pb-210	3.43E-8	3.49E-8	4.49E-8	1.09E-4	1.40E-5	7.66E-5	7.80E-5	4.35E-8	9.52E-5	4.49E-6	7.80E-5	1.04E-6	1.40E-5	7.66E-5	7.66E-5
Pd-107	1.28E-10	1.28E-10	1.28E-10	4.07E-9	4.05E-9	1.09E-8	1.09E-8	1.28E-10	7.37E-10	1.29E-10	1.09E-8	7.15E-8	4.05E-9	1.09E-8	1.09E-8
Po-210	1.72E-5	1.72E-5	1.72E-5	1.08E-3	2.57E-3	2.66E-4	2.66E-4	1.72E-5	4.48E-4	1.72E-5	2.66E-4	3.02E-3	2.57E-3	2.66E-4	2.66E-4
Pu-239	3.21E-6	3.27E-7	3.28E-7	1.68E-4	1.34E-4	4.26E-3	4.26E-3	3.77E-5	4.30E-4	3.22E-6	4.26E-3	7.44E-5	1.34E-4	4.26E-3	4.26E-3
Pu-240	1.07E-10	1.09E-11	1.10E-11	5.61E-9	4.49E-9	1.42E-7	1.42E-7	1.26E-9	1.43E-8	1.08E-10	1.42E-7	2.48E-9	4.49E-9	1.42E-7	1.42E-7
Pu-242	3.58E-6	3.65E-7	3.66E-7	1.87E-4	1.50E-4	4.75E-3	4.75E-3	4.20E-5	4.75E-4	3.59E-6	4.75E-3	8.21E-5	1.50E-4	4.75E-3	4.75E-3
Ra-226	1.74E-5	1.74E-5	3.10E-5	2.13E-3	4.09E-3	2.22E-3	2.22E-3	2.90E-5	2.68E-3	4.51E-4	2.22E-3	9.49E-4	4.09E-3	2.22E-3	2.22E-3
Se-79	4.43E-8	4.44E-8	4.43E-8	2.33E-7	1.92E-7	6.70E-8	6.66E-8	4.44E-8	1.30E-7	4.55E-8	6.66E-8	3.49E-7	1.92E-7	6.70E-8	6.70E-8
Sm-151	3.70E-39	3.70E-39	4.30E-39	4.14E-36	1.06E-36	4.95E-36	4.98E-36	4.18E-39	9.84E-36	1.38E-37	4.98E-36	5.27E-37	1.06E-36	4.95E-36	4.95E-36
Sn-126	6.15E-9	7.14E-9	1.12E-6	2.77E-5	3.21E-5	2.60E-5	2.62E-5	9.34E-7	2.67E-5	1.07E-5	2.62E-5	1.04E-6	3.21E-5	2.60E-5	2.60E-5
Sr-90	4.83E-34	5.02E-34	4.66E-34	3.82E-33	1.65E-33	3.32E-33	3.42E-33	5.08E-34	3.36E-33	6.78E-34	3.42E-33	6.15E-35	1.65E-33	3.32E-33	3.32E-33
Tc-99	2.78E-7	2.79E-7	2.78E-7	2.85E-7	2.55E-7	2.17E-7	2.12E-7	2.79E-7	1.07E-5	2.82E-7	2.12E-7	1.59E-7	2.55E-7	2.17E-7	2.17E-7
Th-229	2.77E-7	2.77E-7	4.45E-7	3.58E-6	4.31E-6	5.69E-6	5.69E-6	4.14E-7	7.11E-6	1.38E-6	5.69E-6	7.11E-6	4.31E-6	5.69E-6	5.69E-6
Th-230	1.42E-10	1.42E-10	1.43E-10	5.07E-10	5.04E-10	1.61E-9	1.61E-9	1.43E-10	2.32E-9	1.44E-10	1.61E-9	3.67E-9	5.04E-10	1.61E-9	1.61E-9
Th-232	3.56E-16	3.56E-16	3.57E-16	1.26E-15	1.26E-15	4.03E-15	4.03E-15	3.57E-16	5.77E-15	3.58E-16	4.03E-15	9.13E-15	1.26E-15	4.03E-15	4.03E-15
U-233	6.65E-9	6.65E-9	8.21E-9	8.57E-7	8.27E-7	7.20E-6	7.20E-6	7.87E-9	1.14E-4	2.85E-8	7.20E-6	1.89E-6	8.27E-7	7.20E-6	7.20E-6
U-234	9.91E-12	9.91E-12	1.18E-11	1.25E-9	1.19E-9	1.07E-8	1.07E-8	1.13E-11	1.74E-7	2.95E-11	1.07E-8	2.87E-9	1.19E-9	1.07E-8	1.07E-8
U-235	1.13E-12	1.12E-12	9.92E-11	1.15E-9	1.45E-9	2.19E-9	2.19E-9	8.11E-11	2.05E-8	4.39E-10	2.19E-9	3.22E-10	1.45E-9	2.19E-9	2.19E-9
U-236	5.98E-12	5.98E-12	6.99E-12	7.49E-10	7.16E-10	6.45E-9	6.45E-9	6.73E-12	1.03E-7	1.61E-11	6.45E-9	1.70E-9	7.16E-10	6.45E-9	6.45E-9
U-238	3.83E-12	3.83E-12	4.40E-12	4.75E-10	4.55E-10	4.12E-9	4.12E-9	4.25E-12	6.54E-8	9.53E-12	4.12E-9	1.08E-9	4.55E-10	4.12E-9	4.12E-9
Zr-93	2.74E-7	2.74E-7	2.74E-7	2.18E-6	5.93E-7	2.72E-6	2.76E-6	2.74E-7	1.02E-5	3.20E-7	2.76E-6	1.43E-4	5.93E-7	2.72E-6	2.72E-6

Table C-3. Total dose rate per radionuclide (µGy/h) to biota in the terrestrial ecosystem under the central corrosion base case.

Radionuclide	European alder	Amphibian	Bird	Bird egg	Silver birch	Dwarf neckera	Ruff	Lumbricus sp.	Detritivorous invertebrate	Pygmy damselfly	Bottle sedge	Flying insects	Natterer's bat	European hare
Ac-227	3.61E-14	1.22E-11	3.43E-12	3.43E-12	3.61E-14	1.80E-12	1.47E-14	7.93E-12	4.91E-12	4.68E-12	3.96E-14	1.55E-11	1.48E-14	1.09E-14
Ag-108m	7.34E-31	9.89E-31	1.00E-30	9.95E-31	7.34E-31	9.72E-31	9.90E-31	2.52E-30	2.50E-30	1.09E-30	9.11E-31	1.02E-30	9.91E-31	9.50E-31
Am-241	2.89E-15	3.76E-13	3.76E-13	3.76E-13	2.89E-15	1.35E-13	1.35E-15	5.95E-13	9.27E-13	3.51E-13	1.57E-15	1.17E-12	1.29E-15	8.84E-16
Am-243	4.03E-12	1.41E-10	1.41E-10	1.41E-10	4.03E-12	5.32E-11	4.02E-12	2.26E-10	3.47E-10	1.32E-10	4.29E-12	4.31E-10	4.06E-12	1.90E-12
C-14	9.51E-14	9.57E-14	9.91E-14	6.35E-14	9.51E-14	6.50E-14	9.79E-14	3.14E-14	3.07E-14	3.14E-14	6.48E-14	3.07E-14	9.79E-14	9.80E-14
Ca-41	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Cl-36	2.62E-7	3.81E-8	3.81E-8	3.81E-8	2.62E-7	5.55E-8	9.47E-8	8.53E-10	1.45E-9	8.84E-10	2.34E-7	1.45E-9	9.40E-8	9.63E-8
Cm-244	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Cm-245	1.82E-13	1.21E-11	1.21E-11	1.21E-11	1.82E-13	4.45E-12	1.46E-13	3.73E-11	4.07E-11	3.72E-11	2.15E-13	4.06E-11	1.48E-13	7.33E-14
Cm-246	2.14E-32	3.42E-30	3.42E-30	3.42E-30	2.14E-32	1.23E-30	5.73E-33	1.05E-29	1.15E-29	1.05E-29	2.16E-32	1.15E-29	5.73E-33	5.66E-33
Cs-135	1.34E-8	1.64E-7	2.30E-7	9.19E-9	1.34E-8	3.09E-8	6.81E-8	1.30E-8	4.00E-8	4.07E-9	1.33E-8	1.64E-8	3.05E-8	3.06E-8
Cs-137	2.62E-36	4.76E-36	6.31E-36	2.87E-36	2.62E-36	3.19E-36	3.73E-36	7.73E-36	8.15E-36	2.86E-36	2.97E-36	3.19E-36	3.14E-36	2.27E-36
Ho-166m	1.98E-31	2.54E-31	2.39E-31	2.54E-31	1.98E-31	2.51E-31	2.47E-31	6.54E-31	6.60E-31	2.54E-31	2.47E-31	2.61E-31	2.50E-31	1.23E-31
I-129	1.07E-8	1.10E-7	1.20E-7	4.21E-5	1.07E-8	2.29E-8	1.48E-8	5.51E-8	9.35E-8	8.45E-8	1.50E-8	8.02E-8	1.41E-8	1.26E-8
Nb-94	1.36E-4	1.86E-4	1.95E-4	2.16E-4	1.36E-4	1.71E-4	1.85E-4	4.54E-4	4.59E-4	1.69E-4	1.69E-4	1.73E-4	1.66E-4	8.59E-5
Ni-59	2.84E-5	1.37E-4	1.39E-4	1.37E-4	2.84E-5	8.59E-5	1.50E-5	1.07E-4	3.70E-5	1.65E-5	5.51E-5	1.61E-5	1.49E-5	1.50E-5
Ni-63	1.79E-35	8.78E-35	8.78E-35	8.78E-35	1.79E-35	5.48E-35	9.52E-36	5.54E-35	1.05E-35	1.05E-35	1.79E-35	1.02E-35	9.52E-36	9.52E-36
Np-237	7.65E-7	8.77E-5	8.78E-5	8.77E-5	7.65E-7	3.18E-5	4.19E-7	1.40E-4	2.18E-4	8.23E-5	8.79E-7	2.72E-4	3.98E-7	2.53E-7
Pa-231	1.43E-8	3.17E-6	8.92E-7	8.93E-7	1.43E-8	4.72E-7	1.01E-8	2.06E-6	4.35E-6	1.21E-6	1.68E-8	4.34E-6	1.02E-8	5.83E-9
Pb-210	7.79E-8	1.99E-6	1.07E-6	1.03E-6	7.79E-8	1.85E-6	6.07E-8	2.78E-7	9.86E-6	9.90E-7	8.45E-8	8.98E-7	1.97E-7	1.97E-7
Pd-107	4.68E-9	2.31E-8	2.31E-8	2.31E-8	4.68E-9	1.43E-8	2.49E-9	1.45E-8	2.76E-9	2.75E-9	4.68E-9	2.76E-9	2.49E-9	2.49E-9
Po-210	1.46E-6	5.69E-6	5.69E-6	5.69E-6	1.46E-6	1.11E-2	4.88E-6	1.93E-4	5.69E-6	1.93E-4	1.46E-6	5.69E-6	4.88E-6	4.88E-6
Pu-239	6.18E-8	1.12E-5	1.12E-5	1.12E-5	6.18E-8	1.37E-5	4.89E-6	9.31E-6	1.86E-5	5.54E-6	6.26E-8	8.11E-6	9.10E-6	4.24E-7
Pu-240	1.74E-12	3.16E-10	3.16E-10	3.16E-10	1.74E-12	3.87E-10	1.38E-10	2.62E-10	5.23E-10	1.56E-10	1.79E-12	2.28E-10	2.56E-10	1.19E-11
Pu-242	6.97E-8	1.25E-5	1.25E-5	1.25E-5	6.97E-8	1.55E-5	5.52E-6	1.05E-5	2.08E-5	6.25E-6	7.16E-8	9.06E-6	1.03E-5	4.78E-7
Ra-226	8.12E-5	3.45E-4	3.65E-4	3.45E-4	8.12E-5	3.05E-4	5.27E-4	8.83E-4	8.69E-4	8.46E-4	8.51E-5	8.32E-4	5.63E-4	5.55E-4
Se-79	7.31E-10	7.63E-9	7.63E-9	7.63E-9	7.31E-10	1.26E-8	7.68E-9	1.79E-7	1.79E-7	1.79E-7	7.26E-10	1.79E-7	7.67E-9	7.69E-9
Sm-151	1.99E-38	2.28E-36	2.28E-36	2.28E-36	1.99E-38	7.46E-37	1.43E-38	3.62E-36	5.62E-36	2.14E-36	2.29E-38	7.10E-36	1.43E-38	1.36E-38
Sn-126	1.56E-6	1.86E-6	1.73E-6	1.86E-6	1.56E-6	2.08E-6	1.89E-6	4.86E-6	4.89E-6	1.86E-6	1.88E-6	1.88E-6	1.91E-6	1.01E-6
Sr-90	4.40E-34	2.82E-33	2.01E-33	4.78E-33	4.40E-34	8.09E-34	3.67E-34	2.71E-35	8.25E-34	2.17E-34	3.18E-34	1.54E-34	1.18E-35	1.29E-35
Tc-99	3.83E-9	2.83E-7	1.33E-7	1.33E-5	3.83E-9	9.93E-6	8.30E-8	1.83E-7	1.76E-7	1.84E-7	3.75E-9	1.79E-7	1.84E-7	1.85E-7
Th-229	1.08E-6	5.24E-7	5.02E-7	5.23E-7	1.08E-6	8.40E-6	5.20E-7	6.09E-6	6.10E-6	5.77E-6	1.16E-6	5.77E-6	1.86E-6	1.70E-6
Th-230	5.52E-10	1.59E-10	1.58E-10	1.58E-10	5.52E-10	5.29E-9	1.58E-10	3.58E-9	3.58E-9	3.57E-9	5.54E-10	3.58E-9	1.03E-9	1.03E-9
Th-232	1.10E-15	3.14E-16	3.14E-16	3.14E-16	1.10E-15	1.06E-14	3.15E-16	7.14E-15	7.12E-15	7.14E-15	1.11E-15	7.12E-15	2.06E-15	2.06E-15
U-233	1.09E-7	4.18E-7	4.53E-7	4.54E-7	1.09E-7	2.41E-5	4.54E-7	7.38E-6	7.38E-6	7.37E-6	1.12E-7	7.37E-6	2.82E-7	2.81E-7
U-234	1.65E-10	6.45E-10	7.00E-10	7.00E-10	1.65E-10	3.65E-8	6.86E-10	1.12E-8	1.14E-8	1.12E-8	1.70E-10	1.14E-8	4.26E-10	4.25E-10
U-235	1.51E-10	2.34E-10	2.41E-10	2.41E-10	1.51E-10	4.28E-9	2.40E-10	1.64E-9	1.65E-9	1.42E-9	1.91E-10	1.44E-9	2.04E-10	1.20E-10
U-236	9.80E-11	3.77E-10	4.09E-10	4.10E-10	9.80E-11	2.18E-8	4.09E-10	6.67E-9	6.67E-9	6.67E-9	1.01E-10	6.67E-9	2.55E-10	2.53E-10
U-238	6.28E-11	2.40E-10	2.61E-10	2.61E-10	6.28E-11	1.39E-8	2.62E-10	4.27E-9	4.25E-9	4.27E-9	6.47E-11	4.24E-9	1.63E-10	1.62E-10
Zr-93	2.61E-7	1.03E-9	1.03E-9	1.03E-9	2.61E-7	1.14E-5	6.89E-7	4.35E-8	4.35E-8	4.36E-8	2.61E-7	4.35E-8	1.03E-9	1.03E-9

Table C-3 continued.

Radionuclide	Gastropod	Norway spruce	Grasses & Herbs	Common grass-hopper warbler	Large gold grasshopper	Yellow widelip orchid	Pool frog	Cloudberry	Short-eared owl	Geyer's whorl snail	Slender green feather moss	Large Mammal	Lichen & bryophytes	Eurasian lynx
Ac-227	1.22E-11	3.61E-14	3.07E-12	1.48E-14	1.35E-10	3.96E-14	2.96E-14	3.77E-14	1.40E-14	1.98E-11	1.80E-12	1.59E-11	8.44E-11	1.20E-14
Ag-108m	1.03E-30	7.34E-31	1.36E-30	9.83E-31	1.00E-30	9.11E-31	1.23E-30	8.61E-31	9.11E-31	1.03E-30	9.19E-31	9.50E-31	4.93E-31	8.60E-31
Am-241	1.83E-12	2.89E-15	4.66E-14	1.29E-15	3.88E-13	1.57E-15	1.82E-15	3.12E-15	1.17E-15	1.48E-12	1.36E-13	3.75E-13	9.52E-13	1.01E-15
Am-243	6.72E-10	4.03E-12	2.07E-11	4.06E-12	1.46E-10	4.29E-12	4.81E-12	4.64E-12	3.57E-12	5.47E-10	5.34E-11	1.39E-10	3.50E-10	2.55E-12
C-14	3.07E-14	9.51E-14	6.35E-14	9.79E-14	3.11E-14	6.48E-14	5.20E-11	6.49E-14	9.80E-14	3.13E-14	5.76E-14	9.91E-14	6.35E-14	9.80E-14
Ca-41	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Cl-36	8.46E-10	2.62E-7	8.71E-8	9.36E-8	7.70E-10	2.34E-7	4.73E-8	2.45E-7	9.53E-8	7.00E-10	1.71E-8	3.81E-8	4.26E-9	9.61E-8
Cm-244	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Cm-245	4.06E-11	1.82E-13	2.21E-13	1.48E-13	3.72E-11	2.15E-13	1.51E-13	2.03E-13	1.32E-13	3.72E-11	4.46E-12	1.21E-11	3.05E-11	9.54E-14
Cm-246	1.15E-29	2.14E-32	2.33E-32	5.73E-33	1.05E-29	2.16E-32	5.17E-33	2.15E-32	5.72E-33	1.05E-29	1.23E-30	3.42E-30	8.67E-30	5.68E-33
Cs-135	1.31E-8	1.34E-8	2.12E-7	6.81E-8	1.44E-8	1.33E-8	4.46E-8	1.33E-8	6.82E-8	1.07E-8	2.54E-8	8.80E-7	1.67E-6	3.06E-8
Cs-137	3.15E-36	2.62E-36	5.18E-36	3.60E-36	3.04E-36	2.97E-36	4.42E-36	2.83E-36	3.33E-36	3.00E-36	2.95E-36	2.58E-35	1.54E-35	2.48E-36
Ho-166m	2.67E-31	1.98E-31	2.47E-31	2.50E-31	2.55E-31	2.47E-31	3.22E-31	2.33E-31	2.19E-31	2.64E-31	2.48E-31	1.43E-31	1.38E-31	1.64E-31
I-129	5.15E-8	1.07E-8	4.56E-8	1.40E-8	4.17E-8	1.50E-8	1.85E-8	1.31E-8	1.35E-8	4.93E-8	2.55E-8	1.29E-7	8.90E-8	1.33E-8
Nb-94	1.73E-4	1.36E-4	1.70E-4	1.79E-4	1.74E-4	1.69E-4	2.25E-4	1.59E-4	1.60E-4	1.74E-4	1.70E-4	1.52E-4	7.80E-7	1.14E-4
Ni-59	3.38E-5	2.84E-5	3.83E-4	1.49E-5	4.21E-5	5.51E-5	1.88E-5	2.98E-5	1.50E-5	2.93E-5	1.05E-4	1.38E-4	1.57E-4	1.50E-5
Ni-63	2.18E-35	1.79E-35	2.30E-34	9.52E-36	2.79E-35	1.79E-35	5.10E-36	1.79E-35	9.52E-36	1.90E-35	5.37E-35	8.78E-35	1.06E-34	9.52E-36
Np-237	4.26E-4	7.65E-7	3.73E-5	3.98E-7	3.47E-4	8.79E-7	5.58E-5	8.27E-7	3.57E-7	1.39E-4	3.19E-5	8.76E-5	2.24E-4	3.01E-7
Pa-231	4.34E-6	1.43E-8	2.45E-8	1.02E-8	3.48E-5	1.68E-8	1.68E-8	1.57E-8	9.13E-9	5.11E-6	4.72E-7	4.11E-6	2.18E-5	7.15E-9
Pb-210	1.29E-7	7.79E-8	1.03E-6	5.47E-8	7.54E-6	8.45E-8	4.06E-8	7.61E-8	5.20E-8	7.32E-8	5.65E-7	6.72E-7	7.00E-5	1.99E-7
Pd-107	2.47E-10	4.68E-9	2.15E-8	2.49E-9	7.31E-9	4.68E-9	1.31E-9	4.68E-9	2.49E-9	4.96E-9	1.43E-8	2.31E-8	8.35E-8	2.49E-9
Po-210	5.69E-6	1.46E-6	2.55E-4	4.88E-6	1.93E-4	1.46E-6	1.10E-5	1.46E-6	4.88E-6	1.93E-4	1.11E-2	5.69E-6	1.29E-2	4.88E-6
Pu-239	5.36E-5	6.18E-8	6.93E-6	4.89E-6	9.48E-6	6.26E-8	6.16E-6	6.21E-8	4.89E-6	4.21E-5	1.37E-5	1.12E-5	4.97E-5	4.24E-7
Pu-240	1.51E-9	1.74E-12	1.95E-10	1.38E-10	2.67E-10	1.79E-12	1.82E-10	1.76E-12	1.38E-10	1.19E-9	3.87E-10	3.16E-10	1.40E-9	1.19E-11
Pu-242	5.99E-5	6.97E-8	7.74E-6	5.52E-6	1.07E-5	7.16E-8	6.93E-6	7.04E-8	5.52E-6	4.75E-5	1.55E-5	1.25E-5	5.55E-5	4.78E-7
Ra-226	4.52E-4	8.12E-5	3.77E-4	5.26E-4	8.46E-4	8.51E-5	3.09E-4	8.39E-5	5.23E-4	3.30E-4	3.04E-4	2.55E-4	1.93E-3	5.58E-4
Se-79	4.19E-9	7.31E-10	6.79E-8	7.67E-9	1.77E-7	7.26E-10	2.60E-8	7.28E-10	7.68E-9	3.12E-9	1.10E-8	7.63E-9	2.42E-6	7.69E-9
Sm-151	1.11E-35	1.99E-38	2.81E-37	1.43E-38	2.36E-36	2.29E-38	1.05E-38	2.09E-38	1.42E-38	9.03E-36	7.27E-37	2.28E-36	5.78E-36	1.38E-38
Sn-126	1.88E-6	1.56E-6	1.85E-6	1.90E-6	1.88E-6	1.88E-6	2.43E-6	1.78E-6	1.68E-6	1.88E-6	1.90E-6	9.14E-7	1.01E-6	1.29E-6
Sr-90	2.63E-34	4.40E-34	6.12E-34	3.54E-34	1.68E-34	3.18E-34	2.00E-33	3.57E-34	3.79E-34	2.47E-34	1.09E-34	6.56E-33	1.46E-32	1.28E-35
Tc-99	1.79E-7	3.83E-9	9.86E-6	8.29E-8	1.78E-7	3.75E-9	2.43E-7	3.79E-9	8.31E-8	1.82E-7	7.08E-6	1.82E-7	9.18E-6	1.85E-7
Th-229	5.77E-6	1.08E-6	2.74E-5	5.23E-7	5.77E-6	1.16E-6	1.23E-6	1.13E-6	4.88E-7	5.77E-6	8.43E-6	1.94E-7	6.43E-5	1.75E-6
Th-230	3.58E-9	5.52E-10	1.77E-8	1.58E-10	3.57E-9	5.54E-10	5.88E-10	5.53E-10	1.58E-10	3.57E-9	5.30E-9	4.97E-11	4.19E-8	1.03E-9
Th-232	7.12E-15	1.10E-15	3.52E-14	3.15E-16	7.14E-15	1.11E-15	1.21E-15	1.10E-15	3.15E-16	7.14E-15	1.06E-14	9.85E-17	8.33E-14	2.06E-15
U-233	7.37E-6	1.09E-7	1.21E-5	4.54E-7	7.37E-6	1.12E-7	1.46E-7	1.10E-7	4.53E-7	7.37E-6	2.41E-5	8.95E-8	5.91E-5	2.81E-7
U-234	1.14E-8	1.65E-10	1.87E-8	6.85E-10	1.12E-8	1.70E-10	2.21E-10	1.66E-10	6.84E-10	1.12E-8	3.65E-8	1.38E-10	9.14E-8	4.25E-10
U-235	1.44E-9	1.51E-10	2.27E-9	2.34E-10	1.43E-9	1.91E-10	2.10E-10	1.77E-10	2.11E-10	1.43E-9	4.29E-9	8.79E-11	1.02E-8	1.48E-10
U-236	6.67E-9	9.80E-11	1.10E-8	4.10E-10	6.67E-9	1.01E-10	1.32E-10	9.91E-11	4.09E-10	6.67E-9	2.18E-8	8.05E-11	5.35E-8	2.54E-10
U-238	4.24E-9	6.28E-11	6.99E-9	2.62E-10	4.27E-9	6.47E-11	8.42E-11	6.34E-11	2.62E-10	4.27E-9	1.39E-8	5.12E-11	3.41E-8	1.62E-10
Zr-93	2.61E-7	1.14E-5	6.89E-7	4.35E-8	4.35E-8	4.36E-8	4.81E-7	2.61E-7	6.89E-7	4.35E-8	1.12E-5	1.03E-9	1.47E-6	6.89E-7

Table C-3 continued

Radionuclide	Flea sedge	Omphalina philonotis	Reptile	Roe deer	Red fox	Yellow foot	Eurasian bittern	Shrub	Knowlton's thread-moss	Mountain hare	Small Mammal	Spotted crake	Grass snake	Soil Inverte-brate (worm)
Ac-227	3.96E-14	2.14E-14	6.74E-12	1.19E-14	1.53E-14	2.14E-14	1.43E-14	2.09E-12	1.80E-12	1.09E-14	1.21E-12	1.43E-14	1.45E-14	1.10E-11
Ag-108m	9.11E-31	9.38E-31	9.76E-31	9.10E-31	1.40E-30	9.38E-31	1.00E-30	1.83E-30	9.19E-31	9.50E-31	2.36E-30	1.00E-30	9.76E-31	2.52E-30
Am-241	1.57E-15	1.93E-15	3.76E-13	1.01E-15	1.39E-15	1.93E-15	1.30E-15	4.64E-14	1.36E-13	8.84E-16	3.77E-13	1.30E-15	1.33E-15	9.20E-13
Am-243	4.29E-12	4.42E-12	1.41E-10	2.55E-12	4.76E-12	4.42E-12	3.76E-12	2.05E-11	5.34E-11	1.90E-12	1.45E-10	3.76E-12	3.87E-12	3.45E-10
C-14	6.48E-14	6.44E-14	9.91E-14	9.80E-14	9.80E-14	6.44E-14	9.80E-14	6.35E-14	5.76E-14	9.80E-14	9.91E-14	9.80E-14	9.80E-14	3.07E-14
Ca-41	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Cl-36	2.34E-7	9.31E-8	3.81E-8	9.61E-8	9.60E-8	9.31E-8	9.56E-8	5.29E-9	1.71E-8	9.63E-8	3.81E-8	9.56E-8	9.52E-8	9.11E-10
Cm-244	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Cm-245	2.15E-13	1.71E-13	1.21E-11	9.51E-14	1.66E-13	1.71E-13	1.38E-13	2.88E-12	4.46E-12	7.33E-14	1.23E-11	1.38E-13	1.42E-13	4.07E-11
Cm-246	2.16E-32	9.20E-33	3.42E-30	5.67E-33	5.68E-33	9.20E-33	5.72E-33	7.83E-31	1.23E-30	5.66E-33	3.42E-30	5.72E-33	5.73E-33	1.15E-29
Cs-135	1.33E-8	4.44E-7	1.10E-6	3.06E-8	3.06E-8	4.44E-7	6.82E-8	1.22E-6	2.54E-8	3.06E-8	8.80E-7	6.82E-8	3.05E-8	2.74E-8
Cs-137	2.97E-36	7.46E-36	1.80E-35	2.53E-36	4.30E-36	7.46E-36	3.73E-36	1.67E-35	2.95E-36	2.27E-36	1.92E-35	3.73E-36	3.16E-36	7.81E-36
Ho-166m	2.47E-31	2.47E-31	2.44E-31	1.64E-31	3.28E-31	2.47E-31	2.32E-31	2.34E-31	2.48E-31	1.23E-31	6.15E-31	2.32E-31	2.39E-31	6.56E-31
I-129	1.50E-8	1.09E-8	1.14E-7	1.34E-8	1.50E-8	1.09E-8	1.51E-8	4.40E-8	2.55E-8	1.26E-8	1.26E-7	1.51E-8	1.48E-8	5.82E-8
Nb-94	1.69E-4	1.69E-4	1.79E-4	1.14E-4	2.30E-4	1.69E-4	1.83E-4	1.59E-4	1.70E-4	8.59E-5	4.45E-4	1.83E-4	1.64E-4	4.54E-4
Ni-59	5.51E-5	5.42E-5	1.39E-4	1.50E-5	1.51E-5	5.42E-5	1.50E-5	6.64E-5	1.05E-4	1.50E-5	1.57E-4	1.50E-5	1.50E-5	1.45E-4
Ni-63	1.79E-35	1.80E-35	8.78E-35	9.52E-36	9.52E-36	1.80E-35	9.52E-36	4.17E-35	5.37E-35	9.52E-36	8.78E-35	9.52E-36	9.52E-36	8.00E-35
Np-237	8.79E-7	5.59E-7	8.77E-5	3.00E-7	4.41E-7	5.59E-7	4.01E-7	6.66E-4	3.19E-5	2.53E-7	8.79E-5	4.01E-7	4.10E-7	2.15E-4
Pa-231	1.68E-8	1.21E-8	3.17E-7	7.13E-9	1.17E-8	1.21E-8	9.49E-9	3.05E-7	4.72E-7	5.83E-9	3.28E-7	9.49E-9	9.75E-9	4.35E-6
Pb-210	8.45E-8	4.57E-8	1.49E-6	1.99E-7	2.04E-7	4.57E-8	6.03E-8	4.66E-6	5.65E-7	1.97E-7	6.74E-7	6.03E-8	2.05E-7	4.89E-7
Pd-107	4.68E-9	4.71E-9	9.64E-8	2.49E-9	2.49E-9	4.71E-9	2.49E-9	8.67E-8	1.43E-8	2.49E-9	2.31E-8	2.49E-9	2.49E-9	2.38E-9
Po-210	1.46E-6	6.07E-7	5.69E-6	4.88E-6	4.88E-6	6.07E-7	4.88E-6	2.02E-4	1.11E-2	4.88E-6	5.69E-6	4.88E-6	4.88E-6	5.69E-6
Pu-239	6.26E-8	1.94E-7	1.12E-5	4.24E-7	4.24E-7	1.94E-7	4.89E-6	1.51E-5	1.37E-5	4.24E-7	1.12E-5	4.89E-6	9.10E-6	1.39E-5
Pu-240	1.79E-12	5.51E-12	3.16E-10	1.19E-11	1.19E-11	5.51E-12	1.38E-10	4.25E-10	3.87E-10	1.19E-11	3.16E-10	1.38E-10	2.56E-10	3.91E-10
Pu-242	7.16E-8	2.20E-7	1.25E-5	4.78E-7	4.78E-7	2.20E-7	5.52E-6	1.69E-5	1.55E-5	4.78E-7	1.25E-5	5.52E-6	1.03E-5	1.55E-5
Ra-226	8.51E-5	5.05E-5	3.44E-4	5.58E-4	5.73E-4	5.05E-5	5.26E-4	2.37E-4	3.04E-4	5.55E-4	2.92E-4	5.26E-4	5.63E-4	8.69E-4
Se-79	7.26E-10	3.01E-10	7.63E-9	7.69E-9	7.69E-9	3.01E-10	7.69E-9	2.18E-7	1.10E-8	7.69E-9	7.63E-9	7.69E-9	7.68E-9	1.79E-7
Sm-151	2.29E-38	1.15E-38	2.28E-36	1.38E-38	1.39E-38	1.15E-38	1.42E-38	2.79E-37	7.27E-37	1.36E-38	2.29E-36	1.42E-38	1.43E-38	5.59E-36
Sn-126	1.88E-6	1.85E-6	1.78E-6	1.29E-6	2.49E-6	1.85E-6	1.78E-6	1.74E-6	1.90E-6	1.01E-6	4.56E-6	1.78E-6	1.83E-6	4.86E-6
Sr-90	3.18E-34	6.25E-36	4.09E-32	1.28E-35	1.27E-35	6.25E-36	3.86E-34	1.47E-34	1.09E-34	1.29E-35	6.26E-33	3.86E-34	1.19E-35	2.70E-35
Tc-99	3.75E-9	1.54E-9	1.82E-7	1.85E-7	1.85E-7	1.54E-9	8.32E-8	9.86E-6	7.08E-6	1.85E-7	1.82E-7	8.32E-8	1.84E-7	1.82E-7
Th-229	1.16E-6	6.00E-7	5.10E-7	1.75E-6	1.91E-6	6.00E-7	5.02E-7	1.02E-5	8.43E-6	1.70E-6	6.50E-7	5.02E-7	1.85E-6	6.09E-6
Th-230	5.54E-10	1.89E-10	1.58E-10	1.03E-9	1.03E-9	1.89E-10	1.58E-10	6.50E-9	5.30E-9	1.03E-9	5.20E-11	1.58E-10	1.03E-9	3.58E-9
Th-232	1.11E-15	3.77E-16	3.14E-16	2.06E-15	2.06E-15	3.77E-16	3.15E-16	1.29E-14	1.06E-14	2.06E-15	1.02E-16	3.15E-16	2.06E-15	7.12E-15
U-233	1.12E-7	3.43E-7	4.18E-7	2.81E-7	2.82E-7	3.43E-7	4.53E-7	5.89E-6	2.41E-5	2.81E-7	9.42E-8	4.53E-7	2.82E-7	7.38E-6
U-234	1.70E-10	5.20E-10	6.45E-10	4.25E-10	4.26E-10	5.20E-10	6.86E-10	9.10E-9	3.65E-8	4.25E-10	1.44E-10	6.86E-10	4.27E-10	1.14E-8
U-235	1.91E-10	2.30E-10	2.29E-10	1.48E-10	2.42E-10	2.30E-10	2.29E-10	1.18E-9	4.29E-9	1.20E-10	3.68E-10	2.29E-10	2.04E-10	1.65E-9
U-236	1.01E-10	3.10E-10	3.77E-10	2.54E-10	2.54E-10	3.10E-10	4.09E-10	5.33E-9	2.18E-8	2.53E-10	8.37E-11	4.09E-10	2.55E-10	6.67E-9
U-238	6.47E-11	1.99E-10	2.40E-10	1.62E-10	1.63E-10	1.99E-10	2.62E-10	3.39E-9	1.39E-8	1.62E-10	5.30E-11	2.62E-10	1.63E-10	4.25E-9
Zr-93	2.61E-7	1.08E-7	1.03E-9	6.89E-7	6.89E-7	1.08E-7	6.89E-7	8.13E-9	1.12E-5	6.89E-7	1.03E-9	6.89E-7	6.89E-7	4.35E-8

Table C-3 continued

Radionuclide	Scots pine	Scapania apiculata	Cranberry	Tree	Chlaenius sulcicollis	Common toad	Common reed	European water vole	Sphagnum sp.	*Sphagnum sp.* (Subm.)	Marsh fritillary	Nephroma laevigatum	Eurasian elk (U.S.: Moose)	Singa nitidula
Ac-227	3.61E-14	1.80E-12	3.77E-14	2.09E-12	1.35E-10	2.44E-14	3.96E-14	2.31E-14	1.80E-12	5.89E-11	4.68E-12	1.80E-12	9.61E-15	1.35E-10
Ag-108m	7.34E-31	9.19E-31	8.61E-31	1.07E-29	1.00E-30	1.27E-30	9.11E-31	2.10E-30	9.19E-31	2.27E-33	1.09E-30	9.72E-31	8.21E-31	1.00E-30
Am-241	2.89E-15	1.36E-13	3.12E-15	1.54E-15	3.88E-13	1.72E-15	1.57E-15	2.14E-15	1.36E-13	2.09E-12	3.51E-13	1.35E-13	7.38E-16	3.88E-13
Am-243	4.03E-12	5.34E-11	4.64E-12	3.53E-12	1.46E-10	4.93E-12	4.29E-12	7.52E-12	5.34E-11	1.49E-9	1.32E-10	5.32E-11	1.15E-12	1.46E-10
C-14	9.51E-14	5.76E-14	6.49E-14	9.61E-14	3.11E-14	3.13E-11	6.48E-14	8.41E-12	5.76E-14	6.45E-11	3.14E-14	6.50E-14	9.80E-14	3.11E-14
Ca-41	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Cl-36	2.62E-7	1.71E-8	2.45E-7	7.71E-9	7.70E-10	6.64E-8	2.34E-7	8.73E-8	1.71E-8	3.03E-10	8.84E-10	5.55E-8	9.63E-8	7.70E-10
Cm-244	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Cm-245	1.82E-13	4.46E-12	2.03E-13	2.86E-12	3.72E-11	1.62E-13	2.15E-13	2.47E-13	4.46E-12	2.99E-11	3.72E-11	4.45E-12	4.80E-14	3.72E-11
Cm-246	2.14E-32	1.23E-30	2.15E-32	7.83E-31	1.05E-29	5.42E-33	2.16E-32	5.83E-33	1.23E-30	7.05E-30	1.05E-29	1.23E-30	5.64E-33	1.05E-29
Cs-135	1.34E-8	2.54E-8	1.33E-8	5.00E-8	1.44E-8	6.11E-8	1.33E-8	2.84E-8	2.54E-8	2.09E-9	4.07E-9	3.09E-8	3.06E-8	1.44E-8
Cs-137	2.62E-36	2.95E-36	2.83E-36	3.56E-36	3.04E-36	4.69E-36	2.97E-36	6.77E-36	2.95E-36	1.15E-37	2.86E-36	3.19E-36	1.78E-36	3.04E-36
Ho-166m	1.98E-31	2.48E-31	2.33E-31	1.98E-31	2.55E-31	3.29E-31	2.47E-31	5.46E-31	2.48E-31	1.68E-33	2.54E-31	2.51E-31	7.54E-32	2.55E-31
I-129	1.07E-8	2.55E-8	1.31E-8	4.92E-8	4.17E-8	1.81E-8	1.50E-8	2.40E-8	2.55E-8	6.22E-8	8.45E-8	2.29E-8	1.15E-8	4.17E-8
Nb-94	1.36E-4	1.70E-4	1.59E-4	1.46E-4	1.74E-4	2.29E-4	1.69E-4	3.82E-4	1.70E-4	4.82E-7	1.69E-4	1.71E-4	5.35E-5	1.74E-4
Ni-59	2.84E-5	1.05E-4	2.98E-5	3.51E-5	4.21E-5	1.90E-5	5.51E-5	3.00E-5	1.05E-4	1.29E-4	1.65E-5	8.59E-5	1.51E-5	4.21E-5
Ni-63	1.79E-35	5.37E-35	1.79E-35	2.23E-35	2.79E-35	6.87E-36	1.79E-35	8.81E-36	5.37E-35	5.86E-35	1.05E-35	5.48E-35	9.52E-36	2.79E-35
Np-237	7.65E-7	3.19E-5	8.27E-7	6.67E-4	3.47E-4	3.37E-5	8.79E-7	9.51E-6	3.19E-5	7.28E-3	8.23E-5	3.18E-5	1.99E-7	3.47E-4
Pa-231	1.43E-8	4.72E-7	1.57E-8	3.03E-7	3.48E-5	1.51E-8	1.68E-8	1.94E-8	4.72E-7	1.96E-5	1.21E-6	4.72E-7	4.32E-9	3.48E-5
Pb-210	7.79E-8	5.65E-7	7.61E-8	1.31E-6	7.54E-6	5.06E-8	8.45E-8	2.07E-7	5.65E-7	4.26E-7	9.90E-7	1.85E-6	1.94E-7	7.54E-6
Pd-107	4.68E-9	1.43E-8	4.68E-9	5.78E-9	7.31E-9	1.78E-9	4.68E-9	2.30E-9	1.43E-8	1.09E-8	2.75E-9	1.43E-8	2.49E-9	7.31E-9
Po-210	1.46E-6	1.11E-2	1.46E-6	7.85E-5	1.93E-4	8.57E-6	1.46E-6	5.87E-6	1.11E-2	2.66E-4	1.93E-4	1.11E-2	4.88E-6	1.93E-4
Pu-239	6.18E-8	1.37E-5	6.21E-8	1.51E-5	9.48E-6	7.34E-6	6.26E-8	1.14E-5	1.37E-5	4.26E-3	5.54E-6	1.37E-5	4.24E-7	9.48E-6
Pu-240	1.74E-12	3.87E-10	1.76E-12	4.25E-10	2.67E-10	2.12E-10	1.79E-12	3.37E-10	3.87E-10	1.42E-7	1.56E-10	3.87E-10	1.19E-11	2.67E-10
Pu-242	6.97E-8	1.55E-5	7.04E-8	1.69E-5	1.07E-5	8.26E-6	7.16E-8	1.28E-5	1.55E-5	4.75E-3	6.25E-6	1.55E-5	4.78E-7	1.07E-5
Ra-226	8.12E-5	3.04E-4	8.39E-5	2.41E-5	8.46E-4	4.14E-4	8.51E-5	5.50E-4	3.04E-4	1.14E-3	8.46E-4	3.05E-4	5.51E-4	8.46E-4
Se-79	7.31E-10	1.10E-8	7.28E-10	2.18E-7	1.77E-7	1.87E-8	7.26E-10	1.06E-8	1.10E-8	3.24E-8	1.79E-7	1.26E-8	7.69E-9	1.77E-7
Sm-151	1.99E-38	7.27E-37	2.09E-38	6.36E-39	2.36E-36	1.22E-38	2.29E-38	1.57E-38	7.27E-37	3.26E-36	2.14E-36	7.46E-37	1.34E-38	2.36E-36
Sn-126	1.56E-6	1.90E-6	1.78E-6	1.48E-6	1.88E-6	2.49E-6	1.88E-6	4.13E-6	1.90E-6	2.47E-8	1.86E-6	2.08E-6	6.60E-7	1.88E-6
Sr-90	4.40E-34	1.09E-34	3.57E-34	1.84E-33	1.68E-34	2.72E-33	3.18E-34	4.99E-35	1.09E-34	6.33E-34	2.17E-34	8.09E-34	1.29E-35	1.68E-34
Tc-99	3.83E-9	7.08E-6	3.79E-9	1.33E-7	1.78E-7	2.30E-7	3.75E-9	1.91E-7	7.08E-6	4.82E-8	1.84E-7	9.93E-6	1.85E-7	1.78E-7
Th-229	1.08E-6	8.43E-6	1.13E-6	9.09E-7	5.77E-6	1.51E-6	1.16E-6	2.00E-6	8.43E-6	3.12E-6	5.77E-6	8.40E-6	1.65E-6	5.77E-6
Th-230	5.52E-10	5.30E-9	5.53E-10	4.39E-10	3.57E-9	7.66E-10	5.54E-10	9.63E-10	5.30E-9	1.61E-9	3.57E-9	5.29E-9	1.03E-9	3.57E-9
Th-232	1.10E-15	1.06E-14	1.10E-15	8.72E-16	7.14E-15	1.55E-15	1.11E-15	1.93E-15	1.06E-14	4.02E-15	7.14E-15	1.06E-14	2.06E-15	7.14E-15
U-233	1.09E-7	2.41E-5	1.10E-7	5.67E-6	7.37E-6	2.01E-7	1.12E-7	2.63E-7	2.41E-5	7.11E-6	7.37E-6	2.41E-5	2.80E-7	7.37E-6
U-234	1.65E-10	3.65E-8	1.66E-10	8.75E-9	1.12E-8	3.04E-10	1.70E-10	3.97E-10	3.65E-8	1.06E-8	1.12E-8	3.65E-8	4.24E-10	1.12E-8
U-235	1.51E-10	4.29E-9	1.77E-10	1.10E-9	1.43E-9	2.29E-10	1.91E-10	3.60E-10	4.29E-9	1.18E-9	1.42E-9	4.28E-9	8.82E-11	1.43E-9
U-236	9.80E-11	2.18E-8	9.91E-11	5.12E-9	6.67E-9	1.81E-10	1.01E-10	2.37E-10	2.18E-8	6.39E-9	6.67E-9	2.18E-8	2.53E-10	6.67E-9
U-238	6.28E-11	1.39E-8	6.34E-11	3.26E-9	4.27E-9	1.16E-10	6.47E-11	1.51E-10	1.39E-8	4.09E-9	4.27E-9	1.39E-8	1.62E-10	4.27E-9
Zr-93	2.61E-7	1.12E-5	2.61E-7	1.80E-8	4.35E-8	5.65E-7	2.61E-7	6.56E-7	1.12E-5	2.04E-6	4.36E-8	1.14E-5	6.89E-7	4.35E-8

Table C-4. Total dose rate per radionuclide (µGy/h) to biota in the marine ecosystem under the central corrosion base case.

Radionuclide	European perch	Grasswrack pondweed	Benthic fish	Benthic mollusc	Greater scaup	Bird	Bladder-wrack	Crustacean	Common eider	Water pyg-myweed	European herring gull	Northern pike	Zander	Polychaete worms	White-tailed eagle	Burbot
Ac-227	2.56E-15	3.09E-13	1.96E-13	5.70E-12	3.77E-15	1.94E-13	3.05E-13	4.56E-13	3.77E-15	3.09E-13	3.77E-15	2.56E-15	2.56E-15	3.34E-12	7.20E-15	2.56E-15
Ag-108m	3.57E-34	4.75E-30	4.27E-30	4.54E-30	1.80E-31	8.92E-33	4.72E-30	4.10E-30	1.80E-31	4.75E-30	1.80E-31	3.11E-34	3.57E-34	9.19E-30	6.65E-31	3.57E-34
Am-241	1.05E-17	2.63E-15	1.28E-15	2.96E-14	1.48E-16	5.23E-16	2.58E-15	5.52E-15	1.48E-16	2.63E-15	1.48E-16	1.05E-17	1.05E-17	1.61E-14	4.51E-16	1.05E-17
Am-243	3.53E-15	3.02E-12	2.17E-12	1.17E-11	7.10E-13	1.74E-13	2.92E-12	3.54E-12	7.10E-13	3.02E-12	7.10E-13	3.53E-15	3.53E-15	9.18E-12	2.71E-12	3.53E-15
C-14	3.86E-11	2.53E-11	3.90E-11	3.14E-11	5.47E-11	5.53E-11	2.55E-11	3.25E-11	5.47E-11	2.53E-11	5.47E-11	3.86E-11	3.86E-11	3.21E-11	5.47E-11	3.86E-11
Ca-41	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Cl-36	4.26E-13	8.23E-10	3.80E-11	1.07E-10	5.72E-13	1.24E-13	6.89E-10	3.38E-11	5.72E-13	8.23E-10	5.72E-13	4.37E-13	4.26E-13	3.56E-10	1.04E-12	4.26E-13
Cm-244	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Cm-245	5.45E-17	6.03E-14	4.74E-14	6.25E-13	2.37E-14	2.70E-15	5.94E-14	6.72E-14	2.37E-14	6.03E-14	2.37E-14	5.45E-17	5.45E-17	1.72E-13	9.05E-14	5.45E-17
Cm-246	1.97E-35	2.19E-33	7.22E-34	2.09E-31	3.82E-35	9.77E-34	2.16E-33	8.52E-33	3.82E-35	2.19E-33	3.82E-35	1.97E-35	1.97E-35	2.54E-32	8.97E-35	1.97E-35
Cs-135	5.99E-12	1.87E-10	6.41E-12	1.79E-11	6.01E-12	1.24E-11	1.27E-10	5.86E-12	6.01E-12	1.87E-10	6.01E-12	5.99E-12	5.99E-12	3.58E-11	6.01E-12	5.99E-12
Cs-137	9.68E-39	8.61E-35	7.20E-35	7.68E-35	5.43E-37	2.37E-38	8.42E-35	6.96E-35	5.43E-37	8.61E-35	5.43E-37	9.40E-39	9.68E-39	1.56E-34	1.85E-36	9.68E-39
Ho-166m	7.31E-37	1.91E-31	1.74E-31	1.85E-31	4.65E-32	1.89E-35	1.91E-31	1.68E-31	4.65E-32	1.91E-31	4.65E-32	7.18E-37	7.31E-37	3.74E-31	1.78E-31	7.31E-37
I-129	8.74E-11	4.26E-8	2.58E-8	3.36E-8	1.21E-9	3.01E-12	4.15E-8	2.21E-8	1.21E-9	4.26E-8	1.21E-9	8.63E-11	8.74E-11	7.09E-8	3.32E-9	8.74E-11
Nb-94	1.01E-10	1.24E-5	1.12E-5	1.19E-5	3.20E-5	6.09E-10	1.23E-5	1.08E-5	3.20E-5	1.24E-5	3.20E-5	9.63E-11	1.01E-10	2.40E-5	1.11E-4	1.01E-10
Ni-59	3.54E-8	1.44E-5	7.71E-7	1.25E-5	3.55E-8	2.84E-7	1.18E-5	1.48E-6	3.55E-8	1.44E-5	3.55E-8	3.54E-8	3.54E-8	1.18E-5	3.56E-8	3.54E-8
Ni-63	6.83E-38	7.58E-36	6.36E-37	2.08E-35	6.83E-38	5.43E-37	6.91E-36	1.89E-36	6.83E-38	7.58E-36	6.83E-38	6.83E-38	6.83E-38	1.42E-35	6.83E-38	6.83E-38
Np-237	2.34E-8	1.89E-6	4.52E-7	1.03E-5	1.45E-7	9.35E-8	1.87E-6	2.77E-6	1.45E-7	1.89E-6	1.45E-7	2.34E-8	2.34E-8	8.39E-6	2.62E-7	2.34E-8
Pa-231	3.31E-11	5.89E-9	3.10E-9	2.64E-7	1.51E-9	1.64E-9	5.81E-9	7.37E-9	1.51E-9	5.89E-9	1.51E-9	3.31E-11	3.31E-11	4.66E-8	5.66E-9	3.31E-11
Pb-210	4.16E-10	1.04E-6	8.28E-8	1.80E-7	3.82E-9	4.94E-8	8.55E-7	8.57E-8	3.82E-9	1.04E-6	3.82E-9	4.11E-10	4.16E-10	5.85E-7	8.68E-9	4.16E-10
Pd-107	3.24E-12	2.75E-10	4.10E-11	4.25E-10	3.24E-12	3.03E-11	2.75E-10	8.35E-11	3.24E-12	2.75E-10	3.24E-12	3.24E-12	3.24E-12	6.38E-10	3.24E-12	3.24E-12
Po-210	4.95E-7	2.94E-8	6.32E-7	1.30E-6	2.12E-11	3.72E-7	2.94E-8	2.23E-6	2.12E-11	2.94E-8	2.12E-11	4.95E-7	4.95E-7	7.18E-7	7.33E-11	4.95E-7
Pu-239	8.04E-9	9.46E-7	1.37E-6	4.29E-7	5.45E-8	5.85E-8	9.46E-7	6.26E-8	5.45E-8	9.46E-7	5.45E-8	8.04E-9	8.04E-9	3.27E-7	5.46E-8	8.04E-9
Pu-240	4.28E-13	5.03E-11	7.25E-11	2.28E-11	2.90E-12	3.11E-12	5.03E-11	3.33E-12	2.90E-12	5.03E-11	2.90E-12	4.28E-13	4.28E-13	1.75E-11	2.90E-12	4.28E-13
Pu-242	5.35E-9	6.29E-7	8.99E-7	2.83E-7	3.63E-8	3.85E-8	6.29E-7	4.13E-8	3.63E-8	6.29E-7	3.63E-8	5.35E-9	5.35E-9	2.18E-7	3.68E-8	5.35E-9
Ra-226	3.98E-7	3.87E-5	1.95E-5	1.50E-5	4.63E-6	6.82E-6	3.81E-5	1.61E-5	4.63E-6	3.87E-5	4.63E-6	3.98E-7	3.98E-7	3.17E-5	1.52E-5	3.98E-7
Se-79	6.96E-9	2.12E-9	1.52E-8	8.30E-9	6.96E-9	1.35E-8	1.69E-9	1.16E-8	6.96E-9	2.12E-9	6.96E-9	6.96E-9	6.96E-9	7.65E-9	6.97E-9	6.96E-9
Sm-151	8.75E-40	2.99E-37	2.63E-38	5.37E-37	1.06E-39	8.60E-39	2.00E-37	9.97E-38	1.06E-39	2.99E-37	1.06E-39	8.75E-40	8.75E-40	2.76E-37	1.58E-39	8.75E-40
Sn-126	4.94E-10	2.84E-7	2.24E-7	2.45E-7	3.46E-7	1.12E-10	2.75E-7	2.13E-7	3.46E-7	2.84E-7	3.46E-7	4.74E-10	4.94E-10	4.96E-7	1.32E-6	4.94E-10
Sr-90	2.02E-37	6.80E-34	1.04E-34	1.75E-34	1.99E-37	2.78E-37	5.42E-34	4.85E-35	1.99E-37	6.80E-34	1.99E-37	2.02E-37	2.02E-37	8.70E-34	1.99E-37	2.02E-37
Tc-99	5.70E-9	1.30E-5	1.34E-8	3.36E-6	5.72E-9	1.17E-8	1.34E-5	8.30E-6	5.72E-9	1.30E-5	5.72E-9	5.70E-9	5.70E-9	5.90E-6	5.73E-9	5.70E-9
Th-229	3.31E-9	3.83E-7	6.52E-8	7.15E-8	5.55E-8	1.49E-10	3.81E-7	6.46E-8	5.55E-8	3.83E-7	5.55E-8	3.31E-9	3.31E-9	1.94E-7	2.03E-7	3.31E-9
Th-230	5.15E-13	4.76E-11	4.80E-13	4.50E-13	7.10E-13	2.32E-14	4.76E-11	7.57E-13	7.10E-13	4.76E-11	7.10E-13	5.15E-13	5.15E-13	8.36E-12	1.08E-12	5.15E-13
Th-232	9.99E-19	9.24E-17	9.01E-19	8.46E-19	1.27E-18	4.48E-20	9.24E-17	1.43E-18	1.27E-18	9.24E-17	1.27E-18	9.99E-19	9.99E-19	1.62E-17	1.69E-18	9.99E-19
U-233	9.28E-11	4.91E-8	7.77E-9	1.75E-8	2.59E-9	2.11E-9	4.90E-8	5.62E-9	2.59E-9	4.91E-8	2.59E-9	9.28E-11	9.28E-11	1.43E-7	3.93E-9	9.28E-11
U-234	8.20E-14	4.37E-11	6.94E-12	1.58E-11	2.44E-12	1.90E-12	4.36E-11	5.01E-12	2.44E-12	4.37E-11	2.44E-12	8.20E-14	8.20E-14	1.27E-10	2.98E-12	8.20E-14
U-235	5.49E-15	1.40E-11	9.57E-12	1.11E-11	3.04E-11	1.24E-13	1.37E-11	9.13E-12	3.04E-11	1.40E-11	3.04E-11	5.49E-15	5.49E-15	2.87E-11	1.04E-10	5.49E-15
U-236	4.57E-14	2.43E-11	3.78E-12	8.62E-12	1.35E-12	1.04E-12	2.43E-11	2.72E-12	1.35E-12	2.43E-11	1.35E-12	4.57E-14	4.57E-14	7.05E-11	2.19E-12	4.57E-14
U-238	2.93E-14	1.56E-11	2.40E-12	5.48E-12	8.40E-13	6.62E-13	1.55E-11	1.72E-12	8.40E-13	1.56E-11	8.40E-13	2.93E-14	2.93E-14	4.52E-11	9.46E-13	2.93E-14
Zr-93	2.73E-9	2.53E-7	1.36E-9	3.40E-8	2.73E-9	5.51E-10	2.47E-7	2.63E-9	2.73E-9	2.53E-7	2.73E-9	2.73E-9	2.73E-9	4.64E-8	2.73E-9	2.73E-9

Table C-4 continued

Radionuclide	Atlantic salmon	Brown trout	Macroalgae	Mammal	Elatine orthosperma	Pelagic fish	Phyto-plankton	Polychaete worm	Bristly stonewort	Ruddy turnstone	RS-Phyto-plankton	RS-Zoo-plankton	Corego-nus sp.	Lump-sucker	European sprat	Alisma wahlenbergii
Ac-227	2.56E-15	2.56E-15	2.31E-13	1.94E-13	3.09E-13	1.94E-13	1.27E-10	5.75E-12	3.10E-13	8.89E-15	2.46E-13	2.82E-11	2.56E-15	2.56E-15	2.56E-15	3.09E-13
Ag-108m	3.57E-34	3.57E-34	4.68E-30	2.80E-32	4.75E-30	9.37E-34	1.27E-33	9.19E-30	4.76E-30	8.94E-31	8.67E-34	1.23E-33	3.57E-34	3.57E-34	3.57E-34	4.75E-30
Am-241	1.05E-17	1.05E-17	4.43E-15	9.77E-16	2.63E-15	2.02E-16	7.32E-13	3.10E-14	2.63E-15	7.25E-16	1.02E-15	1.16E-13	1.05E-17	1.05E-17	1.05E-17	2.63E-15
Am-243	3.53E-15	3.53E-15	3.44E-12	3.26E-13	3.02E-12	6.74E-14	2.44E-10	1.41E-11	3.01E-12	3.68E-12	3.38E-13	3.88E-11	3.53E-15	3.53E-15	3.53E-15	3.02E-12
C-14	3.86E-11	3.86E-11	2.51E-11	5.53E-11	2.53E-11	3.90E-11	4.32E-15	3.14E-11	2.53E-11	5.47E-11	4.32E-15	3.17E-11	3.86E-11	3.86E-11	3.86E-11	2.53E-11
Ca-41	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cl-36	4.26E-13	4.26E-13	4.86E-10	1.12E-13	8.23E-10	2.13E-13	3.20E-12	3.61E-10	7.99E-10	1.38E-12	3.20E-12	3.16E-12	4.26E-13	4.26E-13	4.26E-13	8.23E-10
Cm-244	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cm-245	5.45E-17	5.45E-17	2.69E-13	5.04E-15	6.03E-14	1.80E-15	4.85E-12	1.30E-13	6.03E-14	1.23E-13	5.24E-15	6.00E-13	5.45E-17	5.45E-17	5.45E-17	6.03E-14
Cm-246	1.97E-35	1.97E-35	7.84E-32	1.82E-33	2.19E-33	6.51E-34	1.76E-30	1.01E-32	2.19E-33	1.17E-34	1.90E-33	2.17E-31	1.97E-35	1.97E-35	1.97E-35	2.19E-33
Cs-135	5.99E-12	5.99E-12	4.40E-11	5.68E-12	1.87E-10	2.33E-12	2.67E-14	3.72E-11	1.88E-10	6.00E-12	2.89E-14	1.39E-12	5.99E-12	5.99E-12	5.99E-12	1.87E-10
Cs-137	9.68E-39	9.68E-39	8.16E-35	1.87E-38	8.61E-35	4.26E-39	1.27E-40	1.58E-34	8.60E-35	2.77E-36	1.29E-40	1.78E-39	9.68E-39	9.68E-39	9.68E-39	8.61E-35
Ho-166m	7.31E-37	7.31E-37	1.89E-31	9.75E-35	1.91E-31	6.39E-36	7.54E-33	3.74E-31	1.92E-31	2.41E-31	3.09E-36	2.63E-34	7.31E-37	7.31E-37	7.31E-37	1.91E-31
I-129	8.74E-11	8.74E-11	4.99E-8	2.87E-12	4.26E-8	1.35E-11	3.71E-12	7.28E-08	4.26E-08	5.90E-09	3.67E-12	3.97E-09	8.74E-11	8.74E-11	8.74E-11	4.26E-08
Nb-94	1.01E-10	1.01E-10	1.22E-5	1.58E-9	1.24E-5	5.31E-10	3.21E-11	2.40E-05	1.24E-05	1.66E-04	3.22E-11	5.95E-08	1.01E-10	1.01E-10	1.01E-10	1.24E-05
Ni-59	3.54E-8	3.54E-8	6.92E-6	2.82E-7	1.44E-5	2.84E-7	8.60E-10	1.16E-05	1.46E-05	3.55E-08	9.01E-10	4.73E-06	3.54E-08	3.54E-08	3.54E-08	1.44E-05
Ni-63	6.83E-38	6.83E-38	3.12E-36	5.43E-37	7.58E-36	5.43E-37	2.86E-39	1.42E-35	7.67E-36	6.83E-38	2.95E-39	9.58E-36	6.83E-38	6.83E-38	6.83E-38	7.58E-36
Np-237	2.34E-8	2.34E-8	1.83E-6	9.35E-9	1.89E-6	2.34E-8	3.30E-6	1.09E-05	1.89E-06	3.61E-07	3.02E-06	7.82E-04	2.34E-08	2.34E-08	2.34E-08	1.89E-06
Pa-231	3.31E-11	3.31E-11	9.20E-8	1.00E-8	5.89E-9	1.09E-9	2.29E-6	1.39E-08	5.89E-09	7.74E-09	3.18E-09	3.64E-07	3.31E-11	3.31E-11	3.31E-11	5.89E-09
Pb-210	4.16E-10	4.16E-10	6.37E-7	4.94E-8	1.04E-6	4.99E-10	3.21E-11	6.18E-07	1.06E-06	1.83E-08	2.70E-12	3.26E-08	4.16E-10	4.16E-10	4.16E-10	1.04E-06
Pd-107	3.24E-12	3.24E-12	1.05E-10	3.03E-11	2.75E-10	3.03E-11	5.29E-11	6.38E-10	2.75E-10	3.24E-12	2.74E-10	4.55E-10	3.24E-12	3.24E-12	3.24E-12	2.75E-10
Po-210	4.95E-7	4.95E-7	3.73E-8	3.72E-7	2.94E-8	6.32E-7	9.67E-7	7.44E-07	2.94E-08	1.09E-10	5.77E-07	1.86E-06	4.95E-07	4.95E-07	4.95E-07	2.94E-08
Pu-239	8.04E-9	8.04E-9	1.60E-6	1.09E-7	9.46E-7	1.37E-6	4.68E-5	5.86E-07	9.46E-07	5.49E-08	3.05E-05	1.74E-06	8.04E-09	8.04E-09	8.04E-09	9.46E-07
Pu-240	4.28E-13	4.28E-13	8.49E-11	5.80E-12	5.03E-11	7.25E-11	2.48E-9	3.12E-11	5.03E-11	2.92E-12	1.62E-09	9.26E-11	4.28E-13	4.28E-13	4.28E-13	5.03E-11
Pu-242	5.35E-9	5.35E-9	1.05E-6	7.19E-8	6.29E-7	8.99E-7	3.08E-5	3.86E-07	6.29E-07	3.71E-08	2.01E-05	1.16E-06	5.35E-09	5.35E-09	5.35E-09	6.29E-07
Ra-226	3.98E-7	3.98E-7	1.69E-5	1.43E-6	3.87E-5	6.36E-6	2.36E-5	3.31E-05	3.88E-05	2.23E-05	2.20E-05	1.68E-06	3.98E-07	3.98E-07	3.98E-07	3.87E-05
Se-79	6.96E-9	6.96E-9	6.74E-10	1.35E-8	2.12E-9	1.52E-8	1.97E-12	7.63E-09	2.11E-09	6.96E-09	1.66E-12	4.24E-08	6.96E-09	6.96E-09	6.96E-09	2.12E-09
Sm-151	8.75E-40	8.75E-40	1.59E-37	1.61E-38	2.99E-37	3.33E-39	1.17E-35	6.14E-37	3.06E-37	1.84E-39	8.93E-39	1.12E-36	8.75E-40	8.75E-40	8.75E-40	2.99E-37
Sn-126	4.94E-10	4.94E-10	2.65E-7	1.87E-10	2.84E-7	1.05E-10	6.62E-9	5.00E-07	2.87E-07	1.80E-06	1.65E-10	1.29E-08	4.94E-10	4.94E-10	4.94E-10	2.84E-07
Sr-90	2.02E-37	2.02E-37	4.06E-34	2.82E-37	6.80E-34	4.29E-36	1.95E-37	4.40E-34	7.14E-34	1.94E-37	1.95E-37	2.46E-35	2.02E-37	2.02E-37	2.02E-37	6.80E-34
Tc-99	5.70E-9	5.70E-9	1.11E-5	9.05E-9	1.30E-5	1.17E-8	3.77E-10	8.31E-06	1.30E-05	5.72E-09	3.77E-10	3.64E-08	5.70E-09	5.70E-09	5.70E-09	1.30E-05
Th-229	3.31E-9	3.31E-9	8.25E-8	8.13E-10	3.83E-7	2.71E-9	3.29E-6	1.43E-07	3.83E-07	2.74E-07	3.05E-07	2.21E-08	3.31E-09	3.31E-09	3.31E-09	3.83E-07
Th-230	5.15E-13	5.15E-13	1.54E-12	1.26E-13	4.76E-11	4.21E-13	5.12E-10	5.64E-13	4.76E-11	1.53E-12	4.75E-11	3.43E-12	5.15E-13	5.15E-13	5.15E-13	4.76E-11
Th-232	9.99E-19	9.99E-19	2.95E-18	2.44E-19	9.24E-17	8.14E-19	9.91E-16	1.05E-18	9.24E-17	2.44E-18	9.19E-17	6.66E-18	9.99E-19	9.99E-19	9.99E-19	9.24E-17
U-233	9.28E-11	9.28E-11	6.42E-8	2.11E-10	4.91E-8	7.39E-9	7.39E-8	1.82E-08	4.91E-08	4.62E-09	4.81E-08	1.58E-08	9.28E-11	9.28E-11	9.28E-11	4.91E-08
U-234	8.20E-14	8.20E-14	5.80E-11	1.90E-13	4.37E-11	6.66E-12	6.67E-11	1.66E-11	4.38E-11	4.93E-12	4.34E-11	1.40E-11	8.20E-14	8.20E-14	8.20E-14	4.37E-11
U-235	5.49E-15	5.49E-15	1.42E-11	1.22E-14	1.40E-11	4.33E-13	4.36E-12	2.16E-11	1.40E-11	1.58E-10	2.84E-12	9.18E-13	5.49E-15	5.49E-15	5.49E-15	1.40E-11
U-236	4.57E-14	4.57E-14	3.17E-11	1.04E-13	2.43E-11	3.64E-12	3.64E-11	9.04E-12	2.44E-11	2.66E-12	2.37E-11	7.80E-12	4.57E-14	4.57E-14	4.57E-14	2.43E-11
U-238	2.93E-14	2.93E-14	2.02E-11	6.62E-14	1.56E-11	2.32E-12	2.32E-11	5.73E-12	1.56E-11	1.59E-12	1.51E-11	5.00E-12	2.93E-14	2.93E-14	2.93E-14	1.56E-11
Zr-93	2.73E-9	2.73E-9	1.65E-8	5.51E-10	2.53E-7	5.51E-10	2.14E-7	3.74E-08	2.53E-07	2.73E-09	2.32E-07	1.36E-07	2.73E-09	2.73E-09	2.73E-09	2.53E-07

Table C-4 continued

Radionuclide	Atlantic herring	Horned grebe	Stypocaulon scoparium	Black guillemot	Idotea balthica	Viviparous eelpout	Flat-stalked pondweed	European otter	Vascular plant	Ringed seal	Vimba bream	Zoo-plankton	European eel	Radionu-clide	Water mudwort	Baltic macoma
Ac-227	2.56E-15	3.77E-15	3.17E-13	3.77E-15	6.95E-12	2.31E-14	3.09E-13	5.73E-15	2.21E-13	3.95E-15	2.31E-14	3.37E-12	2.56E-15	Ac-227	3.09E-13	3.34E-12
Ag-108m	3.57E-34	1.80E-31	4.80E-30	1.80E-31	1.66E-33	2.22E-30	4.75E-30	4.67E-31	4.51E-30	2.46E-31	2.22E-30	1.23E-33	3.57E-34	Ag-108m	4.75E-30	9.26E-30
Am-241	1.05E-17	1.48E-16	2.68E-15	1.48E-16	2.87E-14	6.29E-16	2.63E-15	3.66E-16	4.25E-15	1.58E-16	6.29E-16	1.40E-14	1.05E-17	Am-241	2.63E-15	1.62E-14
Am-243	3.53E-15	7.10E-13	3.20E-12	7.10E-13	9.57E-12	1.13E-12	3.02E-12	1.87E-12	3.27E-12	8.79E-13	1.13E-12	4.65E-12	3.53E-15	Am-243	3.02E-12	9.25E-12
C-14	3.86E-11	5.47E-11	2.45E-11	5.47E-11	3.20E-11	3.86E-11	2.53E-11	5.47E-11	2.51E-11	5.47E-11	3.86E-11	3.14E-11	3.86E-11	C-14	2.53E-11	3.21E-11
Ca-41	0.00E+00	0.00E+00	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	Ca-41	0.00E+0	0.00E+0
Cl-36	4.26E-13	5.72E-13	1.21E-9	5.72E-13	4.67E-13	3.62E-11	8.23E-10	8.91E-13	9.93E-11	6.30E-13	3.62E-11	3.22E-12	4.26E-13	Cl-36	8.23E-10	3.81E-10
Cm-244	0.00E+00	0.00E+00	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	Cm-244	0.00E+0	0.00E+0
Cm-245	5.45E-17	2.37E-14	6.19E-14	2.37E-14	1.48E-13	2.44E-14	6.03E-14	6.23E-14	2.66E-13	2.84E-14	2.44E-14	1.40E-13	5.45E-17	Cm-245	6.03E-14	1.73E-13
Cm-246	1.97E-35	3.82E-35	2.21E-33	3.82E-35	5.37E-32	7.69E-35	2.19E-33	6.61E-35	7.83E-32	3.55E-35	7.69E-35	5.08E-32	1.97E-35	Cm-246	2.19E-33	2.54E-32
Cs-135	5.99E-12	6.01E-12	3.87E-10	6.01E-12	1.57E-11	1.13E-11	1.87E-10	6.01E-12	1.39E-11	6.01E-12	1.13E-11	2.90E-12	5.99E-12	Cs-135	1.87E-10	6.05E-11
Cs-137	9.68E-39	5.43E-37	9.04E-35	5.43E-37	2.15E-38	3.73E-35	8.61E-35	1.44E-36	7.68E-35	7.32E-37	3.73E-35	3.66E-39	9.68E-39	Cs-137	8.61E-35	1.57E-34
Ho-166m	7.31E-37	4.65E-32	1.93E-31	4.65E-32	6.76E-35	9.06E-32	1.91E-31	1.25E-31	1.84E-31	6.21E-32	9.06E-32	1.87E-34	7.31E-37	Ho-166m	1.91E-31	3.76E-31
I-129	8.74E-11	1.21E-09	4.54E-8	1.21E-9	1.27E-11	1.55E-8	4.26E-8	3.00E-9	4.75E-8	1.29E-9	1.55E-8	9.65E-9	8.74E-11	I-129	4.26E-8	7.35E-8
Nb-94	1.01E-10	3.20E-05	1.26E-5	3.20E-5	3.53E-10	5.82E-6	1.24E-5	8.64E-5	1.19E-5	4.32E-5	5.82E-6	6.41E-8	1.01E-10	Nb-94	1.24E-5	2.42E-5
Ni-59	3.54E-08	3.55E-08	1.73E-5	3.55E-8	9.19E-6	7.05E-7	1.44E-5	3.56E-8	3.03E-6	3.56E-8	7.05E-7	1.58E-6	3.54E-8	Ni-59	1.44E-5	8.23E-6
Ni-63	6.83E-38	6.83E-38	1.02E-35	6.83E-38	1.82E-35	1.99E-37	7.58E-36	6.83E-38	2.86E-36	6.83E-38	1.99E-37	3.19E-36	6.83E-38	Ni-63	7.58E-36	3.18E-36
Np-237	2.34E-08	1.45E-07	1.92E-6	1.45E-7	2.34E-6	2.71E-7	1.89E-6	1.43E-7	1.77E-6	6.77E-8	2.71E-7	4.01E-7	2.34E-8	Np-237	1.89E-6	8.43E-6
Pa-231	3.31E-11	1.51E-09	5.97E-9	1.51E-9	8.99E-8	1.12E-9	5.89E-9	3.94E-9	9.18E-8	1.93E-9	1.12E-9	4.91E-8	3.31E-11	Pa-231	5.89E-9	4.68E-8
Pb-210	4.16E-10	3.82E-09	1.53E-6	3.82E-9	1.15E-8	6.22E-8	1.04E-6	8.90E-9	1.64E-7	3.38E-9	6.22E-8	4.87E-8	4.16E-10	Pb-210	1.04E-6	6.33E-7
Pd-107	3.24E-12	3.24E-12	2.76E-10	3.24E-12	8.65E-10	3.28E-12	2.75E-10	3.24E-12	8.81E-11	3.24E-12	3.28E-12	7.58E-11	3.24E-12	Pd-107	2.75E-10	6.80E-11
Po-210	4.95E-07	2.12E-11	2.94E-8	2.12E-11	1.64E-6	4.95E-7	2.94E-8	2.13E-7	3.73E-8	2.13E-7	4.95E-7	2.83E-6	4.95E-7	Po-210	2.94E-8	8.95E-7
Pu-239	8.04E-09	5.45E-08	9.46E-7	5.45E-8	4.65E-8	8.22E-9	9.46E-7	9.26E-8	1.60E-6	9.25E-8	8.22E-9	3.04E-6	8.04E-9	Pu-239	9.46E-7	2.64E-7
Pu-240	4.28E-13	2.90E-12	5.03E-11	2.90E-12	2.47E-12	4.46E-13	5.03E-11	4.93E-12	8.49E-11	4.92E-12	4.46E-13	1.61E-10	4.28E-13	Pu-240	5.03E-11	1.41E-11
Pu-242	5.35E-09	3.63E-08	6.30E-7	3.63E-8	3.09E-8	5.55E-9	6.29E-7	6.19E-8	1.05E-6	6.16E-8	5.55E-9	2.00E-6	5.35E-9	Pu-242	6.29E-7	1.76E-7
Ra-226	3.98E-07	4.63E-06	3.99E-5	4.63E-6	2.85E-6	7.16E-6	3.87E-5	1.29E-5	1.55E-5	7.30E-6	7.16E-6	1.88E-6	3.98E-7	Ra-226	3.87E-5	3.05E-5
Se-79	6.96E-09	6.96E-09	3.89E-9	6.96E-9	2.49E-9	7.00E-9	2.12E-9	6.97E-9	4.81E-10	6.97E-9	7.00E-9	9.79E-9	6.96E-9	Se-79	2.12E-9	1.68E-9
Sm-151	8.75E-40	1.06E-39	6.84E-37	1.06E-39	1.15E-37	2.61E-38	2.99E-37	1.35E-39	1.12E-37	1.06E-39	2.61E-38	2.29E-37	8.75E-40	Sm-151	2.99E-37	3.95E-37
Sn-126	4.94E-10	3.46E-07	3.03E-7	3.46E-7	3.78E-10	1.17E-7	2.84E-7	9.27E-7	2.40E-7	4.63E-7	1.17E-7	1.39E-8	4.94E-10	Sn-126	2.84E-7	5.04E-7
Sr-90	2.02E-37	1.99E-37	8.95E-34	1.99E-37	5.04E-34	5.18E-35	6.80E-34	2.00E-37	1.45E-34	2.02E-37	5.18E-35	5.08E-37	2.02E-37	Sr-90	6.80E-34	9.55E-34
Tc-99	5.70E-09	5.72E-09	1.21E-5	5.72E-9	5.81E-6	7.95E-9	1.30E-5	9.15E-9	1.13E-5	9.16E-9	7.95E-9	3.64E-8	5.70E-9	Tc-99	1.30E-5	2.35E-6
Th-229	3.31E-09	5.55E-08	3.86E-7	5.55E-8	1.02E-7	3.68E-8	3.83E-7	1.41E-7	7.78E-8	6.61E-8	3.68E-8	3.38E-8	3.31E-9	Th-229	3.83E-7	1.96E-7
Th-230	5.15E-13	7.10E-13	4.77E-11	7.10E-13	1.59E-11	5.54E-13	4.76E-11	1.02E-12	1.49E-12	7.21E-13	5.54E-13	5.27E-12	5.15E-13	Th-230	4.76E-11	8.39E-12
Th-232	9.99E-19	1.27E-18	9.25E-17	1.27E-18	3.08E-17	1.06E-18	9.24E-17	1.70E-18	2.86E-18	1.26E-18	1.06E-18	1.02E-17	9.99E-19	Th-232	9.24E-17	1.63E-17
U-233	9.28E-11	2.59E-09	4.92E-8	2.59E-9	5.28E-9	3.38E-10	4.91E-8	1.43E-9	1.22E-7	7.02E-10	3.38E-10	1.58E-8	9.28E-11	U-233	4.91E-8	1.43E-7
U-234	8.20E-14	2.44E-12	4.39E-11	2.44E-12	4.67E-12	3.06E-13	4.37E-11	1.60E-12	1.10E-10	6.42E-13	3.06E-13	1.43E-11	8.20E-14	U-234	4.37E-11	1.27E-10
U-235	5.49E-15	3.04E-11	1.45E-11	3.04E-11	3.06E-13	4.88E-12	1.40E-11	8.00E-11	1.71E-11	3.76E-11	4.88E-12	9.27E-13	5.49E-15	U-235	1.40E-11	2.91E-11
U-236	4.57E-14	1.35E-12	2.44E-11	1.35E-12	2.60E-12	1.61E-13	2.43E-11	8.48E-13	6.01E-11	3.30E-13	1.61E-13	7.80E-12	4.57E-14	U-236	2.43E-11	7.06E-11
U-238	2.93E-14	8.40E-13	1.56E-11	8.40E-13	1.67E-12	9.73E-14	1.56E-11	4.86E-13	3.83E-11	1.89E-13	9.73E-14	4.97E-12	2.93E-14	U-238	1.56E-11	4.53E-11
Zr-93	2.73E-09	2.73E-09	2.75E-7	2.73E-9	7.16E-8	3.88E-9	2.53E-7	2.73E-9	1.10E-8	2.73E-9	3.88E-9	1.46E-7	2.73E-9	Zr-93	2.53E-7	5.49E-8

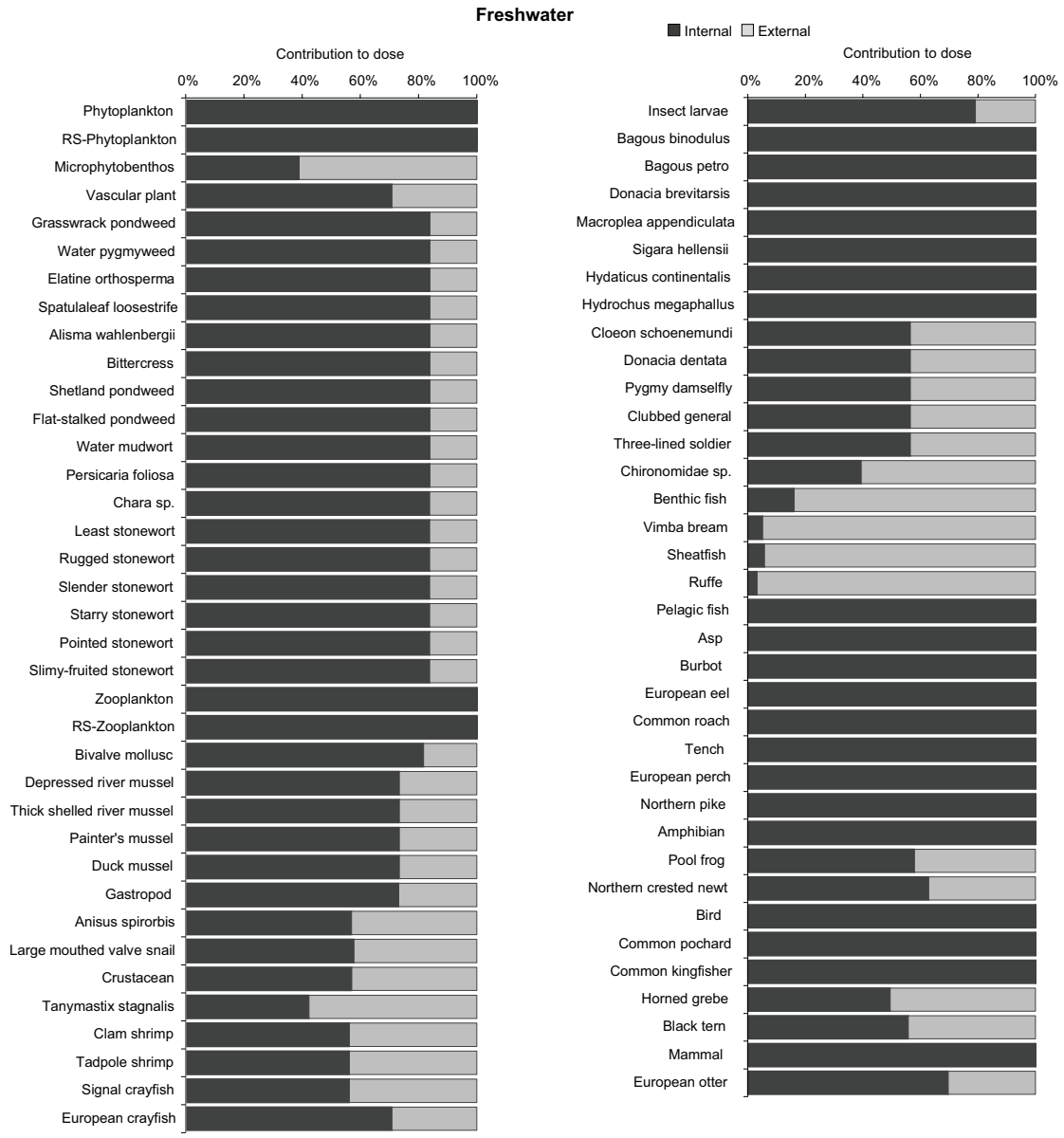

Figure C-1. *Contribution of internal and external exposure to total dose rate for assessment species in the freshwater ecosystem.*

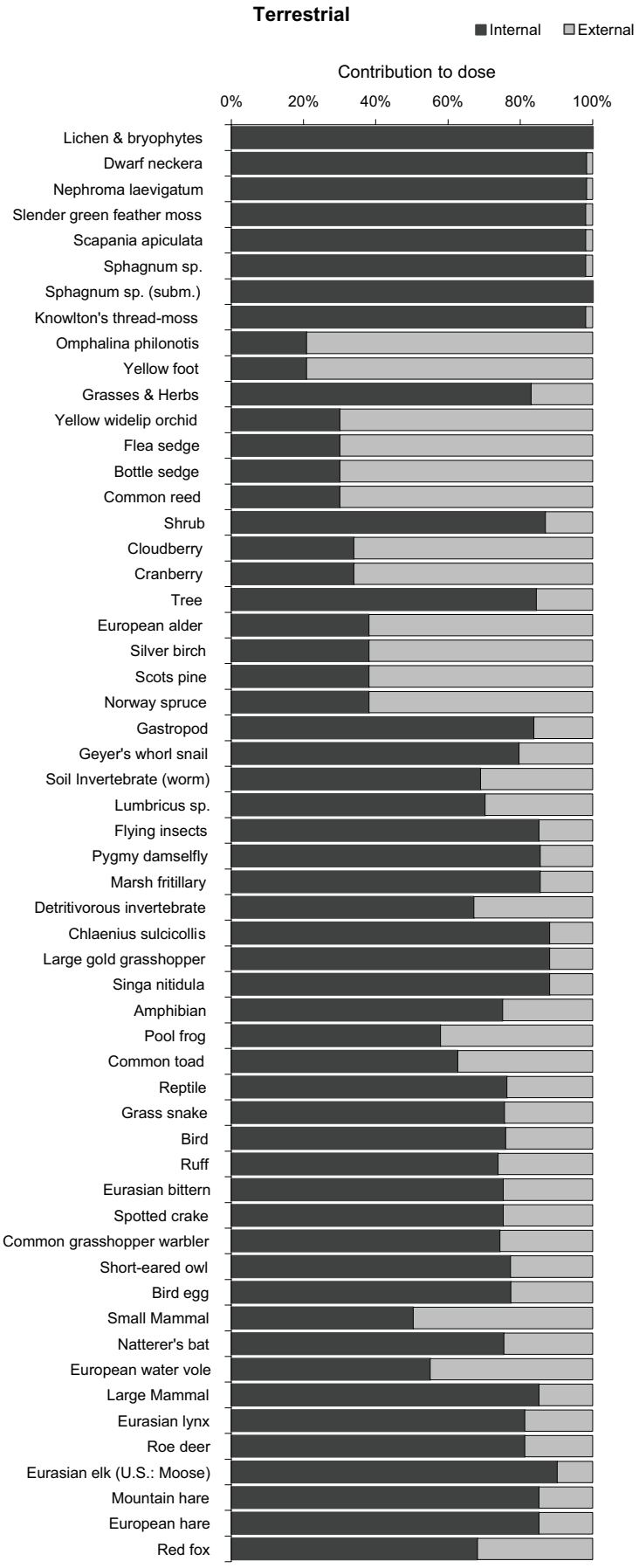

Figure C-2. *Contribution of internal and external exposure to total dose rate for assessment species in the terrestrial ecosystem.*

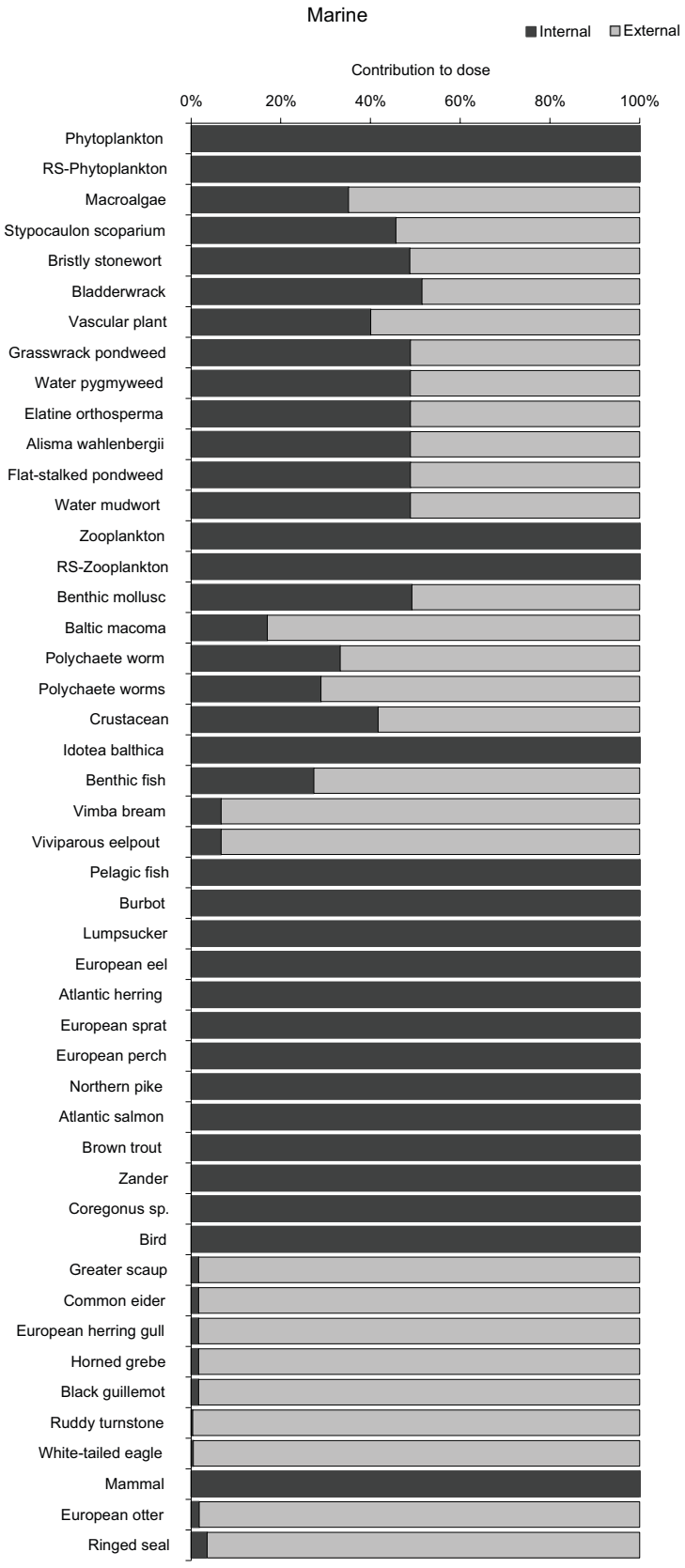

Figure C-3. *Contribution of internal and external exposure to total dose rate for assessment species in the marine ecosystem.*

Appendix D

Results of the central corrosion pulse release case

The central corrosion pulse release case considered releases occurring during three distinct landscape phases: submerged (9000 BC) where the assessment area is submerged below the Baltic Sea and no terrestrial ecosystems are therefore present; mixed (2500 AD) where there is a mix of terrestrial, freshwater (lakes) and marine areas; and land (9000 AD) where the landscape is primarily terrestrial and freshwater objects consist primarily of streams rather than lakes and marine environments are absent.

Total dose rate (the sum of internal and external exposure) results for each reference organism in freshwater, terrestrial and marine ecosystems are presented in Table D-1 to D-3 for the submerged, mixed and land phases, respectively. Results are presented in terms of dose rate per radionuclide and total dose rates across all radionuclides. The relative contribution of internal and external exposure to total dose rate for freshwater, marine and terrestrial biota during each release phase is illustrated in Figure D-1.

Table D-1. Dose rate per radionuclide and total dose rate (µGy/h) for terrestrial, marine and freshwater reference organism following a pulse release during the submerged phase.

Ecosystem	Reference organism	Dose rate per radionuclide								Total dose rate
		Cl-36	Cs-135	I-129	Nb-94	Ni-59	Se-79	Sn-126	Tc-99	
Freshwater	Phytoplankton	2.2E–15	1.8E–11	2.2E–09	2.0E–10	4.0E–10	2.0E–10	9.3E–07	2.1E–16	9.3E–07
	Vascular plant	2.6E–12	1.7E–06	3.7E–05	4.7E–04	1.7E–05	5.6E–07	3.4E–04	2.5E–13	8.7E–04
	Zooplankton	4.0E–13	2.6E–08	2.5E–06	1.4E–08	4.2E–06	1.1E–06	2.2E–06	3.7E–15	1.0E–05
	Bivalve mollusc	2.3E–13	6.9E–08	2.7E–05	4.4E–04	7.2E–06	1.0E–06	2.7E–04	5.2E–15	7.4E–04
	Gastropod	4.1E–13	2.1E–07	3.2E–05	4.5E–04	9.9E–06	1.0E–06	2.9E–04	5.2E–15	7.8E–04
	Crustacean	2.1E–12	1.5E–06	3.7E–05	4.7E–04	1.8E–05	1.7E–06	3.5E–04	2.6E–15	8.8E–04
	Insect larvae	3.9E–12	2.6E–06	7.4E–05	9.3E–04	3.5E–05	1.9E–06	7.0E–04	2.6E–15	1.8E–03
	Benthic fish	2.3E–13	1.4E–07	1.8E–05	4.0E–04	6.7E–07	4.6E–08	2.4E–04	8.6E–15	6.6E–04
	Pelagic fish	1.8E–13	1.3E–07	4.0E–07	9.8E–09	9.0E–08	4.0E–08	7.1E–08	8.6E–15	7.4E–07
	Amphibian	1.8E–13	1.7E–07	2.7E–07	6.2E–09	8.9E–08	4.0E–08	5.9E–08	8.6E–15	6.3E–07
	Bird	1.8E–13	5.5E–08	2.9E–07	1.0E–08	9.0E–08	4.0E–08	7.3E–08	8.6E–15	5.6E–07
	Mammal	1.8E–13	1.7E–07	3.1E–07	1.3E–08	9.0E–08	4.0E–08	8.2E–08	8.6E–15	7.0E–07
Marine	Phytoplankton	6.9E–12	1.3E–12	9.7E–11	1.3E–11	1.1E–11	7.9E–12	5.8E–08	4.2E–10	5.8E–08
	Macroalgae	6.6E–08	4.0E–09	1.7E–06	9.9E–06	1.5E–07	3.4E–09	4.5E–06	1.3E–05	2.9E–05
	Vascular plant	1.3E–08	1.3E–09	1.6E–06	9.7E–06	5.6E–08	2.2E–09	4.1E–06	1.3E–05	2.8E–05
	Zooplankton	6.9E–12	1.4E–10	2.5E–07	2.6E–08	1.9E–08	3.9E–08	1.2E–07	4.1E–08	5.0E–07
	Benthic mollusc	1.5E–08	1.6E–09	1.3E–06	9.7E–06	1.7E–07	3.4E–08	4.1E–06	4.0E–06	1.9E–05
	Polychaete worm	4.9E–08	3.3E–09	2.7E–06	2.0E–05	1.9E–07	3.1E–08	8.4E–06	9.8E–06	4.1E–05
	Crustacean	4.6E–09	5.1E–10	8.3E–07	8.8E–06	2.4E–08	4.7E–08	3.6E–06	9.4E–06	2.3E–05
	Benthic fish	5.1E–09	5.0E–10	9.7E–07	9.1E–06	1.5E–08	6.1E–08	3.8E–06	6.6E–08	1.4E–05
	Pelagic fish	4.6E–13	1.2E–10	3.5E–10	2.2E–10	3.5E–09	6.1E–08	9.1E–10	1.3E–08	7.9E–08
	Bird	2.7E–13	6.2E–10	7.8E–11	2.5E–10	3.5E–09	5.4E–08	9.7E–10	1.3E–08	7.3E–08
	Mammal	2.4E–13	2.8E–10	7.5E–11	6.4E–10	3.4E–09	5.4E–08	1.6E–09	1.0E–08	7.0E–08
Terrestrial	Lichen & bryophytes	1.6E–11	8.7E–06	2.0E–06	4.5E–08	4.0E–07	8.5E–06	1.6E–06	2.2E–17	2.1E–05
	Grasses & Herbs	3.3E–10	1.1E–06	1.0E–06	9.8E–06	9.9E–07	2.4E–07	3.0E–06	2.3E–17	1.6E–05
	Shrub	2.0E–11	6.3E–06	1.0E–06	9.1E–06	1.7E–07	7.7E–07	2.8E–06	2.3E–17	2.0E–05
	Tree	2.9E–11	2.6E–07	1.1E–06	8.4E–06	9.0E–08	7.7E–07	2.4E–06	3.1E–19	1.3E–05
	Gastropod	3.2E–12	6.8E–08	1.2E–06	9.9E–06	8.7E–08	1.5E–08	3.0E–06	4.2E–19	1.4E–05
	Soil invertebrate	3.5E–12	1.4E–07	1.3E–06	2.6E–05	3.7E–07	6.3E–07	7.8E–06	4.3E–19	3.6E–05
	Flying insects	5.5E–12	8.5E–08	1.8E–06	9.9E–06	4.1E–08	6.3E–07	3.0E–06	4.2E–19	1.6E–05
	Detritivorous invertebrate	5.6E–12	2.1E–07	2.1E–06	2.6E–05	9.5E–08	6.3E–07	7.8E–06	4.1E–19	3.7E–05
	Amphibian	1.5E–10	8.5E–07	2.5E–06	1.1E–05	3.5E–07	2.7E–08	3.0E–06	6.7E–19	1.7E–05
	Reptile	1.5E–10	5.7E–06	2.6E–06	1.0E–05	3.6E–07	2.7E–08	2.9E–06	4.3E–19	2.2E–05
	Bird	1.5E–10	1.2E–06	2.7E–06	1.1E–05	3.6E–07	2.7E–08	2.8E–06	3.1E–19	1.8E–05
	Bird egg	1.5E–10	4.8E–08	9.5E–04	1.2E–05	3.5E–07	2.7E–08	3.0E–06	3.1E–17	9.7E–04
	Small mammal	1.5E–10	4.6E–06	2.9E–06	2.6E–05	4.0E–07	2.7E–08	7.3E–06	4.3E–19	4.1E–05
	Large mammal	1.5E–10	4.6E–06	2.9E–06	8.7E–06	3.6E–07	2.7E–08	1.5E–06	4.3E–19	1.8E–05

Table D-2. Dose rate per radionuclide and total dose rate (µGy/h) for terrestrial, marine and freshwater reference organism following a pulse release during the mixed phase.

Ecosystem / Reference organism		Dose rate per radionuclide								Total dose rate
		Cl-36	Cs-135	I-129	Nb-94	Ni-59	Se-79	Sn-126	Tc-99	
Freshwater	Phytoplankton	4.5E–8	1.8E–11	4.1E–9	1.1E–10	2.2E–10	3.0E–10	6.7E–7	1.6E–6	2.3E–6
	Vascular plant	1.2E–5	1.2E–7	4.9E–5	3.7E–5	2.0E–6	6.0E–7	2.9E–5	1.8E–3	2.0E–3
	Zooplankton	8.1E–6	2.6E–8	4.9E–6	7.6E–9	2.3E–6	1.7E–6	1.6E–6	2.7E–5	4.6E–5
	Bivalve mollusc	2.3E–6	1.2E–8	3.5E–5	3.4E–5	3.3E–6	1.5E–6	2.3E–5	4.0E–5	1.4E–4
	Gastropod	2.2E–6	6.1E–8	4.2E–5	3.6E–5	3.6E–6	1.6E–6	2.5E–5	4.3E–5	1.5E–4
	Crustacean	2.0E–6	2.6E–7	5.0E–5	3.7E–5	2.4E–6	2.4E–6	3.1E–5	5.9E–5	1.8E–4
	Insect larvae	2.5E–6	3.3E–7	9.8E–5	7.4E–5	4.5E–6	2.6E–6	6.1E–5	9.4E–5	3.4E–4
	Benthic fish	3.7E–6	1.2E–7	2.4E–5	3.2E–5	1.2E–7	6.6E–8	2.1E–5	6.3E–5	1.4E–4
	Pelagic fish	3.7E–6	1.3E–7	7.7E–7	5.4E–9	5.0E–8	6.1E–8	5.1E–8	6.3E–5	6.7E–5
	Amphibian	3.7E–6	1.7E–7	5.2E–7	3.4E–9	4.9E–8	6.1E–8	4.2E–8	6.3E–5	6.7E–5
	Bird	3.7E–6	5.5E–8	5.7E–7	5.7E–9	5.0E–8	6.1E–8	5.2E–8	6.3E–5	6.7E–5
	Mammal	3.7E–6	1.7E–7	5.9E–7	7.4E–9	5.0E–8	6.1E–8	5.9E–8	6.3E–5	6.7E–5
Marine	Phytoplankton	2.6E–9	1.7E–13	2.6E–11	2.5E–12	1.7E–12	2.0E–12	7.8E–9	1.5E–7	1.6E–7
	Macroalgae	2.2E–7	3.9E–10	4.3E–7	8.1E–7	2.0E–8	7.9E–10	4.5E–7	4.5E–3	4.5E–3
	Vascular plant	4.6E–8	1.2E–10	4.0E–7	7.9E–7	7.9E–9	5.3E–10	4.1E–7	4.5E–3	4.5E–3
	Zooplankton	2.6E–9	1.9E–11	6.9E–8	5.0E–9	3.1E–9	1.0E–8	1.6E–8	1.5E–5	1.5E–5
	Benthic mollusc	4.9E–8	1.6E–10	3.1E–7	7.9E–7	2.6E–8	8.5E–9	4.1E–7	1.3E–3	1.3E–3
	Polychaete worm	1.6E–7	3.2E–10	6.6E–7	1.6E–6	2.8E–8	7.9E–9	8.4E–7	3.3E–3	3.3E–3
	Crustacean	1.5E–8	5.0E–11	2.0E–7	7.2E–7	3.5E–9	1.2E–8	3.6E–7	3.3E–3	3.3E–3
	Benthic fish	1.7E–8	5.2E–11	2.3E–7	7.5E–7	2.1E–9	1.6E–8	3.8E–7	5.5E–6	6.9E–6
	Pelagic fish	1.7E–10	1.5E–11	9.6E–11	4.1E–11	5.5E–10	1.5E–8	1.2E–10	4.7E–6	4.7E–6
	Bird	9.9E–11	8.1E–11	2.1E–11	4.8E–11	5.5E–10	1.4E–8	1.3E–10	4.7E–6	4.7E–6
	Mammal	8.9E–11	3.7E–11	2.0E–11	1.2E–10	5.5E–10	1.4E–8	2.2E–10	3.6E–6	3.6E–6
Terrestrial	Lichen & bryophytes	4.4E–6	8.7E–6	4.6E–6	6.4E–8	4.6E–7	1.2E–5	1.8E–6	2.9E–3	3.0E–3
	Grasses & Herbs	8.9E–5	1.1E–6	2.4E–6	1.4E–5	1.1E–6	3.4E–7	3.4E–6	3.1E–3	3.3E–3
	Shrub	5.4E–6	6.4E–6	2.3E–6	1.3E–5	2.0E–7	1.1E–6	3.1E–6	3.1E–3	3.2E–3
	Tree	7.9E–6	2.6E–7	2.6E–6	1.2E–5	1.0E–7	1.1E–6	2.7E–6	4.2E–5	6.9E–5
	Gastropod	8.7E–7	6.8E–8	2.7E–6	1.4E–5	1.0E–7	2.1E–8	3.4E–6	5.7E–5	7.9E–5
	Soil invertebrate	9.3E–7	1.4E–7	3.0E–6	3.7E–5	4.3E–7	9.0E–7	8.8E–6	5.8E–5	1.1E–4
	Flying insects	1.5E–6	8.6E–8	4.2E–6	1.4E–5	4.8E–8	9.0E–7	3.4E–6	5.7E–5	8.2E–5
	Detritivorous invertebrate	1.5E–6	2.1E–7	4.9E–6	3.8E–5	1.1E–7	9.0E–7	8.8E–6	5.6E–5	1.1E–4
	Amphibian	3.9E–5	8.6E–7	5.7E–6	1.5E–5	4.1E–7	3.8E–8	3.4E–6	9.0E–5	1.6E–4
	Reptile	3.9E–5	5.7E–6	5.9E–6	1.5E–5	4.1E–7	3.8E–8	3.2E–6	5.8E–5	1.3E–4
	Bird	3.9E–5	1.2E–6	6.2E–6	1.6E–5	4.1E–7	3.8E–8	3.1E–6	4.2E–5	1.1E–4
	Bird egg	3.9E–5	4.8E–8	2.2E–3	1.8E–5	4.1E–7	3.8E–8	3.4E–6	4.2E–3	6.5E–3
	Small mammal	3.9E–5	4.6E–6	6.6E–6	3.7E–5	4.6E–7	3.8E–8	8.2E–6	5.8E–5	1.5E–4
	Large mammal	3.9E–5	4.6E–6	6.7E–6	1.3E–5	4.1E–7	3.8E–8	1.6E–6	5.8E–5	1.2E–4

Table D-3. Dose rate per radionuclide and total dose rate (µGy/h) for terrestrial and freshwater reference organism following a pulse release during the land phase*.

Ecosystem /	Reference organism	Dose rate per radionuclide								Total dose rate
		Cl-36	Cs-135	I-129	Nb-94	Ni-59	Se-79	Sn-126	Tc-99	
Freshwater	Phytoplankton	9.1E–8	1.8E–11	3.9E–9	1.1E–10	2.2E–10	3.1E–10	6.7E–7	3.4E–6	4.2E–6
	Vascular plant	2.3E–5	5.2E–8	1.9E–6	1.1E–5	1.3E–7	3.1E–7	2.9E–6	3.9E–3	4.0E–3
	Zooplankton	1.6E–5	2.6E–8	4.6E–6	7.6E–9	2.3E–6	1.8E–6	1.6E–6	5.9E–5	8.6E–5
	Bivalve mollusc	4.6E–6	9.4E–9	7.0E–7	1.0E–5	3.1E–6	1.6E–6	2.3E–6	8.2E–5	1.0E–4
	Gastropod	4.4E–6	5.3E–8	8.1E–7	1.1E–5	3.1E–6	1.6E–6	2.4E–6	8.3E–5	1.1E–4
	Crustacean	3.6E–6	2.0E–7	2.2E–6	1.1E–5	3.7E–7	2.2E–6	2.9E–6	4.4E–5	6.6E–5
	Insect larvae	4.1E–6	2.2E–7	3.1E–6	2.2E–5	4.9E–7	2.2E–6	5.8E–6	4.6E–5	8.4E–5
	Benthic fish	7.5E–6	1.1E–7	1.1E–6	9.5E–6	5.4E–8	6.3E–8	2.1E–6	1.4E–4	1.6E–4
	Pelagic fish	7.5E–6	1.3E–7	7.2E–7	5.4E–9	5.0E–8	6.3E–8	5.1E–8	1.4E–4	1.5E–4
	Amphibian	7.5E–6	1.7E–7	4.9E–7	3.4E–9	4.9E–8	6.3E–8	4.2E–8	1.4E–4	1.5E–4
	Bird	7.5E–6	5.4E–8	5.3E–7	5.7E–9	5.0E–8	6.3E–8	5.2E–8	1.4E–4	1.5E–4
	Mammal	7.5E–6	1.7E–7	5.5E–7	7.4E–9	5.0E–8	6.3E–8	5.9E–8	1.4E–4	1.5E–4
Terrestrial	Lichen & bryophytes	4.7E–6	8.7E–6	4.6E–6	6.4E–8	4.6E–7	1.2E–5	1.8E–6	2.9E–3	3.0E–3
	Grasses & Herbs	9.5E–5	1.1E–6	2.4E–6	1.4E–5	1.1E–6	3.4E–7	3.4E–6	3.2E–3	3.3E–3
	Shrub	5.8E–6	6.4E–6	2.3E–6	1.3E–5	2.0E–7	1.1E–6	3.1E–6	3.2E–3	3.2E–3
	Tree	8.4E–6	2.6E–7	2.6E–6	1.2E–5	1.0E–7	1.1E–6	2.7E–6	4.3E–5	7.0E–5
	Gastropod	9.2E–7	6.8E–8	2.7E–6	1.4E–5	1.0E–7	2.1E–8	3.4E–6	5.7E–5	7.9E–5
	Soil invertebrate	9.9E–7	1.4E–7	3.0E–6	3.7E–5	4.3E–7	9.0E–7	8.8E–6	5.8E–5	1.1E–4
	Flying insects	1.6E–6	8.6E–8	4.2E–6	1.4E–5	4.8E–8	9.0E–7	3.4E–6	5.7E–5	8.2E–5
	Detritivorous invertebrate	1.6E–6	2.1E–7	4.9E–6	3.8E–5	1.1E–7	9.0E–7	8.8E–6	5.6E–5	1.1E–4
	Amphibian	4.2E–5	8.6E–7	5.7E–6	1.5E–5	4.1E–7	3.8E–8	3.4E–6	9.1E–5	1.6E–4
	Reptile	4.2E–5	5.7E–6	5.9E–6	1.5E–5	4.1E–7	3.8E–8	3.2E–6	5.8E–5	1.3E–4
	Bird	4.2E–5	1.2E–6	6.2E–6	1.6E–5	4.1E–7	3.8E–8	3.1E–6	4.3E–5	1.1E–4
	Bird egg	4.2E–5	4.8E–8	2.2E–3	1.8E–5	4.1E–7	3.8E–8	3.4E–6	4.3E–3	6.5E–3
	Small mammal	4.2E–5	4.6E–6	6.6E–6	3.7E–5	4.6E–7	3.8E–8	8.2E–6	5.8E–5	1.6E–4
	Large mammal	4.2E–5	4.6E–6	6.7E–6	1.3E–5	4.1E–7	3.8E–8	1.6E–6	5.8E–5	1.3E–4

* No marine objects during the land phase.

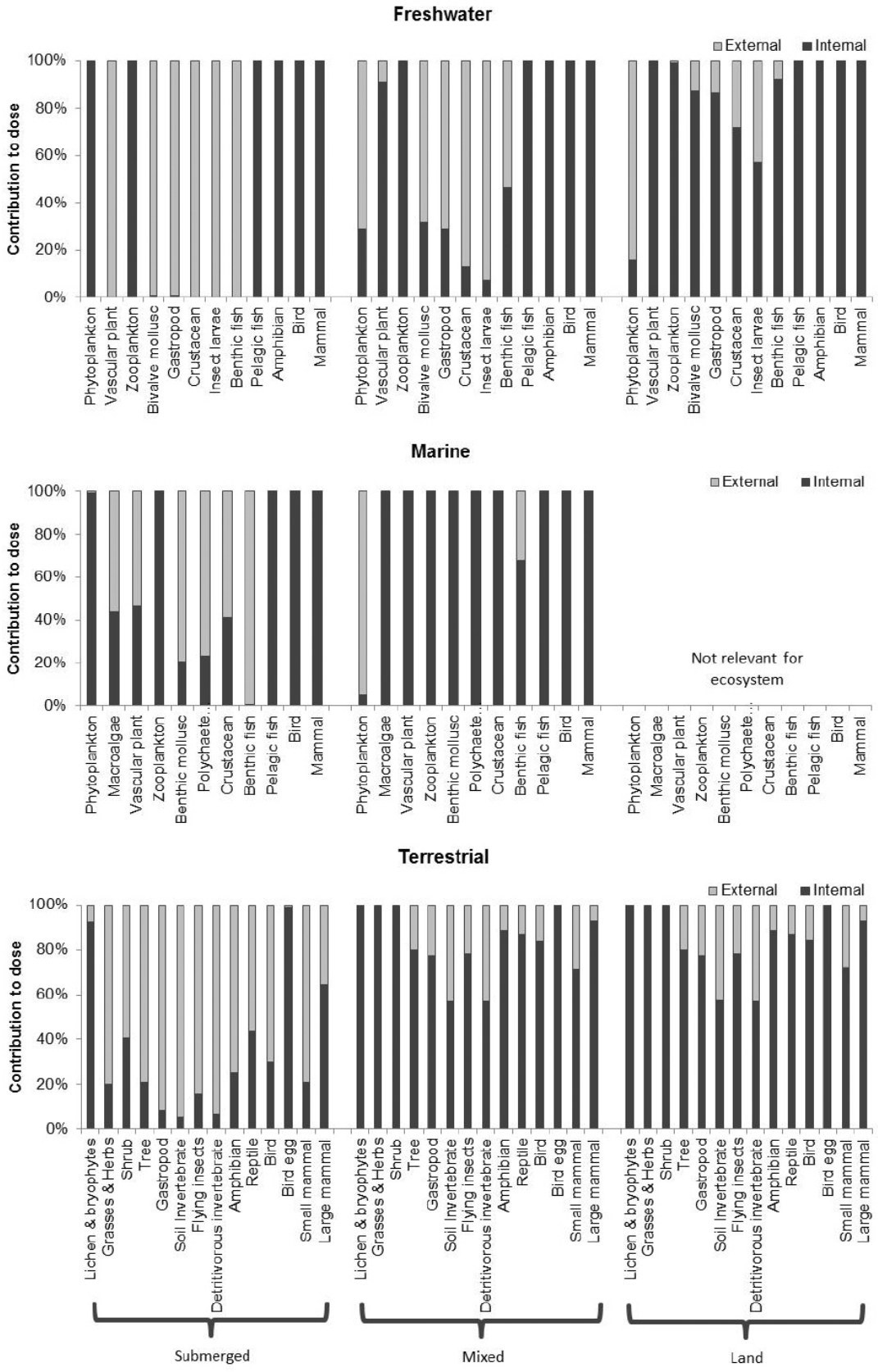

Figure D-1. *Relative contribution of external and internal dose to total dose rate in reference organisms following a pulse release in the submerged, mixed or land phases.*

Appendix E

Dose rate results for the periglacial climate case

Total dose rates (µGy/h) for freshwater biota calculated for the periglacial climate case are presented in Table E-1 (reference organisms). Total dose rates from the central corrosion base case (temperate climate) are also presented for comparison.

Table E-1. Total dose rate (µGy/h) for freshwater biota for the periglacial climate case.

Reference organism	Total dose rate (µGy/h)	
	Temperate climate	Periglacial climate
Phytoplankton	4.70E–02	9.43E–05
Vascular plant	1.03E–02	1.72E–05
Zooplankton	5.62E–03	2.27E–06
Bivalve mollusc	9.52E–03	5.85E–06
Gastropod	7.53E–03	6.30E–06
Crustacean	7.05E–03	9.79E–06
Insect larvae	2.94E–02	5.94E–05
Benthic fish	1.82E–03	2.40E–06
Pelagic fish	2.93E–04	4.09E–07
Bird	2.73E–04	3.92E–07

Appendix F

Dose conversion coefficients (digital Appendix)

Dose conversion coefficients for all organisms included in this safety assessment are presented in Appendix F. Dose conversion coefficients for reference organisms are tabulated in Table F-1–F-6 and Dose conversion coefficients for representative species in Table F-7–F-12.

Table F-1. Dose conversion coefficients for internal exposure of terrestrial reference organisms to alpha, low energy beta (≤ 10 keV) and high energy beta (> 10 keV) /gamma radiation (μGy/h)/(Bq/kg).

Reference organism	Dose Conversion Coefficient of internal alpha radiation													
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m	I-129
Amphibian	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bird	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bird egg	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Detritivorous invertebrate	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Flying insects	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Gastropod	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Grasses & Herbs	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lichen & bryophytes	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mammal (Deer)	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mammal (Rat)	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Reptile	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Shrub	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Soil Invertebrate (worm)	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tree	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-1. Continued.

Reference organism	Dose Conversion Coefficient of internal alpha radiation												
	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226	Se-79
Amphibian	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.34E–02	0.00E+00
Bird	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.43E–02	0.00E+00
Bird egg	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.34E–02	0.00E+00
Detritivorous invertebrate	0.00E+00	0.00E+00	0.00E+00	2.77E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.36E–02	0.00E+00
Flying insects	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.36E–02	0.00E+00
Gastropod	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.36E–02	0.00E+00
Grasses & Herbs	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.36E–02	0.00E+00
Lichen & bryophytes	0.00E+00	0.00E+00	0.00E+00	2.77E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.37E–02	0.00E+00
Mammal (Deer)	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.38E–02	0.00E+00
Mammal (Rat)	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.34E–02	0.00E+00
Reptile	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.34E–02	0.00E+00
Shrub	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.36E–02	0.00E+00
Soil Invertebrate (worm)	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.36E–02	0.00E+00
Tree	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.40E–02	0.00E+00

Table F-1. Continued.

Reference organism	Dose Conversion Coefficient of internal alpha radiation												
	Sm-151	Sn-126	Sr-90	Tc-99	Th-229	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
Amphibian	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.57E–03	2.60E–03	2.40E–03	0.00E+00
Bird	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.57E–03	2.60E–03	2.40E–03	0.00E+00
Bird egg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.57E–03	2.60E–03	2.40E–03	0.00E+00
Detritivorous invertebrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.57E–03	2.60E–03	2.40E–03	0.00E+00
Flying insects	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.57E–03	2.60E–03	2.40E–03	0.00E+00
Gastropod	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.57E–03	2.60E–03	2.40E–03	0.00E+00
Grasses & Herbs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.57E–03	2.60E–03	2.40E–03	0.00E+00
Lichen & bryophytes	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.57E–03	2.60E–03	2.40E–03	0.00E+00
Mammal (Deer)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.51E–03	2.60E–03	2.40E–03	0.00E+00
Mammal (Rat)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.57E–03	2.60E–03	2.40E–03	0.00E+00
Reptile	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.57E–03	2.60E–03	2.40E–03	0.00E+00
Shrub	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.57E–03	2.60E–03	2.40E–03	0.00E+00
Soil Invertebrate (worm)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.57E–03	2.60E–03	2.40E–03	0.00E+00
Tree	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.51E–03	2.60E–03	2.40E–03	0.00E+00

Table F-1. Continued.

Reference organism	Dose Conversion Coefficient of internal low-energy (≤ 10 keV) beta radiation												
	Ac-227	**Ag-108m**	**Am-241**	**Am-243**	**C-14**	**Ca-41**	**Cl-36**	**Cm-244**	**Cm-245**	**Cm-246**	**Cs-135**	**Cs-137**	**Ho-166m**
Amphibian	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.80E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.90E–07	0.00E+00	5.42E–06
Bird	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.90E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.90E–07	0.00E+00	5.42E–06
Bird egg	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.80E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.90E–07	0.00E+00	5.42E–06
Detritivorous invertebrate	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.80E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.80E–07	0.00E+00	5.42E–06
Flying insects	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.80E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.80E–07	0.00E+00	5.42E–06
Gastropod	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.80E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.90E–07	0.00E+00	5.42E–06
Grasses & Herbs	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.80E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.90E–07	0.00E+00	5.42E–06
Lichen & bryophytes	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.80E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.80E–07	0.00E+00	5.42E–06
Mammal (Deer)	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.90E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.90E–07	0.00E+00	5.42E–06
Mammal (Rat)	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.90E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.90E–07	0.00E+00	5.42E–06
Reptile	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.90E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.90E–07	0.00E+00	5.42E–06
Shrub	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.80E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.90E–07	0.00E+00	5.42E–06
Soil Invertebrate (worm)	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.80E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.90E–07	0.00E+00	5.42E–06
Tree	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.90E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.90E–07	0.00E+00	5.42E–06

Table F-1. Continued.

Reference organism	Dose Conversion Coefficient of internal low-energy (≤ 10 keV) beta radiation												
	I-129	**Nb-94**	**Ni-59**	**Ni-63**	**Np-237**	**Pa-231**	**Pb-210**	**Pd-107**	**Po-210**	**Pu-239**	**Pu-240**	**Pu-242**	**Ra-226**
Amphibian	5.07E–06	0.00E+00	2.61E–06	1.19E–06	0.00E+00	7.58E–06	4.80E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Bird	4.84E–06	0.00E+00	2.64E–06	1.19E–06	0.00E+00	7.58E–06	5.00E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Bird egg	4.80E–06	0.00E+00	2.61E–06	1.19E–06	0.00E+00	7.58E–06	4.80E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Detritivorous invertebrate	4.81E–06	0.00E+00	2.66E–06	1.19E–06	0.00E+00	7.58E–06	3.80E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Flying insects	4.81E–06	0.00E+00	2.63E–06	9.90E–07	0.00E+00	7.58E–06	4.20E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Gastropod	4.94E–06	0.00E+00	2.62E–06	1.19E–06	0.00E+00	7.58E–06	4.40E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Grasses & Herbs	4.94E–06	0.00E+00	2.62E–06	1.19E–06	0.00E+00	7.58E–06	4.40E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Lichen & bryophytes	4.81E–06	0.00E+00	2.62E–06	1.19E–06	0.00E+00	7.58E–06	3.40E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Mammal (Deer)	5.00E–06	0.00E+00	2.60E–06	1.19E–06	0.00E+00	7.58E–06	5.00E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Mammal (Rat)	5.04E–06	0.00E+00	2.64E–06	1.19E–06	0.00E+00	7.58E–06	4.80E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Reptile	4.92E–06	0.00E+00	2.64E–06	1.19E–06	0.00E+00	7.58E–06	4.80E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Shrub	4.94E–06	0.00E+00	2.62E–06	1.19E–06	0.00E+00	7.58E–06	4.40E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Soil Invertebrate (worm)	4.94E–06	0.00E+00	2.62E–06	1.19E–06	0.00E+00	7.58E–06	4.60E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Tree	5.00E–06	0.00E+00	2.60E–06	1.19E–06	0.00E+00	7.58E–06	5.00E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00

Table F-1. Continued.

Reference organism	Dose Conversion Coefficient of internal low-energy (≤ 10 keV) beta radiation													
	Se-79	Sm-151	Sn-126	Sr-90	Tc-99	Th-229	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
Amphibian	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Bird	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Bird egg	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Detritivorous invertebrate	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Flying insects	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Gastropod	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Grasses & Herbs	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Lichen & bryophytes	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Mammal (Deer)	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Mammal (Rat)	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Reptile	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Shrub	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Soil Invertebrate (worm)	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Tree	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07

Table F-1. Continued.

Reference organism	Dose Conversion Coefficient of internal high energy beta (> 10 keV) and gamma												
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m
Amphibian	4.71E–06	7.94E–05	3.20E–05	1.62E–04	2.77E–05	2.34E–07	1.60E–04	0.00E+00	3.80E–05	4.44E–06	3.86E–05	1.50E–04	1.13E–04
Bird	4.74E–06	1.79E–04	3.20E–05	1.80E–04	2.87E–05	2.39E–07	1.60E–04	0.00E+00	4.55E–05	4.69E–06	3.86E–05	1.90E–04	2.16E–04
Bird egg	4.72E–06	8.99E–05	3.20E–05	1.64E–04	2.77E–05	2.35E–07	1.60E–04	0.00E+00	3.89E–05	4.49E–06	3.86E–05	1.60E–04	1.23E–04
Detritivorous invertebrate	4.68E–06	3.22E–05	3.20E–05	1.48E–04	2.77E–05	2.03E–07	1.40E–04	0.00E+00	3.35E–05	4.07E–06	3.76E–05	1.20E–04	7.42E–05
Flying insects	4.68E–06	4.15E–05	3.20E–05	1.52E–04	2.77E–05	2.16E–07	1.40E–04	0.00E+00	3.43E–05	4.15E–06	3.76E–05	1.40E–04	7.99E–05
Gastropod	4.69E–06	4.80E–05	3.20E–05	1.54E–04	2.77E–05	2.22E–07	1.50E–04	0.00E+00	3.50E–05	4.20E–06	3.86E–05	1.40E–04	8.47E–05
Grasses & Herbs	4.69E–06	5.05E–05	3.20E–05	1.55E–04	2.77E–05	2.24E–07	1.50E–04	0.00E+00	3.52E–05	4.22E–06	3.86E–05	1.40E–04	8.66E–05
Lichen & bryophytes	4.67E–06	2.68E–05	3.20E–05	1.44E–04	2.77E–05	1.93E–07	1.30E–04	0.00E+00	3.28E–05	4.03E–06	3.76E–05	1.10E–04	7.08E–05
Mammal (Deer)	4.78E–06	6.17E–04	3.20E–05	2.47E–04	2.87E–05	2.41E–07	1.60E–04	0.00E+00	7.27E–05	4.79E–06	3.86E–05	3.40E–04	6.86E–04
Mammal (Rat)	4.73E–06	1.27E–04	3.20E–05	1.70E–04	2.87E–05	2.38E–07	1.60E–04	0.00E+00	4.17E–05	4.61E–06	3.86E–05	1.70E–04	1.61E–04
Reptile	4.72E–06	1.15E–04	3.20E–05	1.69E–04	2.87E–05	2.39E–07	1.60E–04	0.00E+00	4.12E–05	4.58E–06	3.86E–05	1.70E–04	1.50E–04
Shrub	4.69E–06	5.05E–05	3.20E–05	1.55E–04	2.77E–05	2.24E–07	1.50E–04	0.00E+00	3.52E–05	4.22E–06	3.86E–05	1.40E–04	8.66E–05
Soil Invertebrate (worm)	4.69E–06	5.28E–05	3.20E–05	1.56E–04	2.77E–05	2.26E–07	1.50E–04	0.00E+00	3.54E–05	4.24E–06	3.86E–05	1.40E–04	8.88E–05
Tree	4.78E–06	5.73E–04	3.20E–05	2.48E–04	2.87E–05	2.41E–07	1.60E–04	0.00E+00	7.36E–05	4.79E–06	3.86E–05	3.20E–04	6.37E–04

Table F-1. Continued.

Reference organism	Dose Conversion Coefficient of internal high energy beta (> 10 keV) and gamma												
	I-129	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226
Amphibian	3.39E–05	1.30E–04	1.29E–06	8.71E–06	2.80E–05	3.50E–05	2.35E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	4.85E–06	5.60E–04
Bird	3.92E–05	2.20E–04	1.36E–06	8.71E–06	5.60E–05	3.92E–05	2.45E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	5.07E–06	7.50E–04
Bird egg	3.52E–05	1.40E–04	1.29E–06	8.71E–06	2.80E–05	3.56E–05	2.35E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	4.90E–06	5.60E–04
Detritivorous invertebrate	3.22E–05	9.40E–05	9.36E–07	8.71E–06	2.80E–05	3.10E–05	1.86E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	4.48E–06	4.20E–04
Flying insects	3.22E–05	1.00E–04	1.07E–06	8.91E–06	2.80E–05	3.19E–05	2.06E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	4.56E–06	4.20E–04
Gastropod	3.31E–05	1.10E–04	1.18E–06	8.71E–06	2.80E–05	3.25E–05	2.16E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	4.62E–06	4.20E–04
Grasses & Herbs	3.31E–05	1.10E–04	1.18E–06	8.71E–06	2.80E–05	3.27E–05	2.16E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	4.64E–06	5.60E–04
Lichen & bryophytes	3.22E–05	8.80E–05	7.82E–07	8.71E–06	2.80E–05	3.04E–05	1.67E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	4.44E–06	4.20E–04
Mammal (Deer)	4.50E–05	6.40E–04	1.40E–06	8.71E–06	5.60E–05	5.03E–05	2.45E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	5.16E–06	1.20E–03
Mammal (Rat)	3.70E–05	1.80E–04	1.36E–06	8.71E–06	2.80E–05	3.73E–05	2.35E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	5.00E–06	7.00E–04
Reptile	3.61E–05	1.70E–04	1.36E–06	8.71E–06	2.80E–05	3.69E–05	2.35E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	4.98E–06	5.60E–04
Shrub	3.31E–05	1.10E–04	1.18E–06	8.71E–06	2.80E–05	3.27E–05	2.16E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	4.64E–06	5.60E–04
Soil Invertebrate (worm)	3.31E–05	1.10E–04	1.18E–06	8.71E–06	2.80E–05	3.29E–05	2.25E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	4.66E–06	5.60E–04
Tree	4.50E–05	5.80E–04	1.40E–06	8.71E–06	5.60E–05	5.01E–05	2.45E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	5.16E–06	1.05E–03

Table F-1. Continued.

Reference organism	Dose Conversion Coefficient of internal high energy beta (> 10 keV) and gamma													
	Se-79	Sm-151	Sn-126	Sr-90	Tc-99	Th-229	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
Amphibian	3.17E–05	1.03E–05	4.51E–04	5.90E–04	5.80E–05	6.35E–05	0.00E+00	0.00E+00	3.43E–06	0.00E+00	1.35E–04	6.38E–06	0.00E+00	1.03E–05
Bird	3.17E–05	1.03E–05	5.66E–04	6.30E–04	5.80E–05	7.11E–05	0.00E+00	0.00E+00	3.60E–06	0.00E+00	1.35E–04	6.61E–06	0.00E+00	1.03E–05
Bird egg	3.17E–05	1.03E–05	4.65E–04	6.00E–04	5.80E–05	6.44E–05	0.00E+00	0.00E+00	3.47E–06	0.00E+00	1.35E–04	6.43E–06	0.00E+00	1.03E–05
Detritivorous invertebrate	3.17E–05	1.03E–05	2.99E–04	3.50E–04	5.60E–05	5.82E–05	0.00E+00	0.00E+00	3.15E–06	0.00E+00	1.08E–04	5.97E–06	0.00E+00	1.03E–05
Flying insects	3.17E–05	1.03E–05	3.51E–04	4.20E–04	5.70E–05	5.94E–05	0.00E+00	0.00E+00	3.22E–06	0.00E+00	1.08E–04	6.07E–06	0.00E+00	1.03E–05
Gastropod	3.17E–05	1.03E–05	3.79E–04	4.90E–04	5.70E–05	6.02E–05	0.00E+00	0.00E+00	3.26E–06	0.00E+00	1.08E–04	6.14E–06	0.00E+00	1.03E–05
Grasses & Herbs	3.17E–05	1.03E–05	3.90E–04	5.10E–04	5.80E–05	6.05E–05	0.00E+00	0.00E+00	3.28E–06	0.00E+00	1.08E–04	6.16E–06	0.00E+00	1.03E–05
Lichen & bryophytes	3.17E–05	1.03E–05	2.61E–04	2.90E–04	5.40E–05	5.73E–05	0.00E+00	0.00E+00	3.11E–06	0.00E+00	1.08E–04	5.92E–06	0.00E+00	1.03E–05
Mammal (Deer)	3.17E–05	1.03E–05	1.01E–03	6.50E–04	5.80E–05	9.79E–05	0.00E+00	0.00E+00	3.75E–06	0.00E+00	1.89E–04	6.70E–06	0.00E+00	1.03E–05
Mammal (Rat)	3.17E–05	1.03E–05	5.10E–04	6.20E–04	5.80E–05	6.73E–05	0.00E+00	0.00E+00	3.55E–06	0.00E+00	1.35E–04	6.54E–06	0.00E+00	1.03E–05
Reptile	3.17E–05	1.03E–05	4.92E–04	6.00E–04	5.80E–05	6.69E–05	0.00E+00	0.00E+00	3.53E–06	0.00E+00	1.35E–04	6.52E–06	0.00E+00	1.03E–05
Shrub	3.17E–05	1.03E–05	3.90E–04	5.10E–04	5.80E–05	6.05E–05	0.00E+00	0.00E+00	3.28E–06	0.00E+00	1.08E–04	6.16E–06	0.00E+00	1.03E–05
Soil Invertebrate (worm)	3.17E–05	1.03E–05	3.97E–04	5.20E–04	5.80E–05	6.08E–05	0.00E+00	0.00E+00	3.29E–06	0.00E+00	1.08E–04	6.17E–06	0.00E+00	1.03E–05
Tree	3.17E–05	1.03E–05	9.64E–04	6.50E–04	5.80E–05	9.88E–05	0.00E+00	0.00E+00	3.75E–06	0.00E+00	1.89E–04	6.70E–06	0.00E+00	1.03E–05

Table F-2. Dose conversion coefficients for external exposure of terrestrial reference organisms to high energy beta (> 10 keV) /gamma radiation in relation to soil (µGy/h)/(Bq/kg) and air (µGy/h)/(Bq/m^3).

Reference organism	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma in soil												
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m
Amphibian	4.97E–08	8.48E–04	6.00E–06	7.67E–05	0.00E+00	8.15E–09	7.90E–08	1.60E–07	2.77E–05	1.39E–07	0.00E+00	3.00E–04	8.89E–04
Bird	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bird egg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Detritivorous invertebrate	5.10E–08	8.66E–04	6.20E–06	7.82E–05	0.00E+00	8.70E–09	8.10E–08	1.70E–07	2.83E–05	1.48E–07	0.00E+00	3.10E–04	9.08E–04
Flying insects	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Gastropod	5.08E–08	8.64E–04	6.10E–06	7.80E–05	0.00E+00	8.62E–09	8.10E–08	1.60E–07	2.82E–05	1.47E–07	0.00E+00	3.00E–04	9.05E–04
Grasses & Herbs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lichen & bryophytes	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mammal (Deer)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mammal (Rat)	4.65E–08	8.06E–04	5.50E–06	7.31E–05	0.00E+00	6.86E–09	7.50E–08	1.30E–07	2.65E–05	1.18E–07	0.00E+00	2.80E–04	8.47E–04
Reptile	4.40E–08	7.73E–04	5.20E–06	7.02E–05	0.00E+00	5.84E–09	7.20E–08	1.10E–07	2.55E–05	1.02E–07	0.00E+00	2.70E–04	8.13E–04
Shrub	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Soil Invertebrate (worm)	5.05E–08	8.60E–04	6.10E–06	7.77E–05	0.00E+00	8.50E–09	8.00E–08	1.60E–07	2.81E–05	1.45E–07	0.00E+00	3.00E–04	9.01E–04
Tree	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-2. Continued.

Reference organism	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma in soil												
	I-129	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226
Amphibian	3.40E–06	8.30E–04	9.80E–08	0.00E+00	7.50E–06	1.76E–05	5.80E–07	0.00E+00	4.50E–09	8.20E–08	1.60E–07	1.30E–07	8.90E–04
Bird	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bird egg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Detritivorous invertebrate	3.60E–06	8.50E–04	1.00E–07	0.00E+00	7.70E–06	1.80E–05	6.10E–07	0.00E+00	4.60E–09	8.60E–08	1.70E–07	1.39E–07	9.10E–04
Flying insects	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Gastropod	3.50E–06	8.40E–04	1.00E–07	0.00E+00	7.70E–06	1.79E–05	6.10E–07	0.00E+00	4.60E–09	8.60E–08	1.60E–07	1.37E–07	9.00E–04
Grasses & Herbs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lichen & bryophytes	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mammal (Deer)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mammal (Rat)	3.00E–06	7.90E–04	8.20E–08	0.00E+00	7.00E–06	1.66E–05	5.20E–07	0.00E+00	4.30E–09	7.20E–08	1.30E–07	1.11E–07	8.50E–04
Reptile	2.70E–06	7.60E–04	7.00E–08	0.00E+00	6.70E–06	1.58E–05	4.70E–07	0.00E+00	4.10E–09	6.40E–08	1.10E–07	9.55E–08	8.20E–04
Shrub	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Soil Invertebrate (worm)	3.50E–06	8.40E–04	1.00E–07	0.00E+00	7.60E–06	1.78E–05	6.00E–07	0.00E+00	4.50E–09	8.50E–08	1.60E–07	1.36E–07	9.00E–04
Tree	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-2. Continued.

Reference organism	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma in soil													
	Se-79	Sm-151	Sn-126	Sr-90	Tc-99	Th-229	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
Amphibian	0.00E+00	9.46E–10	8.26E–04	1.50E–10	0.00E+00	2.74E–05	2.00E–07	1.40E–07	2.03E–07	1.70E–07	6.60E–05	1.43E–07	1.20E–07	0.00E+00
Bird	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bird egg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Detritivorous invertebrate	0.00E+00	1.01E–09	8.44E–04	1.60E–10	0.00E+00	2.79E–05	2.10E–07	1.50E–07	2.11E–07	1.80E–07	6.70E–05	1.52E–07	1.30E–07	0.00E+00
Flying insects	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Gastropod	0.00E+00	9.97E–10	8.41E–04	1.50E–10	0.00E+00	2.79E–05	2.10E–07	1.50E–07	2.10E–07	1.80E–07	6.70E–05	1.51E–07	1.30E–07	0.00E+00
Grasses & Herbs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lichen & bryophytes	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mammal (Deer)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mammal (Rat)	0.00E+00	8.06E–10	7.86E–04	1.20E–10	0.00E+00	2.61E–05	1.80E–07	1.20E–07	1.84E–07	1.50E–07	6.30E–05	1.23E–07	1.00E–07	0.00E+00
Reptile	0.00E+00	6.96E–10	7.54E–04	1.10E–10	0.00E+00	2.51E–05	1.70E–07	1.10E–07	1.69E–07	1.30E–07	6.00E–05	1.06E–07	8.70E–08	0.00E+00
Shrub	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Soil Invertebrate (worm)	0.00E+00	9.84E–10	8.37E–04	1.50E–10	0.00E+00	2.77E–05	2.10E–07	1.40E–07	2.08E–07	1.70E–07	6.70E–05	1.49E–07	1.20E–07	0.00E+00
Tree	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F2. Continued.

Reference organism	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma on soil												
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m
Amphibian	2.21E–08	3.29E–04	2.60E–06	3.49E–05	0.00E+00	8.54E–41	3.10E–08	4.20E–08	1.35E–05	3.74E–08	0.00E+00	1.10E–04	3.48E–04
Bird	2.04E–08	3.05E–04	2.50E–06	3.21E–05	0.00E+00	8.23E–41	3.10E–08	4.20E–08	1.24E–05	3.42E–08	0.00E+00	1.10E–04	3.23E–04
Bird egg	2.21E–08	3.28E–04	2.50E–06	3.48E–05	0.00E+00	8.52E–41	3.10E–08	4.20E–08	1.34E–05	3.72E–08	0.00E+00	1.10E–04	3.47E–04
Detritivorous invertebrate	2.24E–08	3.32E–04	2.60E–06	3.52E–05	0.00E+00	8.78E–41	3.10E–08	4.30E–08	1.36E–05	3.82E–08	0.00E+00	1.20E–04	3.51E–04
Flying insects	2.24E–08	3.32E–04	2.60E–06	3.52E–05	0.00E+00	8.77E–41	3.10E–08	4.30E–08	1.36E–05	3.82E–08	0.00E+00	1.20E–04	3.51E–04
Gastropod	2.24E–08	3.31E–04	2.60E–06	3.52E–05	0.00E+00	8.75E–41	3.10E–08	4.20E–08	1.36E–05	3.80E–08	0.00E+00	1.20E–04	3.50E–04
Grasses & Herbs	2.82E–08	3.25E–04	3.30E–06	3.69E–05	0.00E+00	1.07E–08	3.10E–08	1.30E–07	1.47E–05	1.13E–07	0.00E+00	1.10E–04	3.43E–04
Lichen & bryophytes	1.16E–08	1.73E–04	5.90E–11	1.83E–05	0.00E+00	4.57E–41	1.60E–12	5.90E–13	7.07E–06	1.96E–08	0.00E+00	6.10E–09	1.83E–04
Mammal (Deer)	8.80E–09	1.61E–04	9.20E–07	1.52E–05	0.00E+00	3.25E–41	1.50E–08	1.10E–08	5.63E–06	1.01E–08	0.00E+00	5.60E–05	1.70E–04
Mammal (Rat)	2.16E–08	3.22E–04	2.50E–06	3.41E–05	0.00E+00	8.50E–41	3.00E–08	4.10E–08	1.32E–05	3.65E–08	0.00E+00	1.10E–04	3.40E–04
Reptile	2.11E–08	3.14E–04	2.40E–06	3.31E–05	0.00E+00	8.54E–41	3.00E–08	4.00E–08	1.28E–05	3.57E–08	0.00E+00	1.10E–04	3.32E–04
Shrub	2.18E–08	3.07E–04	2.70E–06	3.44E–05	0.00E+00	7.70E–10	2.90E–08	5.80E–08	1.35E–05	5.18E–08	0.00E+00	1.10E–04	3.24E–04
Soil Invertebrate (worm)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tree	1.65E–08	2.59E–04	1.90E–06	2.89E–05	0.00E+00	2.26E–13	2.50E–08	1.10E–08	1.13E–05	9.84E–09	0.00E+00	9.00E–05	2.75E–04

Table F2. Continued.

Reference organism	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma on soil												
	I-129	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226
Amphibian	1.10E–06	3.20E–04	1.00E–39	0.00E+00	3.60E–06	7.34E–06	2.80E–07	0.00E+00	1.70E–09	3.30E–08	6.00E–08	5.01E–08	3.40E–04
Bird	1.10E–06	3.20E–04	1.00E–39	0.00E+00	3.60E–06	6.70E–06	2.80E–07	0.00E+00	1.70E–09	3.20E–08	6.00E–08	4.55E–08	3.40E–04
Bird egg	1.10E–06	3.20E–04	1.00E–39	0.00E+00	3.60E–06	7.30E–06	2.80E–07	0.00E+00	1.70E–09	3.20E–08	6.00E–08	4.98E–08	3.40E–04
Detritivorous invertebrate	1.20E–06	3.20E–04	1.10E–39	0.00E+00	3.60E–06	7.40E–06	2.90E–07	0.00E+00	1.70E–09	3.40E–08	6.20E–08	5.18E–08	3.50E–04
Flying insects	1.10E–06	3.20E–04	1.10E–39	0.00E+00	3.60E–06	7.40E–06	2.90E–07	0.00E+00	1.70E–09	3.30E–08	6.20E–08	5.17E–08	3.50E–04
Gastropod	1.10E–06	3.20E–04	1.10E–39	0.00E+00	3.60E–06	7.40E–06	2.90E–07	0.00E+00	1.70E–09	3.30E–08	6.20E–08	5.14E–08	3.50E–04
Grasses & Herbs	1.90E–06	3.10E–04	1.30E–07	0.00E+00	4.20E–06	7.91E–06	4.00E–07	0.00E+00	1.70E–09	6.00E–08	1.30E–07	1.08E–07	3.30E–04
Lichen & bryophytes	2.20E–11	1.80E–08	1.50E–44	0.00E+00	1.00E–10	3.85E–06	4.10E–12	0.00E+00	9.60E–14	6.10E–13	6.40E–13	2.59E–08	2.00E–08
Mammal (Deer)	4.00E–07	1.60E–04	3.70E–40	0.00E+00	1.40E–06	3.37E–06	7.70E–08	0.00E+00	8.60E–10	9.50E–09	1.40E–08	1.17E–08	1.80E–04
Mammal (Rat)	1.10E–06	3.10E–04	1.00E–39	0.00E+00	3.50E–06	7.14E–06	2.80E–07	0.00E+00	1.70E–09	3.20E–08	5.90E–08	4.88E–08	3.40E–04
Reptile	1.10E–06	3.00E–04	1.00E–39	0.00E+00	3.40E–06	6.94E–06	7.20E–06	0.00E+00	1.60E–09	3.10E–08	5.70E–08	4.78E–08	3.30E–04
Shrub	1.60E–06	2.90E–04	9.30E–09	0.00E+00	3.60E–06	6.95E–06	2.00E–07	0.00E+00	1.60E–09	3.10E–08	5.60E–08	4.63E–08	3.20E–04
Soil Invertebrate (worm)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tree	8.80E–07	2.50E–04	2.70E–12	0.00E+00	2.80E–06	5.65E–06	1.30E–07	0.00E+00	1.40E–09	1.10E–08	1.00E–08	8.74E–09	2.70E–04

Table F-2. Continued.

Reference organism	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma on soil													
	Se-79	Sm-151	Sn-126	Sr-90	Tc-99	Th-229	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
Amphibian	0.00E+00	2.44E–10	3.22E–04	1.60E–11	0.00E+00	1.28E–05	7.10E–08	4.30E–08	8.72E–08	6.90E–08	2.90E–05	5.82E–08	4.80E–08	0.00E+00
Bird	0.00E+00	2.25E–10	2.98E–04	1.60E–11	0.00E+00	1.19E–05	7.00E–08	4.30E–08	7.95E–08	6.90E–08	2.90E–05	5.27E–08	4.80E–08	0.00E+00
Bird egg	0.00E+00	2.43E–10	3.21E–04	1.60E–11	0.00E+00	1.28E–05	7.00E–08	4.30E–08	8.67E–08	6.90E–08	2.90E–05	5.79E–08	4.80E–08	0.00E+00
Detritivorous invertebrate	0.00E+00	2.48E–10	3.24E–04	1.60E–11	0.00E+00	1.30E–05	7.20E–08	4.40E–08	8.91E–08	7.20E–08	3.00E–05	6.06E–08	5.00E–08	0.00E+00
Flying insects	0.00E+00	2.47E–10	3.24E–04	1.60E–11	0.00E+00	1.29E–05	7.20E–08	4.40E–08	8.89E–08	7.10E–08	3.00E–05	6.03E–08	5.00E–08	0.00E+00
Gastropod	0.00E+00	2.46E–10	3.24E–04	1.60E–11	0.00E+00	1.29E–05	7.20E–08	4.30E–08	8.87E–08	7.10E–08	3.00E–05	6.00E–08	4.90E–08	0.00E+00
Grasses & Herbs	0.00E+00	8.20E–10	3.18E–04	1.30E–10	0.00E+00	1.42E–05	1.40E–07	1.10E–07	1.30E–07	1.40E–07	3.10E–05	1.20E–07	1.00E–07	0.00E+00
Lichen & bryophytes	0.00E+00	1.28E–10	1.69E–04	3.70E–16	0.00E+00	6.74E–06	1.80E–12	9.00E–13	4.54E–08	9.10E–13	1.10E–09	3.01E–08	4.60E–13	0.00E+00
Mammal (Deer)	0.00E+00	7.74E–11	1.58E–04	4.60E–12	0.00E+00	5.38E–06	2.50E–08	1.30E–08	3.03E–08	1.70E–08	1.30E–05	1.33E–08	1.00E–08	0.00E+00
Mammal (Rat)	0.00E+00	2.39E–10	3.14E–04	1.60E–11	0.00E+00	1.25E–05	6.90E–08	4.20E–08	8.49E–08	6.70E–08	2.90E–05	5.67E–08	4.70E–08	0.00E+00
Reptile	0.00E+00	2.33E–10	3.07E–04	1.50E–11	0.00E+00	1.22E–05	6.70E–08	4.10E–08	8.29E–08	6.60E–08	2.80E–05	5.56E–08	4.60E–08	0.00E+00
Shrub	0.00E+00	3.28E–10	3.01E–04	5.10E–11	0.00E+00	1.29E–05	7.80E–08	5.00E–08	7.91E–08	5.90E–08	2.80E–05	4.87E–08	4.00E–08	0.00E+00
Soil Invertebrate (worm)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tree	0.00E+00	8.81E–11	2.54E–04	5.90E–12	0.00E+00	1.08E–05	4.40E–08	2.10E–08	4.69E–08	1.80E–08	2.40E–05	1.10E–08	6.90E–09	0.00E+00

Table F-2. Continued.

Reference organism	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma in air												
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m
Amphibian	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bird	2.05E–08	3.05E–04	2.00E–06	3.22E–05	0.00E+00	8.54E–41	2.70E–08	1.60E–08	1.25E–05	3.47E–08	0.00E+00	1.00E–04	3.22E–04
Bird egg	2.21E–08	3.28E–04	0.00E+00	3.48E–05	0.00E+00	8.54E–41	0.00E+00	0.00E+00	1.34E–05	3.73E–08	0.00E+00	0.00E+00	3.47E–04
Detritivorous invertebrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Flying insects	0.00E+00	0.00E+00	2.60E–06	0.00E+00	0.00E+00	0.00E+00	3.10E–08	4.30E–08	0.00E+00	0.00E+00	0.00E+00	1.20E–04	0.00E+00
Gastropod	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Grasses & Herbs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lichen & bryophytes	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mammal (Deer)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mammal (Rat)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Reptile	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Shrub	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Soil Invertebrate (worm)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tree	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-2. Continued.

Reference organism	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma in air												
	I-129	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226
Amphibian	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bird	8.80E–07	2.80E–04	6.60E–41	0.00E+00	2.90E–06	6.73E–06	1.40E–07	0.00E+00	1.50E–09	1.50E–08	1.80E–08	4.65E–08	3.00E–04
Bird egg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.30E–06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E–08	0.00E+00
Detritivorous invertebrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Flying insects	1.10E–06	3.20E–04	1.10E–39	0.00E+00	3.60E–06	0.00E+00	2.90E–07	0.00E+00	1.70E–09	3.30E–08	6.20E–08	0.00E+00	3.50E–04
Gastropod	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Grasses & Herbs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lichen & bryophytes	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mammal (Deer)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mammal (Rat)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Reptile	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Shrub	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Soil Invertebrate (worm)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tree	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-2. Continued.

Reference organism	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma in air													
	Se-79	**Sm-151**	**Sn-126**	**Sr-90**	**Tc-99**	**Th-229**	**Th-230**	**Th-232**	**U-233**	**U-234**	**U-235**	**U-236**	**U-238**	**Zr-93**
Amphibian	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bird	0.00E+00	2.27E–10	2.98E–04	6.40E–12	0.00E+00	1.19E–05	4.90E–08	2.40E–08	8.05E–08	2.50E–08	2.50E–05	5.40E–08	1.20E–08	0.00E+00
Bird egg	0.00E+00	2.43E–10	3.21E–04	0.00E+00	0.00E+00	1.28E–05	0.00E+00	0.00E+00	8.69E–08	0.00E+00	0.00E+00	5.81E–08	0.00E+00	0.00E+00
Detritivorous invertebrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Flying insects	0.00E+00	0.00E+00	0.00E+00	1.60E–11	0.00E+00	0.00E+00	7.20E–08	4.40E–08	0.00E+00	7.10E–08	3.00E–05	0.00E+00	5.00E–08	0.00E+00
Gastropod	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Grasses & Herbs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lichen & bryophytes	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mammal (Deer)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mammal (Rat)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Reptile	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Shrub	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Soil Invertebrate (worm)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tree	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-3. Dose conversion coefficients for internal exposure of freshwater reference organisms to alpha, low energy beta (< 10 keV) and high energy beta (> 10 keV) /gamma radiation (µGy/h)/(Bq/kg).

Reference organism	Dose Conversion Coefficient of internal alpha radiation												
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m
Amphibian	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00
Benthic fish	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00
Bird	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00
Bivalve mollusc	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00
Crustacean	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00
Gastropod	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00
Insect larvae	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00
Mammal	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00
Pelagic fish	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00
Phytoplankton	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00
Vascular plant	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00
Zooplankton	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00

Table F-3. Continued.

Reference organism	Dose Conversion Coefficient of internal alpha radiation												
	I-129	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226
Amphibian	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.34E–02
Benthic fish	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.43E–02
Bird	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.43E–02
Bivalve mollusc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.34E–02
Crustacean	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.77E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.37E–02
Gastropod	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.34E–02
Insect larvae	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.77E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.37E–02
Mammal	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.43E–02
Pelagic fish	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.43E–02
Phytoplankton	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.77E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.39E–02
Vascular plant	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.77E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.37E–02
Zooplankton	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.77E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.37E–02

Table F-3. Continued.

Reference organism	Dose Conversion Coefficient of internal alpha radiation													
	Se-79	Sm-151	Sn-126	Sr-90	Tc-99	Th-229	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
Amphibian	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.57E–03	2.60E–03	2.40E–03	0.00E+00
Benthic fish	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.57E–03	2.60E–03	2.40E–03	0.00E+00
Bird	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.57E–03	2.60E–03	2.40E–03	0.00E+00
Bivalve mollusc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.57E–03	2.60E–03	2.40E–03	0.00E+00
Crustacean	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.59E–03	2.60E–03	2.40E–03	0.00E+00
Gastropod	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.57E–03	2.60E–03	2.40E–03	0.00E+00
Insect larvae	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.59E–03	2.60E–03	2.40E–03	0.00E+00
Mammal	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.54E–03	2.60E–03	2.40E–03	0.00E+00
Pelagic fish	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.57E–03	2.60E–03	2.40E–03	0.00E+00
Phytoplankton	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.50E–03	2.60E–03	2.40E–03	0.00E+00
Vascular plant	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.59E–03	2.60E–03	2.40E–03	0.00E+00
Zooplankton	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.59E–03	2.60E–03	2.40E–03	0.00E+00

Table F-3. Continued.

Reference organism	Dose Conversion Coefficient of internal low-energy (≤ 10 keV) beta radiation												
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m
Amphibian	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.80E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.90E–07	0.00E+00	5.42E–06
Benthic fish	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.90E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.90E–07	0.00E+00	5.42E–06
Bird	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.90E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.90E–07	0.00E+00	5.42E–06
Bivalve mollusc	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.80E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.90E–07	0.00E+00	5.42E–06
Crustacean	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.80E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.70E–07	0.00E+00	5.42E–06
Gastropod	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.80E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.90E–07	0.00E+00	5.42E–06
Insect larvae	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.80E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.70E–07	0.00E+00	5.42E–06
Mammal	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.90E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.90E–07	0.00E+00	5.42E–06
Pelagic fish	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.90E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.90E–07	0.00E+00	5.42E–06
Phytoplankton	4.33E–06	1.79E–06	0.00E+00	9.51E–06	5.40E–13	1.33E–06	0.00E+00	0.00E+00	4.83E–06	6.63E–07	6.90E–13	1.20E–12	5.30E–06
Vascular plant	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.70E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.60E–07	0.00E+00	5.41E–06
Zooplankton	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.70E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.60E–07	0.00E+00	5.42E–06

Table F-3. Continued.

Reference organism	Dose Conversion Coefficient of internal low-energy (≤ 10 keV) beta radiation												
	I-129	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226
Amphibian	5.07E–06	0.00E+00	2.61E–06	1.19E–06	0.00E+00	7.58E–06	4.80E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Benthic fish	4.84E–06	0.00E+00	2.64E–06	1.19E–06	0.00E+00	7.58E–06	5.00E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Bird	4.84E–06	0.00E+00	2.64E–06	1.19E–06	0.00E+00	7.58E–06	5.00E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Bivalve mollusc	4.80E–06	0.00E+00	2.57E–06	1.19E–06	0.00E+00	7.58E–06	4.80E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Crustacean	5.04E–06	0.00E+00	2.61E–06	1.18E–06	0.00E+00	7.58E–06	4.20E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Gastropod	4.94E–06	0.00E+00	2.58E–06	1.19E–06	0.00E+00	7.58E–06	4.60E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Insect larvae	5.04E–06	0.00E+00	2.61E–06	1.18E–06	0.00E+00	7.58E–06	4.20E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Mammal	5.06E–06	0.00E+00	2.64E–06	1.19E–06	0.00E+00	7.58E–06	5.00E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Pelagic fish	4.73E–06	0.00E+00	2.64E–06	1.19E–06	0.00E+00	7.58E–06	5.00E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Phytoplankton	9.94E–12	0.00E+00	5.40E–12	2.40E–12	0.00E+00	7.43E–06	9.60E–12	1.74E–06	0.00E+00	0.00E+00	0.00E+00	6.74E–07	0.00E+00
Vascular plant	5.04E–06	0.00E+00	2.65E–06	1.18E–06	0.00E+00	7.58E–06	4.50E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Zooplankton	5.04E–06	0.00E+00	2.67E–06	1.18E–06	0.00E+00	7.58E–06	4.00E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00

Table F-3. Continued.

Reference organism	Dose Conversion Coefficient of internal low-energy (≤ 10 keV) beta radiation													
	Se-79	Sm-151	Sn-126	Sr-90	Tc-99	Th-229	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
Amphibian	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Benthic fish	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Bird	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Bivalve mollusc	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Crustacean	3.10E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Gastropod	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Insect larvae	3.10E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Mammal	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Pelagic fish	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Phytoplankton	6.00E–13	1.08E–06	3.66E–06	0.00E+00	0.00E+00	9.54E–06	0.00E+00	0.00E+00	5.81E–07	0.00E+00	0.00E+00	7.45E–07	0.00E+00	9.47E–07
Vascular plant	3.10E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.75E–07
Zooplankton	3.00E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07

Table F-3. Continued.

Reference organism	Dose Conversion Coefficient of internal high energy beta (> 10 keV) and gamma												
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m
Amphibian	4.71E–06	7.94E–05	3.20E–05	1.62E–04	2.77E–05	2.34E–07	1.60E–04	0.00E+00	3.80E–05	4.44E–06	3.86E–05	1.50E–04	1.13E–04
Benthic fish	4.74E–06	1.72E–04	3.20E–05	1.79E–04	2.87E–05	2.39E–07	1.60E–04	0.00E+00	4.52E–05	4.69E–06	3.86E–05	1.90E–04	2.08E–04
Bird	4.74E–06	1.79E–04	3.20E–05	1.80E–04	2.87E–05	2.39E–07	1.60E–04	0.00E+00	4.55E–05	4.69E–06	3.86E–05	1.90E–04	2.16E–04
Bivalve mollusc	4.72E–06	9.31E–05	3.20E–05	1.64E–04	2.77E–05	2.36E–07	1.60E–04	0.00E+00	3.91E–05	4.50E–06	3.86E–05	1.60E–04	1.27E–04
Crustacean	4.66E–06	1.80E–05	3.20E–05	1.38E–04	2.77E–05	1.83E–07	1.10E–04	0.00E+00	3.19E–05	3.98E–06	3.66E–05	9.60E–05	6.64E–05
Gastropod	4.70E–06	5.55E–05	3.20E–05	1.56E–04	2.77E–05	2.27E–07	1.50E–04	0.00E+00	3.57E–05	4.27E–06	3.86E–05	1.40E–04	9.09E–05
Insect larvae	4.66E–06	1.88E–05	3.20E–05	1.39E–04	2.77E–05	1.84E–07	1.10E–04	0.00E+00	3.21E–05	3.98E–06	3.66E–05	9.80E–05	6.70E–05
Mammal	4.74E–06	2.47E–04	3.20E–05	1.91E–04	2.87E–05	2.40E–07	1.60E–04	0.00E+00	5.03E–05	4.73E–06	3.86E–05	2.10E–04	2.89E–04
Pelagic fish	4.73E–06	1.62E–04	3.20E–05	1.77E–04	2.87E–05	2.39E–07	1.60E–04	0.00E+00	4.46E–05	4.68E–06	3.86E–05	1.80E–04	1.99E–04
Phytoplankton	4.14E–06	3.84E–06	6.50E–11	7.17E–05	5.35E–11	1.61E–07	1.20E–10	0.00E+00	2.30E–05	3.31E–06	6.83E–11	1.19E–10	3.97E–05
Vascular plant	4.66E–06	2.49E–05	3.20E–05	1.33E–04	2.67E–05	1.88E–07	1.10E–04	0.00E+00	3.19E–05	3.99E–06	3.56E–05	9.80E–05	6.76E–05
Zooplankton	4.64E–06	1.25E–05	3.20E–05	1.29E–04	2.67E–05	1.79E–07	8.00E–05	0.00E+00	3.13E–05	3.94E–06	3.56E–05	7.60E–05	6.29E–05

Table F-3. Continued.

Reference organism	Dose Conversion Coefficient of internal high energy beta (> 10 keV) and gamma												
	I-129	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226
Amphibian	3.39E–05	1.30E–04	1.29E–06	8.71E–06	2.80E–05	3.50E–05	2.35E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	4.85E–06	5.60E–04
Benthic fish	3.92E–05	2.20E–04	1.36E–06	8.71E–06	5.60E–05	3.90E–05	2.45E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	5.07E–06	7.50E–04
Bird	3.92E–05	2.20E–04	1.36E–06	8.71E–06	5.60E–05	3.92E–05	2.45E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	5.07E–06	7.50E–04
Bivalve mollusc	3.52E–05	1.40E–04	1.33E–06	8.71E–06	2.80E–05	3.58E–05	2.35E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	4.91E–06	5.60E–04
Crustacean	3.10E–05	7.90E–05	6.93E–07	8.62E–06	2.80E–05	2.98E–05	1.36E–04	3.54E–06	0.00E+00	0.00E+00	0.00E+00	4.38E–06	2.80E–04
Gastropod	3.31E–05	1.10E–04	1.22E–06	8.71E–06	2.80E–05	3.32E–05	2.25E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	4.69E–06	5.60E–04
Insect larvae	3.10E–05	8.10E–05	6.93E–07	8.62E–06	2.80E–05	2.99E–05	1.36E–04	3.54E–06	0.00E+00	0.00E+00	0.00E+00	4.39E–06	2.80E–04
Mammal	4.09E–05	2.90E–04	1.36E–06	8.71E–06	5.60E–05	4.12E–05	2.45E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	5.10E–06	7.50E–04
Pelagic fish	3.83E–05	2.10E–04	1.36E–06	8.71E–06	5.60E–05	3.87E–05	2.45E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	5.06E–06	7.50E–04
Phytoplankton	6.11E–11	1.20E–10	1.11E–12	1.76E–11	5.70E–11	2.41E–05	1.50E–10	3.20E–06	0.00E+00	0.00E+00	0.00E+00	3.62E–06	2.90E–10
Vascular plant	3.10E–05	7.60E–05	7.48E–07	8.62E–06	2.80E–05	2.98E–05	1.46E–04	3.54E–06	0.00E+00	0.00E+00	0.00E+00	4.40E–06	2.80E–04
Zooplankton	3.10E–05	6.80E–05	6.27E–07	8.62E–06	2.80E–05	2.93E–05	9.60E–05	3.54E–06	0.00E+00	0.00E+00	0.00E+00	4.35E–06	2.80E–04

Table F-3. Continued.

Reference organism	Dose Conversion Coefficient of internal high energy beta (> 10 keV) and gamma													
	Se-79	Sm-151	Sn-126	Sr-90	Tc-99	Th-229	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
Amphibian	3.17E–05	1.03E–05	4.51E–04	5.90E–04	5.80E–05	6.35E–05	0.00E+00	0.00E+00	3.43E–06	0.00E+00	1.35E–04	6.38E–06	0.00E+00	1.03E–05
Benthic fish	3.17E–05	1.03E–05	5.59E–04	6.30E–04	5.80E–05	7.08E–05	0.00E+00	0.00E+00	3.60E–06	0.00E+00	1.35E–04	6.61E–06	0.00E+00	1.03E–05
Bird	3.17E–05	1.03E–05	5.66E–04	6.30E–04	5.80E–05	7.11E–05	0.00E+00	0.00E+00	3.60E–06	0.00E+00	1.35E–04	6.61E–06	0.00E+00	1.03E–05
Bivalve mollusc	3.17E–05	1.03E–05	4.70E–04	6.00E–04	5.80E–05	6.47E–05	0.00E+00	0.00E+00	3.48E–06	0.00E+00	1.35E–04	6.44E–06	0.00E+00	1.03E–05
Crustacean	3.07E–05	1.02E–05	1.94E–04	2.00E–04	5.30E–05	5.60E–05	0.00E+00	0.00E+00	3.07E–06	0.00E+00	1.08E–04	5.85E–06	0.00E+00	1.03E–05
Gastropod	3.17E–05	1.03E–05	4.04E–04	5.30E–04	5.80E–05	6.11E–05	0.00E+00	0.00E+00	3.31E–06	0.00E+00	1.08E–04	6.21E–06	0.00E+00	1.03E–05
Insect larvae	3.07E–05	1.02E–05	2.00E–04	2.10E–04	5.30E–05	5.62E–05	0.00E+00	0.00E+00	3.07E–06	0.00E+00	1.08E–04	5.86E–06	0.00E+00	1.03E–05
Mammal	3.17E–05	1.03E–05	6.37E–04	6.40E–04	5.80E–05	7.59E–05	0.00E+00	0.00E+00	3.64E–06	0.00E+00	1.35E–04	6.64E–06	0.00E+00	1.03E–05
Pelagic fish	3.17E–05	1.03E–05	5.49E–04	6.30E–04	5.80E–05	7.02E–05	0.00E+00	0.00E+00	3.60E–06	0.00E+00	1.35E–04	6.60E–06	0.00E+00	1.03E–05
Phytoplankton	5.94E–11	8.51E–06	5.62E–05	2.10E–10	9.30E–11	3.94E–05	0.00E+00	0.00E+00	2.47E–06	0.00E+00	2.16E–10	4.72E–06	0.00E+00	8.65E–06
Vascular plant	3.07E–05	1.02E–05	2.46E–04	2.80E–04	5.10E–05	5.56E–05	0.00E+00	0.00E+00	3.07E–06	0.00E+00	1.08E–04	5.86E–06	0.00E+00	1.03E–05
Zooplankton	2.97E–05	1.02E–05	1.50E–04	1.40E–04	5.00E–05	5.48E–05	0.00E+00	0.00E+00	3.03E–06	0.00E+00	1.08E–04	5.79E–06	0.00E+00	1.02E–05

Table F-4. Dose conversion coefficients for external exposure of freshwater reference organisms to low energy beta (≤ 10 keV) and high energy beta (> 10 keV)/ gamma radiation (µGy/h)/(Bq/l).

Reference organism	Dose Conversion Coefficient of external low-energy (≤ 10 keV) beta radiation												
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m
Amphibian	1.03E–14	1.09E–15	0.00E+00	1.57E–14	0.00E+00	1.16E–15	0.00E+00	0.00E+00	7.60E–15	9.91E–16	0.00E+00	0.00E+00	9.87E–15
Benthic fish	6.03E–16	6.03E–17	0.00E+00	8.72E–16	0.00E+00	6.41E–17	0.00E+00	0.00E+00	4.20E–16	5.47E–17	0.00E+00	0.00E+00	5.72E–16
Bird	4.22E–16	4.13E–17	0.00E+00	5.98E–16	0.00E+00	4.38E–17	0.00E+00	0.00E+00	2.87E–16	3.74E–17	0.00E+00	0.00E+00	3.99E–16
Bivalve mollusc	3.27E–15	3.32E–16	0.00E+00	4.80E–15	0.00E+00	3.53E–16	0.00E+00	0.00E+00	2.31E–15	3.01E–16	0.00E+00	0.00E+00	3.11E–15
Crustacean	8.96E–28	1.16E–30	0.00E+00	1.37E–28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.32E–28
Gastropod	6.46E–28	8.35E–31	0.00E+00	9.91E–29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.28E–28
Insect larvae	8.89E–28	1.15E–30	0.00E+00	1.36E–28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.26E–28
Mammal	6.60E–16	6.77E–17	0.00E+00	9.77E–16	0.00E+00	7.19E–17	0.00E+00	0.00E+00	4.71E–16	6.14E–17	0.00E+00	0.00E+00	6.29E–16
Pelagic fish	4.22E–16	4.13E–17	0.00E+00	5.98E–16	0.00E+00	4.38E–17	0.00E+00	0.00E+00	2.87E–16	3.74E–17	0.00E+00	0.00E+00	3.99E–16
Phytoplankton	1.14E–07	1.49E–08	0.00E+00	2.11E–07	0.00E+00	1.59E–08	0.00E+00	0.00E+00	1.04E–07	1.36E–08	0.00E+00	0.00E+00	1.13E–07
Vascular plant	1.61E–09	2.11E–10	0.00E+00	2.98E–09	0.00E+00	2.25E–10	0.00E+00	0.00E+00	1.47E–09	1.92E–10	0.00E+00	0.00E+00	1.60E–09
Zooplankton	3.59E–12	4.17E–13	0.00E+00	5.95E–12	0.00E+00	4.44E–13	0.00E+00	0.00E+00	2.91E–12	3.79E–13	0.00E+00	0.00E+00	3.48E–12

Table F-4. Continued.

Reference organism	Dose Conversion Coefficient of external low-energy (≤ 10 keV) beta radiation												
	I-129	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226
Amphibian	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.08E–14	0.00E+00	5.79E–15	0.00E+00	0.00E+00	0.00E+00	9.59E–16	0.00E+00
Benthic fish	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.98E–16	0.00E+00	3.55E–16	0.00E+00	0.00E+00	0.00E+00	5.29E–17	0.00E+00
Bird	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.09E–16	0.00E+00	2.54E–16	0.00E+00	0.00E+00	0.00E+00	3.62E–17	0.00E+00
Bivalve mollusc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.29E–15	0.00E+00	1.90E–15	0.00E+00	0.00E+00	0.00E+00	2.92E–16	0.00E+00
Crustacean	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.80E–28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Gastropod	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.07E–28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Insect larvae	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.72E–28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mammal	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.71E–16	0.00E+00	3.81E–16	0.00E+00	0.00E+00	0.00E+00	5.94E–17	0.00E+00
Pelagic fish	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.09E–16	0.00E+00	2.54E–16	0.00E+00	0.00E+00	0.00E+00	3.62E–17	0.00E+00
Phytoplankton	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.49E–07	0.00E+00	4.92E–08	0.00E+00	0.00E+00	0.00E+00	1.32E–08	0.00E+00
Vascular plant	0.00E+00	0.00E+00	0.00E+00	6.10E–10	0.00E+00	2.10E–09	0.00E+00	6.99E–10	0.00E+00	0.00E+00	0.00E+00	1.86E–10	0.00E+00
Zooplankton	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.14E–12	0.00E+00	1.82E–12	0.00E+00	0.00E+00	0.00E+00	3.67E–13	0.00E+00

Table F-4. Continued.

Reference organism	Dose Conversion Coefficient of external low-energy (≤ 10 keV) beta radiation													
	Se-79	**Sm-151**	**Sn-126**	**Sr-90**	**Tc-99**	**Th-229**	**Th-230**	**Th-232**	**U-233**	**U-234**	**U-235**	**U-236**	**U-238**	**Zr-93**
Amphibian	0.00E+00	3.79E–15	3.37E–15	0.00E+00	0.00E+00	1.55E–14	0.00E+00	0.00E+00	9.07E–16	0.00E+00	0.00E+00	1.01E–15	0.00E+00	3.50E–15
Benthic fish	0.00E+00	2.34E–16	1.91E–16	0.00E+00	0.00E+00	8.55E–16	0.00E+00	0.00E+00	5.01E–17	0.00E+00	0.00E+00	5.58E–17	0.00E+00	2.17E–16
Bird	0.00E+00	1.67E–16	1.32E–16	0.00E+00	0.00E+00	5.85E–16	0.00E+00	0.00E+00	3.43E–17	0.00E+00	0.00E+00	3.82E–17	0.00E+00	1.55E–16
Bivalve mollusc	0.00E+00	1.25E–15	1.04E–15	0.00E+00	0.00E+00	4.71E–15	0.00E+00	0.00E+00	2.76E–16	0.00E+00	0.00E+00	3.07E–16	0.00E+00	1.16E–15
Crustacean	0.00E+00	6.68E–28	1.28E–28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.44E–28
Gastropod	0.00E+00	4.82E–28	9.24E–29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.65E–28
Insect larvae	0.00E+00	6.62E–28	1.27E–28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.39E–28
Mammal	0.00E+00	2.50E–16	2.12E–16	0.00E+00	0.00E+00	9.60E–16	0.00E+00	0.00E+00	5.62E–17	0.00E+00	0.00E+00	6.26E–17	0.00E+00	2.31E–16
Pelagic fish	0.00E+00	1.67E–16	1.32E–16	0.00E+00	0.00E+00	5.85E–16	0.00E+00	0.00E+00	3.43E–17	0.00E+00	0.00E+00	3.82E–17	0.00E+00	1.55E–16
Phytoplankton	0.00E+00	3.14E–08	4.23E–08	0.00E+00	0.00E+00	2.12E–07	0.00E+00	0.00E+00	1.24E–08	0.00E+00	0.00E+00	1.39E–08	0.00E+00	2.81E–08
Vascular plant	0.00E+00	4.47E–10	5.98E–10	0.00E+00	0.00E+00	3.00E–09	0.00E+00	0.00E+00	1.76E–10	0.00E+00	0.00E+00	1.96E–10	0.00E+00	4.00E–10
Zooplankton	0.00E+00	1.18E–12	1.24E–12	0.00E+00	0.00E+00	5.92E–12	0.00E+00	0.00E+00	3.47E–13	0.00E+00	0.00E+00	3.86E–13	0.00E+00	1.08E–12

Table F-4. Continued.

Reference organism	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma												
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m
Amphibian	8.82E–08	8.99E–04	1.40E–05	1.24E–04	5.90E–08	6.94E–09	4.20E–06	4.00E–07	4.97E–05	3.56E–07	1.40E–07	3.20E–04	9.65E–04
Benthic fish	6.67E–08	8.06E–04	1.10E–05	1.07E–04	1.70E–08	1.94E–09	1.30E–06	1.40E–07	4.26E–05	1.28E–07	4.10E–08	2.80E–04	8.70E–04
Bird	6.63E–08	7.99E–04	1.10E–05	1.06E–04	1.80E–08	2.04E–09	1.40E–06	1.40E–07	4.23E–05	1.27E–07	4.30E–08	2.80E–04	8.62E–04
Bivalve mollusc	8.35E–08	8.85E–04	1.40E–05	1.21E–04	4.50E–08	5.31E–09	3.30E–06	3.30E–07	4.86E–05	2.97E–07	1.00E–07	3.10E–04	9.52E–04
Crustacean	1.47E–07	9.60E–04	1.80E–05	1.48E–04	9.00E–07	5.81E–08	5.40E–05	9.30E–07	5.57E–05	8.34E–07	2.20E–06	3.70E–04	1.01E–03
Gastropod	1.02E–07	9.23E–04	1.60E–05	1.29E–04	1.20E–07	1.42E–08	8.30E–06	5.70E–07	5.18E–05	5.11E–07	2.70E–07	3.30E–04	9.87E–04
Insect larvae	1.46E–07	9.59E–04	1.80E–05	1.46E–04	8.20E–07	5.69E–08	5.10E–05	9.20E–07	5.56E–05	8.28E–07	2.00E–06	3.70E–04	1.01E–03
Mammal	5.76E–08	7.31E–04	8.90E–06	9.39E–05	1.20E–08	1.39E–09	9.80E–07	9.60E–08	3.75E–05	8.64E–08	3.00E–08	2.60E–04	7.89E–04
Pelagic fish	6.81E–08	8.15E–04	1.10E–05	1.08E–04	1.80E–08	2.04E–09	1.40E–06	1.50E–07	4.32E–05	1.38E–07	4.30E–08	2.90E–04	8.80E–04
Phytoplankton	6.56E–07	9.74E–04	3.20E–03	2.14E–04	2.90E–05	8.03E–08	1.60E–04	3.30E–03	6.48E–05	1.50E–06	3.90E–05	4.70E–04	1.04E–03
Vascular plant	1.44E–07	9.53E–04	1.80E–05	1.52E–04	1.10E–06	5.38E–08	5.50E–05	9.00E–07	5.58E–05	8.03E–07	2.70E–06	3.70E–04	1.01E–03
Zooplankton	1.54E–07	9.65E–04	1.90E–05	1.56E–04	1.30E–06	6.27E–08	8.10E–05	9.50E–07	5.64E–05	8.57E–07	3.00E–06	3.90E–04	1.02E–03

Table F-4. Continued.

Reference organism	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma												
	I-129	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226
Amphibian	1.20E–05	8.70E–04	8.40E–08	3.80E–09	1.60E–05	2.24E–05	1.10E–05	4.59E–10	4.70E–09	1.80E–07	3.70E–07	3.11E–07	1.00E–03
Benthic fish	7.30E–06	7.90E–04	2.30E–08	1.10E–09	1.20E–05	1.86E–05	3.80E–06	1.25E–10	4.30E–09	7.80E–08	1.30E–07	1.11E–07	9.10E–04
Bird	7.10E–06	7.80E–04	2.50E–08	1.10E–09	1.20E–05	1.84E–05	3.90E–06	1.33E–10	4.20E–09	7.70E–08	1.30E–07	1.11E–07	9.00E–04
Bivalve mollusc	1.10E–05	8.60E–04	6.40E–08	2.90E–09	1.50E–05	2.17E–05	8.70E–06	3.53E–10	4.60E–09	1.50E–07	3.10E–07	2.58E–07	1.00E–03
Crustacean	1.50E–05	9.30E–04	7.00E–07	5.70E–08	2.00E–05	2.76E–05	3.60E–05	1.20E–08	4.90E–09	4.00E–07	9.50E–07	7.92E–07	1.30E–03
Gastropod	1.30E–05	8.90E–04	1.70E–07	9.40E–09	1.70E–05	2.41E–05	2.10E–05	1.91E–09	4.80E–09	2.40E–07	5.50E–07	4.56E–07	1.10E–03
Insect larvae	1.50E–05	9.20E–04	6.90E–07	5.40E–08	2.00E–05	2.75E–05	1.10E–04	1.14E–08	4.90E–09	4.00E–07	9.40E–07	7.85E–07	1.30E–03
Mammal	5.20E–06	7.20E–04	1.70E–08	7.40E–10	1.00E–05	1.64E–05	2.80E–06	8.16E–11	3.90E–09	5.90E–08	9.20E–08	7.66E–08	8.30E–04
Pelagic fish	7.70E–06	8.00E–04	2.50E–08	1.10E–09	1.20E–05	1.89E–05	4.00E–06	1.33E–10	4.30E–09	8.20E–08	1.40E–07	1.19E–07	9.20E–04
Phytoplankton	5.10E–05	1.00E–03	4.00E–06	9.90E–06	2.80E–03	3.34E–05	2.50E–04	3.46E–07	3.10E–03	3.00E–03	3.00E–03	1.55E–06	1.50E–02
Vascular plant	1.50E–05	9.30E–04	6.50E–07	6.04E–08	2.00E–05	2.76E–05	9.60E–05	8.06E–09	4.90E–09	4.00E–07	9.20E–07	7.59E–07	1.30E–03
Zooplankton	1.50E–05	9.40E–04	7.60E–07	8.70E–08	2.00E–05	2.81E–05	1.50E–04	1.12E–08	4.90E–09	4.20E–07	9.90E–07	8.18E–07	1.40E–03

Table F-4. Continued.

Reference organism	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma													
	Se-79	Sm-151	Sn-126	Sr-90	Tc-99	Th-229	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
Amphibian	7.70E–08	8.06E–09	9.12E–04	6.30E–05	3.70E–07	4.88E–05	4.10E–07	2.90E–07	3.70E–07	3.70E–07	9.50E–05	3.16E–07	2.70E–07	4.71E–09
Benthic fish	2.30E–08	2.56E–09	8.05E–04	2.10E–05	1.10E–07	4.17E–05	2.40E–07	1.40E–07	2.20E–07	1.50E–07	8.20E–05	1.20E–07	9.50E–08	1.31E–09
Bird	2.40E–08	2.62E–09	7.97E–04	2.00E–05	1.20E–07	4.14E–05	2.40E–07	1.40E–07	2.18E–07	1.50E–07	8.10E–05	1.20E–07	9.50E–08	1.38E–09
Bivalve mollusc	5.90E–08	6.36E–09	8.93E–04	4.90E–05	2.90E–07	4.77E–05	3.60E–07	2.50E–07	3.32E–07	3.10E–07	9.30E–05	2.63E–07	2.20E–07	3.56E–09
Crustacean	1.20E–06	8.48E–08	1.17E–03	4.50E–04	5.70E–06	5.64E–05	9.20E–07	7.50E–07	7.47E–07	9.50E–07	1.10E–04	8.47E–07	7.30E–07	6.98E–08
Gastropod	1.50E–07	1.63E–08	9.60E–04	1.20E–04	7.30E–07	5.10E–05	5.30E–07	4.00E–07	4.74E–07	5.30E–07	9.90E–05	4.65E–07	4.00E–07	1.16E–08
Insect larvae	1.10E–06	8.06E–08	1.16E–03	4.40E–04	5.30E–06	5.61E–05	9.00E–07	7.40E–07	7.40E–07	9.40E–07	1.10E–04	8.39E–07	7.20E–07	6.65E–08
Mammal	1.60E–08	1.78E–09	7.27E–04	1.40E–05	8.50E–08	3.66E–05	2.00E–07	1.10E–07	1.80E–07	1.10E–07	7.20E–05	8.62E–08	6.60E–08	9.23E–10
Pelagic fish	2.40E–08	2.71E–09	8.14E–04	2.40E–05	1.20E–07	4.23E–05	2.50E–07	1.50E–07	2.27E–07	1.60E–07	8.30E–05	1.28E–07	1.00E–07	1.38E–09
Phytoplankton	3.20E–05	1.81E–06	1.31E–03	6.50E–04	5.80E–05	7.30E–05	2.70E–03	2.30E–03	1.35E–06	2.80E–03	2.80E–03	2.00E–06	2.40E–03	1.69E–06
Vascular plant	1.50E–06	9.71E–08	1.12E–03	3.70E–04	7.70E–06	5.66E–05	9.40E–07	7.60E–07	7.29E–07	9.50E–07	1.10E–04	8.35E–07	7.20E–07	7.45E–08
Zooplankton	1.70E–06	1.34E–07	1.21E–03	5.10E–04	8.40E–06	5.75E–05	1.00E–06	8.30E–07	7.76E–07	1.00E–06	1.10E–04	9.08E–07	7.80E–07	1.09E–07

Table F-5. Dose conversion coefficients for internal exposure of marine reference organisms to alpha, low energy beta (≤ 10 keV) and high energy beta (> 10 keV) /gamma radiation (µGy/h)/(Bq/kg).

Reference organism	Dose Conversion Coefficient of internal alpha radiation												
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m
Phytoplankton	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00
Macroalgae	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00
Vascular plant	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00
Zooplankton	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00
Benthic mollusc	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00
Polychaete worm	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00
Crustacean	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00
Benthic fish	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00
Pelagic fish	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00
(Wading) bird	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00
Mammal	3.93E–05	0.00E+00	3.17E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.30E–03	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00

Table F-5. Continued.

Reference organism	Dose Conversion Coefficient of internal alpha radiation												
	I-129	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226
Phytoplankton	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.77E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.39E–02
Macroalgae	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.36E–02
Vascular plant	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.34E–02
Zooplankton	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.77E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.36E–02
Benthic mollusc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.34E–02
Polychaete worm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.34E–02
Crustacean	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.43E–02
Benthic fish	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.34E–02
Pelagic fish	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.33E–02
(Wading) bird	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.43E–02
Mammal	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E–03	2.87E–03	0.00E+00	0.00E+00	3.10E–03	3.00E–03	3.00E–03	2.82E–03	1.40E–02

Table F-5. Continued.

Reference organism	Dose Conversion Coefficient of internal alpha radiation													
	Se-79	Sm-151	Sn-126	Sr-90	Tc-99	Th-229	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
Phytoplankton	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.59E–03	2.60E–03	2.40E–03	0.00E+00
Macroalgae	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.57E–03	2.60E–03	2.40E–03	0.00E+00
Vascular plant	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.57E–03	2.60E–03	2.40E–03	0.00E+00
Zooplankton	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.57E–03	2.60E–03	2.40E–03	0.00E+00
Benthic mollusc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.57E–03	2.60E–03	2.40E–03	0.00E+00
Polychaete worm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.57E–03	2.60E–03	2.40E–03	0.00E+00
Crustacean	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.57E–03	2.60E–03	2.40E–03	0.00E+00
Benthic fish	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.57E–03	2.60E–03	2.40E–03	0.00E+00
Pelagic fish	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.57E–03	2.60E–03	2.40E–03	0.00E+00
(Wading) bird	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.57E–03	2.60E–03	2.40E–03	0.00E+00
Mammal	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03	2.70E–03	2.30E–03	2.78E–03	2.80E–03	2.51E–03	2.60E–03	2.40E–03	0.00E+00

Table F-5. Continued.

Reference organism	Dose Conversion Coefficient of internal low-energy (≤ 10 keV) beta radiation												
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m
Phytoplankton	4.45E–06	1.81E–06	0.00E+00	9.72E–06	1.80E–11	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	2.30E–11	4.30E–11	5.42E–06
Macroalgae	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.80E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.80E–07	0.00E+00	5.42E–06
Vascular plant	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.80E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.90E–07	0.00E+00	5.42E–06
Zooplankton	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.80E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.80E–07	0.00E+00	5.42E–06
Benthic mollusc	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.80E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.90E–07	0.00E+00	5.42E–06
Polychaete worm	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.80E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.90E–07	0.00E+00	5.42E–06
Crustacean	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.90E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.90E–07	0.00E+00	5.42E–06
Benthic fish	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.90E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.90E–07	0.00E+00	5.42E–06
Pelagic fish	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.90E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.90E–07	0.00E+00	5.42E–06
(Wading) bird	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.90E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.90E–07	0.00E+00	5.42E–06
Mammal	4.45E–06	1.81E–06	0.00E+00	9.72E–06	2.90E–07	1.35E–06	0.00E+00	0.00E+00	4.93E–06	6.77E–07	3.90E–07	0.00E+00	5.42E–06

Table F-5. Continued.

Reference organism	Dose Conversion Coefficient of internal low-energy (≤ 10 keV) beta radiation												
	I-129	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226
Phytoplankton	3.22E–10	0.00E+00	1.72E–10	7.68E–11	0.00E+00	7.58E–06	2.75E–10	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Macroalgae	4.94E–06	0.00E+00	2.59E–06	1.19E–06	0.00E+00	7.58E–06	4.00E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Vascular plant	5.07E–06	0.00E+00	2.61E–06	1.19E–06	0.00E+00	7.58E–06	4.80E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Zooplankton	4.81E–06	0.00E+00	2.63E–06	1.19E–06	0.00E+00	7.58E–06	3.60E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Benthic mollusc	5.07E–06	0.00E+00	2.61E–06	1.19E–06	0.00E+00	7.58E–06	4.80E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Polychaete worm	4.94E–06	0.00E+00	2.65E–06	1.19E–06	0.00E+00	7.58E–06	4.60E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Crustacean	4.73E–06	0.00E+00	2.64E–06	1.19E–06	0.00E+00	7.58E–06	4.80E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Benthic fish	5.04E–06	0.00E+00	2.64E–06	1.19E–06	0.00E+00	7.58E–06	4.80E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Pelagic fish	5.04E–06	0.00E+00	2.64E–06	1.19E–06	0.00E+00	7.58E–06	4.80E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
(Wading) bird	4.84E–06	0.00E+00	2.64E–06	1.19E–06	0.00E+00	7.58E–06	5.00E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00
Mammal	4.90E–06	0.00E+00	2.60E–06	1.19E–06	0.00E+00	7.58E–06	5.00E–06	1.79E–06	0.00E+00	0.00E+00	0.00E+00	6.87E–07	0.00E+00

Table F-5. Continued.

Reference organism	Dose Conversion Coefficient of internal low-energy (≤ 10 keV) beta radiation													
	Se-79	Sm-151	Sn-126	Sr-90	Tc-99	Th-229	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
Phytoplankton	2.00E–11	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Macroalgae	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Vascular plant	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Zooplankton	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Benthic mollusc	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Polychaete worm	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Crustacean	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Benthic fish	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Pelagic fish	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
(Wading) bird	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07
Mammal	3.20E–07	1.11E–06	3.70E–06	0.00E+00	0.00E+00	9.75E–06	0.00E+00	0.00E+00	5.93E–07	0.00E+00	0.00E+00	7.59E–07	0.00E+00	9.76E–07

Table F-5. Continued.

Reference organism	Dose Conversion Coefficient of internal high energy beta (> 10 keV) and gamma												
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m
Phytoplankton	4.58E–06	4.86E–06	2.10E–09	9.63E–05	1.78E–09	1.62E–07	4.30E–09	0.00E+00	2.79E–05	3.82E–06	2.28E–09	4.26E–09	5.15E–05
Macroalgae	4.69E–06	4.20E–05	3.20E–05	1.51E–04	2.77E–05	2.18E–07	1.40E–04	0.00E+00	3.44E–05	4.14E–06	3.76E–05	1.30E–04	8.13E–05
Vascular plant	4.71E–06	7.51E–05	3.20E–05	1.61E–04	2.77E–05	2.34E–07	1.60E–04	0.00E+00	3.76E–05	4.41E–06	3.86E–05	1.50E–04	1.09E–04
Zooplankton	4.67E–06	2.74E–05	3.20E–05	1.47E–04	2.77E–05	2.00E–07	1.30E–04	0.00E+00	3.31E–05	4.04E–06	3.76E–05	1.20E–04	7.19E–05
Benthic mollusc	4.71E–06	7.19E–05	3.20E–05	1.60E–04	2.77E–05	2.33E–07	1.60E–04	0.00E+00	3.73E–05	4.39E–06	3.86E–05	1.50E–04	1.06E–04
Polychaete worm	4.70E–06	5.94E–05	3.20E–05	1.58E–04	2.77E–05	2.31E–07	1.50E–04	0.00E+00	3.61E–05	4.29E–06	3.86E–05	1.40E–04	9.49E–05
Crustacean	4.73E–06	1.58E–04	3.20E–05	1.76E–04	2.87E–05	2.39E–07	1.60E–04	0.00E+00	4.40E–05	4.66E–06	3.86E–05	1.80E–04	1.94E–04
Benthic fish	4.73E–06	1.25E–04	3.20E–05	1.71E–04	2.87E–05	2.39E–07	1.60E–04	0.00E+00	4.22E–05	4.62E–06	3.86E–05	1.70E–04	1.60E–04
Pelagic fish	4.73E–06	1.41E–04	3.20E–05	1.73E–04	2.87E–05	2.39E–07	1.60E–04	0.00E+00	4.29E–05	4.64E–06	3.86E–05	1.80E–04	1.76E–04
(Wading) bird	4.74E–06	1.79E–04	3.20E–05	1.80E–04	2.87E–05	2.39E–07	1.60E–04	0.00E+00	4.55E–05	4.69E–06	3.86E–05	1.90E–04	2.16E–04
Mammal	4.78E–06	5.73E–04	3.20E–05	2.43E–04	2.87E–05	2.41E–07	1.60E–04	0.00E+00	7.12E–05	4.79E–06	3.86E–05	3.30E–04	6.39E–04

Table F-5. Continued.

Reference organism	Dose Conversion Coefficient of internal high energy beta (> 10 keV) and gamma												
	I-129	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226
Phytoplankton	1.98E–09	4.00E–09	3.78E–11	5.63E–10	1.80E–09	2.74E–05	5.23E–09	3.51E–06	0.00E+00	0.00E+00	0.00E+00	4.21E–06	9.10E–09
Macroalgae	3.31E–05	1.00E–04	1.11E–06	8.71E–06	2.80E–05	3.18E–05	1.96E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	4.56E–06	4.20E–04
Vascular plant	3.39E–05	1.30E–04	1.29E–06	8.71E–06	2.80E–05	3.47E–05	2.35E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	4.82E–06	5.60E–04
Zooplankton	3.22E–05	9.10E–05	8.75E–07	8.71E–06	2.80E–05	3.07E–05	1.76E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	4.45E–06	4.20E–04
Benthic mollusc	3.39E–05	1.30E–04	1.29E–06	8.71E–06	2.80E–05	3.45E–05	2.35E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	4.80E–06	5.60E–04
Polychaete worm	3.31E–05	1.20E–04	1.25E–06	8.71E–06	2.80E–05	3.34E–05	2.25E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	4.71E–06	5.60E–04
Crustacean	3.83E–05	2.00E–04	1.36E–06	8.71E–06	5.60E–05	3.85E–05	2.35E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	5.05E–06	7.50E–04
Benthic fish	3.70E–05	1.70E–04	1.36E–06	8.71E–06	2.80E–05	3.75E–05	2.35E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	5.01E–06	5.60E–04
Pelagic fish	3.70E–05	1.90E–04	1.36E–06	8.71E–06	2.80E–05	3.79E–05	2.35E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	5.03E–06	7.00E–04
(Wading) bird	3.92E–05	2.20E–04	1.36E–06	8.71E–06	5.60E–05	3.92E–05	2.45E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	5.07E–06	7.50E–04
Mammal	4.41E–05	5.90E–04	1.40E–06	8.71E–06	5.60E–05	4.95E–05	2.45E–04	3.55E–06	0.00E+00	0.00E+00	0.00E+00	5.15E–06	1.05E–03

Table F-5. Continued.

Reference organism	Dose Conversion Coefficient of internal high energy beta (> 10 keV) and gamma													
	Se-79	Sm-151	Sn-126	Sr-90	Tc-99	Th-229	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
Phytoplankton	1.98E–09	9.92E–06	7.60E–05	7.60E–09	3.10E–09	4.89E–05	0.00E+00	0.00E+00	2.88E–06	0.00E+00	6.80E–09	5.58E–06	0.00E+00	1.00E–05
Macroalgae	3.17E–05	1.03E–05	3.50E–04	4.50E–04	5.70E–05	5.95E–05	0.00E+00	0.00E+00	3.22E–06	0.00E+00	1.08E–04	6.07E–06	0.00E+00	1.03E–05
Vascular plant	3.17E–05	1.03E–05	4.45E–04	5.80E–04	5.80E–05	6.31E–05	0.00E+00	0.00E+00	3.41E–06	0.00E+00	1.35E–04	6.35E–06	0.00E+00	1.03E–05
Zooplankton	3.17E–05	1.03E–05	2.63E–04	2.90E–04	5.60E–05	5.77E–05	0.00E+00	0.00E+00	3.13E–06	0.00E+00	1.08E–04	5.94E–06	0.00E+00	1.03E–05
Benthic mollusc	3.17E–05	1.03E–05	4.38E–04	5.80E–04	5.80E–05	6.28E–05	0.00E+00	0.00E+00	3.40E–06	0.00E+00	1.08E–04	6.34E–06	0.00E+00	1.03E–05
Polychaete worm	3.17E–05	1.03E–05	4.11E–04	5.40E–04	5.80E–05	6.15E–05	0.00E+00	0.00E+00	3.33E–06	0.00E+00	1.08E–04	6.23E–06	0.00E+00	1.03E–05
Crustacean	3.17E–05	1.03E–05	5.45E–04	6.30E–04	5.80E–05	6.96E–05	0.00E+00	0.00E+00	3.58E–06	0.00E+00	1.35E–04	6.59E–06	0.00E+00	1.03E–05
Benthic fish	3.17E–05	1.03E–05	5.03E–04	6.00E–04	5.80E–05	6.78E–05	0.00E+00	0.00E+00	3.56E–06	0.00E+00	1.35E–04	6.55E–06	0.00E+00	1.03E–05
Pelagic fish	3.17E–05	1.03E–05	5.26E–04	6.20E–04	5.80E–05	6.84E–05	0.00E+00	0.00E+00	3.57E–06	0.00E+00	1.35E–04	6.57E–06	0.00E+00	1.03E–05
(Wading) bird	3.17E–05	1.03E–05	5.66E–04	6.30E–04	5.80E–05	7.11E–05	0.00E+00	0.00E+00	3.60E–06	0.00E+00	1.35E–04	6.61E–06	0.00E+00	1.03E–05
Mammal	3.17E–05	1.03E–05	9.64E–04	6.50E–04	5.80E–05	9.64E–05	0.00E+00	0.00E+00	3.74E–06	0.00E+00	1.89E–04	6.69E–06	0.00E+00	1.03E–05

Table F-6. Dose conversion coefficients for external exposure of marine reference organisms to low energy beta (≤ 10 keV) and high energy beta (> 10 keV)/ gamma radiation (µGy/h)/(Bq/l).

Reference organism	Dose Conversion Coefficient of external low-energy (≤ 10 keV) beta radiation													
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m	I-129
Phytoplankton	1.57E–11	1.84E–12	0.00E+00	2.62E–11	0.00E+00	1.96E–12	0.00E+00	0.00E+00	1.28E–11	1.67E–12	0.00E+00	0.00E+00	1.52E–11	0.00E+00
Macroalgae	3.29E–12	4.07E–13	0.00E+00	5.78E–12	0.00E+00	4.33E–13	0.00E+00	0.00E+00	2.84E–12	3.70E–13	0.00E+00	0.00E+00	3.23E–12	0.00E+00
Vascular plant	1.10E–14	1.16E–15	0.00E+00	1.67E–14	0.00E+00	1.23E–15	0.00E+00	0.00E+00	8.07E–15	1.05E–15	0.00E+00	0.00E+00	1.05E–14	0.00E+00
Zooplankton	8.20E–28	1.06E–30	0.00E+00	1.26E–28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.70E–28	0.00E+00
Benthic mollusc	9.37E–15	9.76E–16	0.00E+00	1.41E–14	0.00E+00	1.04E–15	0.00E+00	0.00E+00	6.80E–15	8.86E–16	0.00E+00	0.00E+00	8.94E–15	0.00E+00
Polychaete worm	9.89E–15	1.03E–15	0.00E+00	1.49E–14	0.00E+00	1.10E–15	0.00E+00	0.00E+00	7.20E–15	9.39E–16	0.00E+00	0.00E+00	9.45E–15	0.00E+00
Crustacean	4.35E–28	5.62E–31	0.00E+00	6.67E–29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.55E–28	0.00E+00
Benthic fish	1.03E–14	1.16E–15	0.00E+00	1.66E–14	0.00E+00	1.24E–15	0.00E+00	0.00E+00	8.11E–15	1.06E–15	0.00E+00	0.00E+00	9.97E–15	0.00E+00
Pelagic fish	4.46E–28	5.77E–31	0.00E+00	6.85E–29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.65E–28	0.00E+00
(Wading) bird	4.22E–16	4.13E–17	0.00E+00	5.98E–16	0.00E+00	4.38E–17	0.00E+00	0.00E+00	2.87E–16	3.74E–17	0.00E+00	0.00E+00	3.99E–16	0.00E+00
Mammal	6.26E–17	6.35E–18	0.00E+00	9.17E–17	0.00E+00	6.75E–18	0.00E+00	0.00E+00	4.42E–17	5.76E–18	0.00E+00	0.00E+00	5.95E–17	0.00E+00

Table F-6. Continued.

Reference organism	Dose Conversion Coefficient of external low-energy (≤ 10 keV) beta radiation													
	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226	Se-79	Sm-151
Phytoplankton	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.82E–11	0.00E+00	7.85E–12	0.00E+00	0.00E+00	0.00E+00	1.62E–12	0.00E+00	0.00E+00	5.09E–12
Macroalgae	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.04E–12	0.00E+00	1.55E–12	0.00E+00	0.00E+00	0.00E+00	3.58E–13	0.00E+00	0.00E+00	9.97E–13
Vascular plant	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E–14	0.00E+00	6.15E–15	0.00E+00	0.00E+00	0.00E+00	1.02E–15	0.00E+00	0.00E+00	4.02E–15
Zooplankton	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.97E–28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.12E–28
Benthic mollusc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.67E–15	0.00E+00	5.33E–15	0.00E+00	0.00E+00	0.00E+00	8.57E–16	0.00E+00	0.00E+00	3.49E–15
Polychaete worm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.02E–14	0.00E+00	5.61E–15	0.00E+00	0.00E+00	0.00E+00	9.08E–16	0.00E+00	0.00E+00	3.68E–15
Crustacean	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.76E–28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.24E–28
Benthic fish	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E–14	0.00E+00	5.42E–15	0.00E+00	0.00E+00	0.00E+00	1.02E–15	0.00E+00	0.00E+00	3.53E–15
Pelagic fish	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.88E–28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.33E–28
(Wading) bird	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.09E–16	0.00E+00	2.54E–16	0.00E+00	0.00E+00	0.00E+00	3.62E–17	0.00E+00	0.00E+00	1.67E–16
Mammal	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.29E–17	0.00E+00	3.64E–17	0.00E+00	0.00E+00	0.00E+00	5.57E–18	0.00E+00	0.00E+00	2.39E–17

Table F-6. Continued.

Reference organism	Dose Conversion Coefficient of external low-energy (≤ 10 keV) beta radiation											
	Sn-126	Sr-90	Tc-99	Th-229	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
Phytoplankton	5.44E–12	0.00E+00	0.00E+00	2.61E–11	0.00E+00	0.00E+00	1.53E–12	0.00E+00	0.00E+00	1.70E–12	0.00E+00	4.64E–12
Macroalgae	1.18E–12	0.00E+00	0.00E+00	5.78E–12	0.00E+00	0.00E+00	3.39E–13	0.00E+00	0.00E+00	3.77E–13	0.00E+00	9.02E–13
Vascular plant	3.58E–15	0.00E+00	0.00E+00	1.64E–14	0.00E+00	0.00E+00	9.62E–16	0.00E+00	0.00E+00	1.07E–15	0.00E+00	3.71E–15
Zooplankton	1.17E–28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.90E–28
Benthic mollusc	3.03E–15	0.00E+00	0.00E+00	1.38E–14	0.00E+00	0.00E+00	8.10E–16	0.00E+00	0.00E+00	9.03E–16	0.00E+00	3.23E–15
Polychaete worm	3.21E–15	0.00E+00	0.00E+00	1.47E–14	0.00E+00	0.00E+00	8.59E–16	0.00E+00	0.00E+00	9.57E–16	0.00E+00	3.40E–15
Crustacean	6.22E–29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.13E–28
Benthic fish	3.50E–15	0.00E+00	0.00E+00	1.65E–14	0.00E+00	0.00E+00	9.67E–16	0.00E+00	0.00E+00	1.08E–15	0.00E+00	3.23E–15
Pelagic fish	6.38E–29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.21E–28
(Wading) bird	1.32E–16	0.00E+00	0.00E+00	5.85E–16	0.00E+00	0.00E+00	3.43E–17	0.00E+00	0.00E+00	3.82E–17	0.00E+00	1.55E–16
Mammal	2.00E–17	0.00E+00	0.00E+00	9.00E–17	0.00E+00	0.00E+00	5.27E–18	0.00E+00	0.00E+00	5.88E–18	0.00E+00	2.22E–17

Table F-6. Continued.

Reference organism	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma													
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m	I-129
Phytoplankton	2.12E–07	9.73E–04	3.20E–03	1.89E–04	2.90E–05	7.94E–08	1.60E–04	3.30E–03	5.99E–05	9.92E–07	3.90E–05	4.70E–04	1.03E–03	5.10E–05
Macroalgae	1.10E–07	9.36E–04	1.70E–05	1.34E–04	1.60E–07	2.38E–08	2.30E–05	7.00E–07	5.31E–05	6.24E–07	4.30E–07	3.40E–04	9.97E–04	1.30E–05
Vascular plant	8.98E–08	9.03E–04	1.50E–05	1.24E–04	6.20E–08	7.39E–09	4.60E–06	4.20E–07	5.00E–05	3.78E–07	1.40E–07	3.20E–04	9.69E–04	1.20E–05
Zooplankton	1.31E–07	9.51E–04	1.80E–05	1.39E–04	4.30E–07	4.18E–08	3.10E–05	8.40E–07	5.45E–05	7.53E–07	9.90E–07	3.50E–04	1.01E–03	1.40E–05
Benthic mollusc	9.16E–08	9.06E–04	1.50E–05	1.25E–04	7.20E–08	8.59E–09	5.10E–06	4.40E–07	5.03E–05	3.96E–07	1.70E–07	3.20E–04	9.72E–04	1.20E–05
Polychaete worm	9.69E–08	9.19E–04	1.50E–05	1.27E–04	7.20E–08	1.03E–08	8.60E–06	5.30E–07	5.14E–05	4.77E–07	1.70E–07	3.30E–04	9.83E–04	1.30E–05
Crustacean	6.97E–08	8.20E–04	1.10E–05	1.09E–04	2.10E–08	2.42E–09	1.60E–06	1.70E–07	4.38E–05	1.50E–07	5.00E–08	2.90E–04	8.84E–04	7.90E–06
Benthic fish	7.32E–08	8.53E–04	1.20E–05	1.14E–04	1.80E–08	2.07E–09	1.80E–06	2.10E–07	4.56E–05	1.88E–07	4.30E–08	3.00E–04	9.18E–04	9.20E–06
Pelagic fish	7.23E–08	8.37E–04	1.20E–05	1.12E–04	2.30E–08	2.67E–09	1.70E–06	1.90E–07	4.50E–05	1.73E–07	5.50E–08	2.90E–04	9.02E–04	8.50E–06
(Wading) bird	6.63E–08	7.99E–04	1.10E–05	1.06E–04	1.80E–08	2.04E–09	1.40E–06	1.40E–07	4.23E–05	1.27E–07	4.30E–08	2.80E–04	8.62E–04	7.10E–06
Mammal	2.50E–08	4.04E–04	3.30E–06	4.24E–05	3.60E–09	4.04E–10	3.10E–07	2.80E–08	1.66E–05	2.49E–08	8.60E–09	1.40E–04	4.39E–04	1.60E–06

Table F-6. Continued.

Reference organism	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma													
	Nb-94	**Ni-59**	**Ni-63**	**Np-237**	**Pa-231**	**Pb-210**	**Pd-107**	**Po-210**	**Pu-239**	**Pu-240**	**Pu-242**	**Ra-226**	**Se-79**	**Sm-151**
Phytoplankton	1.00E–03	4.00E–06	9.90E–06	2.80E–03	3.01E–05	2.50E–04	3.42E–08	3.10E–03	3.00E–03	3.00E–03	9.74E–07	1.50E–02	3.20E–05	3.94E–07
Macroalgae	9.00E–04	2.90E–07	7.00E–09	1.80E–05	2.53E–05	4.70E–05	8.18E–10	4.90E–09	3.00E–07	6.80E–07	5.66E–07	1.10E–03	2.10E–07	1.48E–08
Vascular plant	8.80E–04	8.90E–08	4.00E–09	1.60E–05	2.27E–05	1.20E–05	4.88E–10	4.70E–09	1.90E–07	4.00E–07	3.30E–07	1.00E–03	8.10E–08	8.54E–09
Zooplankton	9.10E–04	5.00E–07	3.60E–08	1.90E–05	2.66E–05	7.20E–05	7.54E–09	4.90E–09	3.60E–07	8.50E–07	7.03E–07	1.20E–03	5.60E–07	5.39E–08
Benthic mollusc	8.80E–04	1.00E–07	4.70E–09	1.60E–05	2.29E–05	1.30E–05	5.73E–10	4.70E–09	1.90E–07	4.20E–07	3.48E–07	1.00E–03	9.40E–08	9.64E–09
Polychaete worm	8.90E–04	1.20E–07	4.60E–09	1.70E–05	2.37E–05	2.20E–05	5.62E–10	4.80E–09	2.30E–07	5.10E–07	4.20E–07	1.10E–03	9.40E–08	9.98E–09
Crustacean	8.00E–04	2.90E–08	1.60E–09	1.30E–05	1.91E–05	4.50E–06	3.08E–10	4.30E–09	8.80E–08	1.60E–07	1.31E–07	9.20E–04	2.80E–08	3.36E–09
Benthic fish	8.30E–04	2.50E–08	1.10E–09	1.30E–05	2.01E–05	6.10E–06	1.27E–10	4.50E–09	1.00E–07	1.90E–07	1.60E–07	9.70E–04	2.40E–08	3.06E–09
Pelagic fish	8.20E–04	3.20E–08	1.70E–09	1.30E–05	1.97E–05	4.90E–06	3.41E–10	4.40E–09	9.70E–08	1.80E–07	1.50E–07	9.40E–04	3.10E–08	3.74E–09
(Wading) bird	7.80E–04	2.50E–08	1.10E–09	1.20E–05	1.84E–05	3.90E–06	1.33E–10	4.20E–09	7.70E–08	1.30E–07	1.11E–07	9.00E–04	2.40E–08	2.62E–09
Mammal	4.10E–04	4.90E–09	1.70E–10	4.30E–06	8.04E–06	8.80E–07	1.58E–11	2.20E–09	2.10E–08	2.70E–08	2.28E–08	5.00E–04	4.70E–09	4.60E–10

Table F-6. Continued.

Reference organism	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma											
	Sn-126	**Sr-90**	**Tc-99**	**Th-229**	**Th-230**	**Th-232**	**U-233**	**U-234**	**U-235**	**U-236**	**U-238**	**Zr-93**
Phytoplankton	1.29E–03	6.50E–04	5.80E–05	6.35E–05	2.70E–03	2.30E–03	9.34E–07	2.80E–03	2.80E–03	1.14E–06	2.40E–03	3.29E–07
Macroalgae	1.01E–03	2.00E–04	1.50E–06	5.25E–05	6.30E–07	5.00E–07	5.58E–07	6.60E–07	1.00E–04	5.89E–07	5.10E–07	8.76E–09
Vascular plant	9.19E–04	6.90E–05	4.00E–07	4.91E–05	4.20E–07	3.00E–07	3.83E–07	3.90E–07	9.50E–05	3.35E–07	2.80E–07	5.01E–09
Zooplankton	1.10E–03	3.60E–04	2.70E–06	5.44E–05	7.90E–07	6.50E–07	6.67E–07	8.30E–07	1.00E–04	7.42E–07	6.40E–07	4.39E–08
Benthic mollusc	9.25E–04	7.70E–05	4.60E–07	4.94E–05	4.40E–07	3.20E–07	3.97E–07	4.10E–07	9.60E–05	3.54E–07	3.00E–07	5.87E–09
Polychaete worm	9.53E–04	1.10E–04	5.00E–07	5.04E–05	4.90E–07	3.70E–07	4.45E–07	4.90E–07	9.80E–05	4.25E–07	3.60E–07	5.76E–09
Crustacean	8.19E–04	2.30E–05	1.40E–07	4.29E–05	2.60E–07	1.60E–07	2.36E–07	1.80E–07	8.40E–05	1.39E–07	1.10E–07	1.95E–09
Benthic fish	8.60E–04	5.00E–05	1.20E–07	4.46E–05	2.80E–07	1.80E–07	2.59E–07	2.00E–07	8.70E–05	1.64E–07	1.30E–07	1.35E–09
Pelagic fish	8.37E–04	2.70E–05	1.50E–07	4.41E–05	2.80E–07	1.70E–07	2.52E–07	2.00E–07	8.60E–05	1.57E–07	1.30E–07	2.14E–09
(Wading) bird	7.97E–04	2.00E–05	1.20E–07	4.14E–05	2.40E–07	1.40E–07	2.18E–07	1.50E–07	8.10E–05	1.20E–07	9.50E–08	1.38E–09
Mammal	4.00E–04	4.20E–06	2.40E–08	1.60E–05	7.70E–08	4.10E–08	7.51E–08	3.90E–08	3.40E–05	2.73E–08	2.00E–08	2.16E–10

Table F-7. Dose conversion coefficients for internal exposure of terrestrial representative species to alpha, low energy beta (≤ 10 keV) and high energy beta (> 10 keV) /gamma radiation (μGy/h)/(Bq/kg).

Representative Species	Dose Conversion Coefficient of internal alpha radiation							
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244
Pygmy damselfly	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Pool frog	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
European alder	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Silver birch	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Dwarf neckera	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Ruff	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Lumbricus sp.	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Bottle sedge	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Natterer’s bat	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
European hare	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Norway spruce	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Common grasshopper warbler	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Large gold grasshopper	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Yellow widelip orchid	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Cloudberry	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Short-eared owl (AIR)	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Geyer’s whorl snail	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Slender green feather moss	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Eurasian lynx	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Flea sedge	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Omphalina philonotis	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Red fox	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Roe deer	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Yellow foot	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Eurasian bittern	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Knowlton’s thread-moss	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Mountain hare	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Spotted crake	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Grass snake	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Scots pine	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Scapania apiculata	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Cranberry	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Chlaenius sulcicollis	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Common toad	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Common reed	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
European water vole	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Sphagnum sp.	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Marsh fritillary	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Nephroma laevigatum	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Eurasian elk (U.S.: Moose)	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Singa nitidula	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
European otter (T)	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
White-tailed eagle(T)	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Common kingfisher(T)	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Ruddy turnstone(T)	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Northern crested newt (T)	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Black tern(T)	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
European otter(T)	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Ringed seal(T)	3.93E–05	0.00E+00	3.16E–03	3.04E–03	0.00E+00	0.00E+00	0.00E+00	3.34E–03
Sea birds (T)	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03

Table F-7. Continued.

Representative Species	Dose Conversion Coefficient of internal alpha radiation continued							
	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m	I-129	Nb-94	Ni-59
Pygmy damselfly	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pool frog	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European alder	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver birch	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dwarf neckera	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ruff	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lumbricus sp.	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bottle sedge	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Natterer’s bat	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European hare	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Norway spruce	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common grasshopper warbler	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Large gold grasshopper	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Yellow widelip orchid	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cloudberry	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Short-eared owl (AIR)	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Geyer’s whorl snail	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Slender green feather moss	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian lynx	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Flea sedge	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Omphalina philonotis	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Red fox	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Roe deer	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Yellow foot	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian bittern	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Knowlton’s thread-moss	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mountain hare	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Spotted crake	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Grass snake	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scots pine	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scapania apiculata	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cranberry	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chlaenius sulcicollis	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common toad	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common reed	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European water vole	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sphagnum sp.	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Marsh fritillary	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nephroma laevigatum	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian elk (U.S.: Moose)	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Singa nitidula	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European otter (T)	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
White-tailed eagle(T)	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common kingfisher(T)	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ruddy turnstone(T)	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Northern crested newt (T)	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Black tern(T)	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European otter(T)	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ringed seal(T)	3.09E–03	3.10E–03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sea birds (T)	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-7. Continued.

Representative Species	Dose Conversion Coefficient of internal alpha radiation continued							
	Ni-63	Np-237	Pa-231	Pb-210	Pd-107	Po-210	Pu-239	Pu-240
Pygmy damselfly	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Pool frog	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
European alder	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Silver birch	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Dwarf neckera	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Ruff	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Lumbricus sp.	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Bottle sedge	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Natterer’s bat	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
European hare	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Norway spruce	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Common grasshopper warbler	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Large gold grasshopper	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Yellow widelip orchid	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Cloudberry	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Short-eared owl (AIR)	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Geyer’s whorl snail	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Slender green feather moss	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Eurasian lynx	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Flea sedge	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Omphalina philonotis	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Red fox	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Roe deer	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Yellow foot	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Eurasian bittern	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Knowlton’s thread-moss	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Mountain hare	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Spotted crake	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Grass snake	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Scots pine	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Scapania apiculata	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Cranberry	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Chlaenius sulcicollis	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Common toad	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Common reed	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
European water vole	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Sphagnum sp.	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Marsh fritillary	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Nephroma laevigatum	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Eurasian elk (U.S.: Moose)	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Singa nitidula	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
European otter (T)	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
White-tailed eagle(T)	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Common kingfisher(T)	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Ruddy turnstone(T)	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Northern crested newt (T)	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Black tern(T)	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
European otter(T)	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Ringed seal(T)	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03
Sea birds (T)	0.00E+00	2.75E–03	2.87E–03	0.00E+00	0.00E+00	3.06E–03	2.97E–03	2.97E–03

Table F-7. Continued.

Representative Species	Dose Conversion Coefficient of internal alpha radiation continued							
	Pu-242	Ra-226	Se-79	Sm-151	Sn-126	Sr-90	Tc-99	Th-229
Pygmy damselfly	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Pool frog	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
European alder	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Silver birch	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Dwarf neckera	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Ruff	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Lumbricus sp.	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Bottle sedge	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Natterer’s bat	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
European hare	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Norway spruce	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Common grasshopper warbler	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Large gold grasshopper	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Yellow widelip orchid	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Cloudberry	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Short-eared owl (AIR)	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Geyer’s whorl snail	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Slender green feather moss	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Eurasian lynx	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Flea sedge	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Omphalina philonotis	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Red fox	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Roe deer	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Yellow foot	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Eurasian bittern	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Knowlton’s thread-moss	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Mountain hare	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Spotted crake	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Grass snake	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Scots pine	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Scapania apiculata	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Cranberry	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Chlaenius sulcicollis	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Common toad	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Common reed	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
European water vole	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Sphagnum sp.	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Marsh fritillary	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Nephroma laevigatum	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Eurasian elk (U.S.: Moose)	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Singa nitidula	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
European otter (T)	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
White-tailed eagle(T)	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Common kingfisher(T)	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Ruddy turnstone(T)	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Northern crested newt (T)	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Black tern(T)	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
European otter(T)	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Ringed seal(T)	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03
Sea birds (T)	2.82E–03	1.38E–02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.81E–03

Table F-7. Continued.

Representative Species	Dose Conversion Coefficient of internal alpha radiation continued							
	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
Pygmy damselfly	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Pool frog	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
European alder	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Silver birch	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Dwarf neckera	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Ruff	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Lumbricus sp.	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Bottle sedge	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Natterer’s bat	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
European hare	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Norway spruce	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Common grasshopper warbler	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Large gold grasshopper	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Yellow widelip orchid	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Cloudberry	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Short-eared owl (AIR)	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Geyer’s whorl snail	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Slender green feather moss	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Eurasian lynx	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Flea sedge	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Omphalina philonotis	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Red fox	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Roe deer	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Yellow foot	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Eurasian bittern	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Knowlton’s thread-moss	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Mountain hare	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Spotted crake	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Grass snake	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Scots pine	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Scapania apiculata	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Cranberry	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Chlaenius sulcicollis	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Common toad	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Common reed	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
European water vole	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Sphagnum sp.	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Marsh fritillary	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Nephroma laevigatum	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Eurasian elk (U.S.: Moose)	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Singa nitidula	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
European otter (T)	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
White-tailed eagle(T)	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Common kingfisher(T)	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Ruddy turnstone(T)	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Northern crested newt (T)	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Black tern(T)	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
European otter(T)	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Ringed seal(T)	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00
Sea birds (T)	2.69E–03	2.30E–03	2.78E–03	2.74E–03	2.54E–03	2.60E–03	2.41E–03	0.00E+00

Table F-7. Continued.

Representative Species	Dose Conversion Coefficient of internal low-energy (≤ 10 keV) beta radiation							
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244
Pygmy damselfly	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Pool frog	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
European alder	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Silver birch	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Dwarf neckera	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Ruff	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Lumbricus sp.	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Bottle sedge	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Natterer’s bat	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
European hare	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Norway spruce	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Common grasshopper warbler	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Large gold grasshopper	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Yellow widelip orchid	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Cloudberry	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Short-eared owl (AIR)	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Geyer’s whorl snail	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Slender green feather moss	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Eurasian lynx	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Flea sedge	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Omphalina philonotis	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Red fox	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Roe deer	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Yellow foot	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Eurasian bittern	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Knowlton’s thread-moss	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Mountain hare	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Spotted crake	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Grass snake	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Scots pine	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Scapania apiculata	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Cranberry	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Chlaenius sulcicollis	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Common toad	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Common reed	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
European water vole	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Sphagnum sp.	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Marsh fritillary	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Nephroma laevigatum	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Eurasian elk (U.S.: Moose)	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Singa nitidula	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
European otter (T)	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
White-tailed eagle(T)	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Common kingfisher(T)	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Ruddy turnstone(T)	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Northern crested newt (T)	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Black tern(T)	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
European otter(T)	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Ringed seal(T)	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07
Sea birds (T)	4.45E–06	1.81E–06	5.73E–06	9.72E–06	3.73E–07	1.35E–06	6.91E–08	7.62E–07

Table F-7. Continued.

Representative Species	Dose Conversion Coefficient of internal low-energy (≤ 10 keV) beta radiation continued							
	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m	I-129	Nb-94	Ni-59
Pygmy damselfly	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Pool frog	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
European alder	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Silver birch	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Dwarf neckera	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Ruff	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Lumbricus sp.	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Bottle sedge	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Natterer's bat	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
European hare	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Norway spruce	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Common grasshopper warbler	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Large gold grasshopper	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Yellow widelip orchid	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Cloudberry	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Short-eared owl (AIR)	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Geyer's whorl snail	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Slender green feather moss	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Eurasian lynx	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Flea sedge	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Omphalina philonotis	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Red fox	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Roe deer	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Yellow foot	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Eurasian bittern	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Knowlton's thread-moss	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Mountain hare	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Spotted crake	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Grass snake	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Scots pine	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Scapania apiculata	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Cranberry	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Chlaenius sulcicollis	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Common toad	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Common reed	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
European water vole	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Sphagnum sp.	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Marsh fritillary	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Nephroma laevigatum	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Eurasian elk (U.S.: Moose)	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Singa nitidula	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
European otter (T)	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
White-tailed eagle(T)	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Common kingfisher(T)	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Ruddy turnstone(T)	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Northern crested newt (T)	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Black tern(T)	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
European otter(T)	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Ringed seal(T)	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06
Sea birds (T)	4.93E–06	6.77E–07	3.05E–07	3.71E–07	5.42E–06	4.94E–06	1.25E–07	2.63E–06

Table F-7. Continued.

Representative Species	Dose Conversion Coefficient of internal low-energy (≤ 10 keV) beta radiation continued							
	Ni-63	Np-237	Pa-231	Pb-210	Pd-107	Po-210	Pu-239	Pu-240
Pygmy damselfly	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Pool frog	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
European alder	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Silver birch	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Dwarf neckera	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Ruff	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Lumbricus sp.	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Bottle sedge	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Natterer’s bat	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
European hare	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Norway spruce	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Common grasshopper warbler	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Large gold grasshopper	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Yellow widelip orchid	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Cloudberry	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Short-eared owl (AIR)	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Geyer’s whorl snail	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Slender green feather moss	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Eurasian lynx	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Flea sedge	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Omphalina philonotis	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Red fox	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Roe deer	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Yellow foot	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Eurasian bittern	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Knowlton’s thread-moss	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Mountain hare	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Spotted crake	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Grass snake	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Scots pine	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Scapania apiculata	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Cranberry	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Chlaenius sulcicollis	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Common toad	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Common reed	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
European water vole	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Sphagnum sp.	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Marsh fritillary	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Nephroma laevigatum	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Eurasian elk (U.S.: Moose)	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Singa nitidula	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
European otter (T)	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
White-tailed eagle(T)	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Common kingfisher(T)	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Ruddy turnstone(T)	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Northern crested newt (T)	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Black tern(T)	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
European otter(T)	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Ringed seal(T)	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07
Sea birds (T)	1.21E–06	5.49E–06	7.58E–06	4.23E–06	1.79E–06	3.66E–13	1.18E–06	8.28E–07

Table F-7. Continued.

Representative Species	Dose Conversion Coefficient of internal low-energy (≤ 10 keV) beta radiation continued							
	Pu-242	Ra-226	Se-79	Sm-151	Sn-126	Sr-90	Tc-99	Th-229
Pygmy damselfly	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Pool frog	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
European alder	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Silver birch	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Dwarf neckera	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Ruff	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Lumbricus sp.	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Bottle sedge	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Natterer's bat	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
European hare	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Norway spruce	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Common grasshopper warbler	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Large gold grasshopper	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Yellow widelip orchid	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Cloudberry	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Short-eared owl (AIR)	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Geyer's whorl snail	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Slender green feather moss	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Eurasian lynx	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Flea sedge	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Omphalina philonotis	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Red fox	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Roe deer	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Yellow foot	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Eurasian bittern	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Knowlton's thread-moss	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Mountain hare	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Spotted crake	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Grass snake	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Scots pine	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Scapania apiculata	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Cranberry	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Chlaenius sulcicollis	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Common toad	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Common reed	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
European water vole	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Sphagnum sp.	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Marsh fritillary	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Nephroma laevigatum	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Eurasian elk (U.S.: Moose)	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Singa nitidula	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
European otter (T)	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
White-tailed eagle(T)	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Common kingfisher(T)	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Ruddy turnstone(T)	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Northern crested newt (T)	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Black tern(T)	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
European otter(T)	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Ringed seal(T)	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06
Sea birds (T)	6.87E–07	1.63E–06	3.19E–07	1.11E–06	3.70E–06	1.12E–07	1.95E–07	9.75E–06

Table F-7. Continued.

Representative Species	Dose Conversion Coefficient of internal low-energy (≤ 10 keV) beta radiation continued							
	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
Pygmy damselfly	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Pool frog	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
European alder	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Silver birch	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Dwarf neckera	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Ruff	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Lumbricus sp.	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Bottle sedge	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Natterer’s bat	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
European hare	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Norway spruce	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Common grasshopper warbler	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Large gold grasshopper	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Yellow widelip orchid	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Cloudberry	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Short-eared owl (AIR)	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Geyer’s whorl snail	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Slender green feather moss	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Eurasian lynx	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Flea sedge	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Omphalina philonotis	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Red fox	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Roe deer	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Yellow foot	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Eurasian bittern	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Knowlton’s thread-moss	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Mountain hare	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Spotted crake	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Grass snake	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Scots pine	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Scapania apiculata	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Cranberry	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Chlaenius sulcicollis	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Common toad	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Common reed	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
European water vole	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Sphagnum sp.	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Marsh fritillary	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Nephroma laevigatum	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Eurasian elk (U.S.: Moose)	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Singa nitidula	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
European otter (T)	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
White-tailed eagle(T)	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Common kingfisher(T)	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Ruddy turnstone(T)	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Northern crested newt (T)	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Black tern(T)	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
European otter(T)	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Ringed seal(T)	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07
Sea birds (T)	6.49E–07	6.44E–07	5.93E–07	8.07E–07	1.23E–05	7.59E–07	6.68E–07	9.76E–07

Table F-7. Continued.

Representative Species	Dose Conversion Coefficient of internal high energy beta (> 10 keV) and gamma							
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244
Pygmy damselfly	4.71E–06	8.17E–05	2.88E–05	1.62E–04	2.81E–05	2.35E–07	1.54E–04	4.77E–06
Pool frog	4.71E–06	7.13E–05	2.81E–05	1.60E–04	2.81E–05	2.33E–07	1.53E–04	4.70E–06
European alder	4.78E–06	5.73E–04	4.04E–05	2.48E–04	2.81E–05	2.41E–07	1.57E–04	5.15E–06
Silver birch	4.78E–06	5.73E–04	4.04E–05	2.48E–04	2.81E–05	2.41E–07	1.57E–04	5.15E–06
Dwarf neckera	4.70E–06	6.77E–05	2.79E–05	1.59E–04	2.81E–05	2.34E–07	1.52E–04	4.65E–06
Ruff	4.72E–06	9.33E–05	2.94E–05	1.64E–04	2.81E–05	2.37E–07	1.55E–04	4.82E–06
Lumbricus sp.	4.69E–06	5.28E–05	2.68E–05	1.56E–04	2.80E–05	2.26E–07	1.48E–04	4.53E–06
Bottle sedge	4.69E–06	4.92E–05	2.67E–05	1.54E–04	2.80E–05	2.31E–07	1.40E–04	4.51E–06
Natterer’s bat	4.71E–06	8.25E–05	2.88E–05	1.62E–04	2.81E–05	2.35E–07	1.54E–04	4.77E–06
European hare	4.78E–06	6.17E–04	4.01E–05	2.47E–04	2.81E–05	2.41E–07	1.57E–04	5.15E–06
Norway spruce	4.78E–06	5.73E–04	4.04E–05	2.48E–04	2.81E–05	2.41E–07	1.57E–04	5.15E–06
Common grasshopper warbler	4.71E–06	7.35E–05	2.82E–05	1.61E–04	2.81E–05	2.35E–07	1.53E–04	4.70E–06
Large gold grasshopper	4.68E–06	3.22E–05	2.54E–05	1.48E–04	2.78E–05	2.03E–07	1.34E–04	4.34E–06
Yellow widelip orchid	4.69E–06	4.92E–05	2.67E–05	1.54E–04	2.80E–05	2.31E–07	1.40E–04	4.51E–06
Cloudberry	4.70E–06	5.45E–05	2.69E–05	1.56E–04	2.81E–05	2.28E–07	1.47E–04	4.54E–06
Short-eared owl (AIR)	4.73E–06	1.27E–04	3.09E–05	1.71E–04	2.81E–05	2.38E–07	1.56E–04	4.95E–06
Geyer’s whorl snail	4.69E–06	4.80E–05	2.65E–05	1.54E–04	2.80E–05	2.22E–07	1.47E–04	4.49E–06
Slender green feather moss	4.61E–06	7.07E–06	2.36E–05	1.07E–04	2.47E–05	1.67E–07	4.64E–05	4.10E–06
Eurasian lynx	4.76E–06	3.14E–04	3.64E–05	2.07E–04	2.81E–05	2.41E–07	1.57E–04	5.12E–06
Flea sedge	4.69E–06	4.92E–05	2.67E–05	1.54E–04	2.80E–05	2.31E–07	1.40E–04	4.51E–06
Omphalina philonotis	4.68E–06	3.24E–05	2.54E–05	1.49E–04	2.78E–05	2.04E–07	1.34E–04	4.34E–06
Red fox	4.75E–06	2.37E–04	3.44E–05	1.92E–04	2.81E–05	2.40E–07	1.57E–04	5.09E–06
Roe deer	4.76E–06	3.80E–04	3.72E–05	2.15E–04	2.81E–05	2.41E–07	1.57E–04	5.12E–06
Yellow foot	4.68E–06	3.24E–05	2.54E–05	1.49E–04	2.78E–05	2.04E–07	1.34E–04	4.34E–06
Eurasian bittern	4.74E–06	1.79E–04	3.25E–05	1.80E–04	2.81E–05	2.39E–07	1.56E–04	5.03E–06
Knowlton’s thread-moss	4.61E–06	7.07E–06	2.36E–05	1.07E–04	2.47E–05	1.67E–07	4.64E–05	4.10E–06
Mountain hare	4.78E–06	6.17E–04	4.01E–05	2.47E–04	2.81E–05	2.41E–07	1.57E–04	5.15E–06
Spotted crake	4.74E–06	1.79E–04	3.25E–05	1.80E–04	2.81E–05	2.39E–07	1.56E–04	5.03E–06
Grass snake	4.73E–06	1.15E–04	3.05E–05	1.69E–04	2.81E–05	2.39E–07	1.56E–04	4.92E–06
Scots pine	4.78E–06	5.73E–04	4.04E–05	2.48E–04	2.81E–05	2.41E–07	1.57E–04	5.15E–06
Scapania apiculata	4.61E–06	7.07E–06	2.36E–05	1.07E–04	2.47E–05	1.67E–07	4.64E–05	4.10E–06
Cranberry	4.70E–06	5.45E–05	2.69E–05	1.56E–04	2.81E–05	2.28E–07	1.47E–04	4.54E–06
Chlaenius sulcicollis	4.68E–06	3.22E–05	2.54E–05	1.48E–04	2.78E–05	2.03E–07	1.34E–04	4.34E–06
Common toad	4.72E–06	8.99E–05	2.92E–05	1.64E–04	2.81E–05	2.36E–07	1.54E–04	4.81E–06
Common reed	4.69E–06	4.92E–05	2.67E–05	1.54E–04	2.80E–05	2.31E–07	1.40E–04	4.51E–06
European water vole	4.72E–06	1.03E–04	2.98E–05	1.66E–04	2.81E–05	2.37E–07	1.55E–04	4.87E–06
Sphagnum sp.	4.61E–06	7.07E–06	2.36E–05	1.07E–04	2.47E–05	1.67E–07	4.64E–05	4.10E–06
Marsh fritillary	4.71E–06	8.17E–05	2.88E–05	1.62E–04	2.81E–05	2.35E–07	1.54E–04	4.77E–06
Nephroma laevigatum	4.70E–06	6.77E–05	2.79E–05	1.59E–04	2.81E–05	2.34E–07	1.52E–04	4.65E–06
Eurasian elk (U.S.: Moose)	4.78E–06	6.73E–04	4.07E–05	2.54E–04	2.81E–05	2.41E–07	1.57E–04	5.15E–06
Singa nitidula	4.68E–06	3.22E–05	2.54E–05	1.48E–04	2.78E–05	2.03E–07	1.34E–04	4.34E–06
European otter (T)	4.75E–06	2.56E–04	3.47E–05	1.94E–04	2.81E–05	2.40E–07	1.57E–04	5.09E–06
White-tailed eagle(T)	4.74E–06	1.90E–04	3.29E–05	1.82E–04	2.81E–05	2.40E–07	1.56E–04	5.05E–06
Common kingfisher(T)	4.71E–06	7.39E–05	2.83E–05	1.61E–04	2.81E–05	2.35E–07	1.53E–04	4.71E–06
Ruddy turnstone(T)	4.73E–06	1.45E–04	3.15E–05	1.74E–04	2.81E–05	2.39E–07	1.56E–04	4.99E–06
Northern crested newt (T)	4.72E–06	9.40E–05	2.94E–05	1.64E–04	2.81E–05	2.36E–07	1.55E–04	4.83E–06
Black tern(T)	4.71E–06	7.94E–05	2.86E–05	1.62E–04	2.81E–05	2.36E–07	1.54E–04	4.74E–06
European otter(T)	4.75E–06	2.56E–04	3.47E–05	1.94E–04	2.81E–05	2.40E–07	1.57E–04	5.09E–06
Ringed seal(T)	4.77E–06	4.69E–04	3.86E–05	2.29E–04	2.81E–05	2.41E–07	1.57E–04	5.13E–06
Sea birds (T)	4.74E–06	1.79E–04	3.25E–05	1.80E–04	2.81E-05	2.39E-07	1.56E-04	5.03E-06

Table F-7. Continued.

Representative Species	Dose Conversion Coefficient of internal high energy beta (> 10 keV) and gamma continued							
	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m	I-129	Nb-94	Ni-59
Pygmy damselfly	3.82E–05	4.45E–06	3.85E–05	1.54E–04	1.15E–04	3.46E–05	1.35E–04	1.31E–06
Pool frog	3.72E–05	4.39E–06	3.84E–05	1.50E–04	1.05E–04	3.40E–05	1.26E–04	1.29E–06
European alder	7.36E–05	4.79E–06	3.86E–05	3.24E–04	6.37E–04	4.48E–05	5.79E–04	1.38E–06
Silver birch	7.36E–05	4.79E–06	3.86E–05	3.24E–04	6.37E–04	4.48E–05	5.79E–04	1.38E–06
Dwarf neckera	3.69E–05	4.35E–06	3.85E–05	1.48E–04	1.02E–04	3.39E–05	1.23E–04	1.30E–06
Ruff	3.92E–05	4.50E–06	3.85E–05	1.59E–04	1.27E–04	3.52E–05	1.45E–04	1.33E–06
Lumbricus sp.	3.54E–05	4.24E–06	3.84E–05	1.41E–04	8.88E–05	3.30E–05	1.10E–04	1.21E–06
Bottle sedge	3.53E–05	4.22E–06	3.82E–05	1.33E–04	8.84E–05	3.30E–05	1.08E–04	1.26E–06
Natterer’s bat	3.82E–05	4.45E–06	3.85E–05	1.54E–04	1.16E–04	3.46E–05	1.35E–04	1.31E–06
European hare	7.27E–05	4.79E–06	3.86E–05	3.41E–04	6.86E–04	4.46E–05	6.35E–04	1.38E–06
Norway spruce	7.36E–05	4.79E–06	3.86E–05	3.24E–04	6.37E–04	4.48E–05	5.79E–04	1.38E–06
Common grasshopper warbler	3.74E–05	4.39E–06	3.85E–05	1.51E–04	1.08E–04	3.42E–05	1.28E–04	1.31E–06
Large gold grasshopper	3.35E–05	4.07E–06	3.78E–05	1.23E–04	7.42E–05	3.21E–05	9.36E–05	9.30E–07
Yellow widelip orchid	3.53E–05	4.22E–06	3.82E–05	1.33E–04	8.84E–05	3.30E–05	1.08E–04	1.26E–06
Cloudberry	3.56E–05	4.25E–06	3.84E–05	1.41E–04	9.07E–05	3.32E–05	1.12E–04	1.23E–06
Short-eared owl (AIR)	4.18E–05	4.61E–06	3.85E–05	1.71E–04	1.61E–04	3.69E–05	1.75E–04	1.35E–06
Geyer’s whorl snail	3.50E–05	4.20E–06	3.82E–05	1.38E–04	8.47E–05	3.28E–05	1.06E–04	1.16E–06
Slender green feather moss	2.87E–05	3.84E–06	3.15E–05	4.97E–05	5.45E–05	2.85E–05	4.83E–05	4.93E–07
Eurasian lynx	5.68E–05	4.76E–06	3.86E–05	2.35E–04	3.62E–04	4.26E–05	3.44E–04	1.38E–06
Flea sedge	3.53E–05	4.22E–06	3.82E–05	1.33E–04	8.84E–05	3.30E–05	1.08E–04	1.26E–06
Omphalina philonotis	3.35E–05	4.07E–06	3.78E–05	1.24E–04	7.43E–05	3.21E–05	9.38E–05	9.36E–07
Red fox	5.05E–05	4.74E–06	3.86E–05	2.09E–04	2.79E–04	4.09E–05	2.75E–04	1.37E–06
Roe deer	6.01E–05	4.76E–06	3.86E–05	2.58E–04	4.32E–04	4.31E–05	4.07E–04	1.38E–06
Yellow foot	3.35E–05	4.07E–06	3.78E–05	1.24E–04	7.43E–05	3.21E–05	9.38E–05	9.36E–07
Eurasian bittern	4.55E–05	4.69E–06	3.85E–05	1.89E–04	2.16E–04	3.90E–05	2.22E–04	1.36E–06
Knowlton’s thread-moss	2.87E–05	3.84E–06	3.15E–05	4.97E–05	5.45E–05	2.85E–05	4.83E–05	4.93E–07
Mountain hare	7.27E–05	4.79E–06	3.86E–05	3.41E–04	6.86E–04	4.46E–05	6.35E–04	1.38E–06
Spotted crake	4.55E–05	4.69E–06	3.85E–05	1.89E–04	2.16E–04	3.90E–05	2.22E–04	1.36E–06
Grass snake	4.13E–05	4.58E–06	3.85E–05	1.67E–04	1.50E–04	3.64E–05	1.65E–04	1.36E–06
Scots pine	7.36E–05	4.79E–06	3.86E–05	3.24E–04	6.37E–04	4.48E–05	5.79E–04	1.38E–06
Scapania apiculata	2.87E–05	3.84E–06	3.15E–05	4.97E–05	5.45E–05	2.85E–05	4.83E–05	4.93E–07
Cranberry	3.56E–05	4.25E–06	3.84E–05	1.41E–04	9.07E–05	3.32E–05	1.12E–04	1.23E–06
Chlaenius sulcicollis	3.35E–05	4.07E–06	3.78E–05	1.23E–04	7.42E–05	3.21E–05	9.36E–05	9.30E–07
Common toad	3.88E–05	4.49E–06	3.85E–05	1.57E–04	1.23E–04	3.50E–05	1.42E–04	1.32E–06
Common reed	3.53E–05	4.22E–06	3.82E–05	1.33E–04	8.84E–05	3.30E–05	1.08E–04	1.26E–06
European water vole	3.99E–05	4.54E–06	3.85E–05	1.62E–04	1.36E–04	3.57E–05	1.53E–04	1.33E–06
Sphagnum sp.	2.87E–05	3.84E–06	3.15E–05	4.97E–05	5.45E–05	2.85E–05	4.83E–05	4.93E–07
Marsh fritillary	3.82E–05	4.45E–06	3.85E–05	1.54E–04	1.15E–04	3.46E–05	1.35E–04	1.31E–06
Nephroma laevigatum	3.69E–05	4.35E–06	3.85E–05	1.48E–04	1.02E–04	3.39E–05	1.23E–04	1.30E–06
Eurasian elk (U.S.: Moose)	7.56E–05	4.79E–06	3.86E–05	3.60E–04	7.46E–04	4.49E–05	6.89E–04	1.38E–06
Singa nitidula	3.35E–05	4.07E–06	3.78E–05	1.23E–04	7.42E–05	3.21E–05	9.36E–05	9.30E–07
European otter (T)	5.15E–05	4.74E–06	3.86E–05	2.16E–04	2.99E–04	4.12E–05	2.93E–04	1.37E–06
White-tailed eagle(T)	4.65E–05	4.70E–06	3.86E–05	1.93E–04	2.28E–04	3.94E–05	2.32E–04	1.37E–06
Common kingfisher(T)	3.75E–05	4.39E–06	3.85E–05	1.51E–04	1.08E–04	3.42E–05	1.28E–04	1.31E–06
Ruddy turnstone(T)	4.31E–05	4.65E–06	3.85E–05	1.77E–04	1.80E–04	3.77E–05	1.92E–04	1.36E–06
Northern crested newt (T)	3.92E–05	4.51E–06	3.85E–05	1.59E–04	1.27E–04	3.52E–05	1.46E–04	1.33E–06
Black tern(T)	3.80E–05	4.43E–06	3.85E–05	1.53E–04	1.13E–04	3.45E–05	1.33E–04	1.32E–06
European otter(T)	5.15E–05	4.74E–06	3.86E–05	2.16E–04	2.99E–04	4.12E–05	2.93E–04	1.37E–06
Ringed seal(T)	6.58E–05	4.78E–06	3.86E–05	2.89E–04	5.28E–04	4.39E–05	4.90E–04	1.38E–06
Sea birds (T)	4.55E-05	4.69E-06	3.85E-05	1.89E-04	2.16E-04	3.90E-05	2.22E-04	1.36E-06

Table F-7. Continued.

Representative Species	Dose Conversion Coefficient of internal high energy beta (> 10 keV) and gamma continued							
	Ni-63	Np-237	Pa-231	Pb-210	Pd-107	Po-210	Pu-239	Pu-240
Pygmy damselfly	8.67E–06	3.94E–05	3.51E–05	2.35E–04	3.55E–06	2.56E–10	2.99E–06	5.90E–06
Pool frog	8.67E–06	3.87E–05	3.44E–05	2.32E–04	3.55E–06	2.08E–10	2.97E–06	5.83E–06
European alder	8.68E–06	5.13E–05	5.01E–05	2.44E–04	3.55E–06	2.65E–09	3.16E–06	6.26E–06
Silver birch	8.68E–06	5.13E–05	5.01E–05	2.44E–04	3.55E–06	2.65E–09	3.16E–06	6.26E–06
Dwarf neckera	8.67E–06	3.85E–05	3.41E–05	2.29E–04	3.55E–06	1.94E–10	2.95E–06	5.78E–06
Ruff	8.68E–06	3.99E–05	3.58E–05	2.36E–04	3.55E–06	3.11E–10	3.02E–06	5.95E–06
Lumbricus sp.	8.67E–06	3.74E–05	3.29E–05	2.21E–04	3.55E–06	1.28E–10	2.90E–06	5.65E–06
Bottle sedge	8.67E–06	3.73E–05	3.27E–05	2.03E–04	3.55E–06	1.24E–10	2.89E–06	5.63E–06
Natterer's bat	8.67E–06	3.94E–05	3.52E–05	2.35E–04	3.55E–06	2.60E–10	3.00E–06	5.90E–06
European hare	8.68E–06	5.10E–05	5.03E–05	2.44E–04	3.55E–06	2.95E–09	3.15E–06	6.26E–06
Norway spruce	8.68E–06	5.13E–05	5.01E–05	2.44E–04	3.55E–06	2.65E–09	3.16E–06	6.26E–06
Common grasshopper warbler	8.67E–06	3.88E–05	3.45E–05	2.32E–04	3.55E–06	2.19E–10	2.97E–06	5.83E–06
Large gold grasshopper	8.66E–06	3.59E–05	3.10E–05	1.89E–04	3.55E–06	5.77E–11	2.81E–06	5.44E–06
Yellow widelip orchid	8.67E–06	3.73E–05	3.27E–05	2.03E–04	3.55E–06	1.24E–10	2.89E–06	5.63E–06
Cloudberry	8.67E–06	3.76E–05	3.30E–05	2.20E–04	3.55E–06	1.37E–10	2.90E–06	5.67E–06
Short-eared owl (AIR)	8.68E–06	4.14E–05	3.74E–05	2.39E–04	3.55E–06	4.73E–10	3.07E–06	6.07E–06
Geyer's whorl snail	8.67E–06	3.71E–05	3.25E–05	2.17E–04	3.55E–06	1.09E–10	2.88E–06	5.61E–06
Slender green feather moss	8.43E–06	3.25E–05	2.80E–05	5.83E–05	3.53E–06	3.08E–12	2.67E–06	5.14E–06
Eurasian lynx	8.68E–06	4.68E–05	4.34E–05	2.43E–04	3.55E–06	1.38E–09	3.14E–06	6.23E–06
Flea sedge	8.67E–06	3.73E–05	3.27E–05	2.03E–04	3.55E–06	1.24E–10	2.89E–06	5.63E–06
Omphalina philonotis	8.66E–06	3.59E–05	3.10E–05	1.89E–04	3.55E–06	5.83E–11	2.81E–06	5.45E–06
Red fox	8.68E–06	4.48E–05	4.12E–05	2.43E–04	3.55E–06	1.01E–09	3.12E–06	6.21E–06
Roe deer	8.68E–06	4.76E–05	4.49E–05	2.44E–04	3.55E–06	1.72E–09	3.14E–06	6.23E–06
Yellow foot	8.66E–06	3.59E–05	3.10E–05	1.89E–04	3.55E–06	5.83E–11	2.81E–06	5.45E–06
Eurasian bittern	8.68E–06	4.30E–05	3.92E–05	2.41E–04	3.55E–06	7.27E–10	3.10E–06	6.15E–06
Knowlton's thread-moss	8.43E–06	3.25E–05	2.80E–05	5.83E–05	3.53E–06	3.08E–12	2.67E–06	5.14E–06
Mountain hare	8.68E–06	5.10E–05	5.03E–05	2.44E–04	3.55E–06	2.95E–09	3.15E–06	6.26E–06
Spotted crake	8.68E–06	4.30E–05	3.92E–05	2.41E–04	3.55E–06	7.27E–10	3.10E–06	6.15E–06
Grass snake	8.68E–06	4.10E–05	3.69E–05	2.38E–04	3.55E–06	4.16E–10	3.05E–06	6.05E–06
Scots pine	8.68E–06	5.13E–05	5.01E–05	2.44E–04	3.55E–06	2.65E–09	3.16E–06	6.26E–06
Scapania apiculata	8.43E–06	3.25E–05	2.80E–05	5.83E–05	3.53E–06	3.08E–12	2.67E–06	5.14E–06
Cranberry	8.67E–06	3.76E–05	3.30E–05	2.20E–04	3.55E–06	1.37E–10	2.90E–06	5.67E–06
Chlaenius sulcicollis	8.66E–06	3.59E–05	3.10E–05	1.89E–04	3.55E–06	5.77E–11	2.81E–06	5.44E–06
Common toad	8.67E–06	3.98E–05	3.56E–05	2.36E–04	3.55E–06	2.94E–10	3.01E–06	5.94E–06
Common reed	8.67E–06	3.73E–05	3.27E–05	2.03E–04	3.55E–06	1.24E–10	2.89E–06	5.63E–06
European water vole	8.68E–06	4.04E–05	3.63E–05	2.37E–04	3.55E–06	3.55E–10	3.03E–06	6.00E–06
Sphagnum sp.	8.43E–06	3.25E–05	2.80E–05	5.83E–05	3.53E–06	3.08E–12	2.67E–06	5.14E–06
Marsh fritillary	8.67E–06	3.94E–05	3.51E–05	2.35E–04	3.55E–06	2.56E–10	2.99E–06	5.90E–06
Nephroma laevigatum	8.67E–06	3.85E–05	3.41E–05	2.29E–04	3.55E–06	1.94E–10	2.95E–06	5.78E–06
Eurasian elk (U.S.: Moose)	8.68E–06	5.18E–05	5.16E–05	2.44E–04	3.55E–06	3.25E–09	3.16E–06	6.26E–06
Singa nitidula	8.66E–06	3.59E–05	3.10E–05	1.89E–04	3.55E–06	5.77E–11	2.81E–06	5.44E–06
European otter (T)	8.68E–06	4.51E–05	4.16E–05	2.43E–04	3.55E–06	1.11E–09	3.12E–06	6.21E–06
White-tailed eagle(T)	8.68E–06	4.34E–05	3.96E–05	2.42E–04	3.55E–06	7.80E–10	3.11E–06	6.17E–06
Common kingfisher(T)	8.67E–06	3.89E–05	3.45E–05	2.32E–04	3.55E–06	2.20E–10	2.97E–06	5.84E–06
Ruddy turnstone(T)	8.68E–06	4.20E–05	3.81E–05	2.40E–04	3.55E–06	5.61E–10	3.08E–06	6.11E–06
Northern crested newt (T)	8.67E–06	4.00E–05	3.58E–05	2.37E–04	3.55E–06	3.13E–10	3.02E–06	5.96E–06
Black tern(T)	8.67E–06	3.92E–05	3.49E–05	2.34E–04	3.55E–06	2.46E–10	2.98E–06	5.87E–06
European otter(T)	8.68E–06	4.51E–05	4.16E–05	2.43E–04	3.55E–06	1.11E–09	3.12E–06	6.21E–06
Ringed seal(T)	8.68E–06	4.92E–05	4.72E–05	2.44E–04	3.55E–06	2.17E–09	3.15E–06	6.25E–06
Sea birds (T)	8.68E–06	4.30E-05	3.92E-05	2.41E-04	3.55E-06	7.27E-10	3.10E-06	6.15E-06

Table F-7. Continued.

Representative Species	Dose Conversion Coefficient of internal high energy beta (> 10 keV) and gamma continued							
	Pu-242	Ra-226	Se-79	Sm-151	Sn-126	Sr-90	Tc-99	Th-229
Pygmy damselfly	4.86E–06	5.52E–04	3.18E–05	1.03E–05	4.54E–04	5.91E–04	5.78E–05	6.37E–05
Pool frog	4.80E–06	5.33E–04	3.18E–05	1.03E–05	4.38E–04	5.76E–04	5.77E–05	6.27E–05
European alder	5.16E–06	1.05E–03	3.19E–05	1.03E–05	9.64E–04	6.48E–04	5.81E–05	9.88E–05
Silver birch	5.16E–06	1.05E–03	3.19E–05	1.03E–05	9.64E–04	6.48E–04	5.81E–05	9.88E–05
Dwarf neckera	4.76E–06	5.24E–04	3.18E–05	1.03E–05	4.28E–04	5.64E–04	5.78E–05	6.24E–05
Ruff	4.90E–06	5.70E–04	3.18E–05	1.03E–05	4.69E–04	6.01E–04	5.79E–05	6.47E–05
Lumbricus sp.	4.66E–06	4.83E–04	3.17E–05	1.03E–05	3.97E–04	5.21E–04	5.75E–05	6.08E–05
Bottle sedge	4.64E–06	4.46E–04	3.17E–05	1.03E–05	3.60E–04	4.67E–04	5.69E–05	6.06E–05
Natterer’s bat	4.86E–06	5.53E–04	3.18E–05	1.03E–05	4.55E–04	5.91E–04	5.78E–05	6.38E–05
European hare	5.16E–06	1.12E–03	3.19E–05	1.03E–05	1.01E–03	6.48E–04	5.81E–05	9.79E–05
Norway spruce	5.16E–06	1.05E–03	3.19E–05	1.03E–05	9.64E–04	6.48E–04	5.81E–05	9.88E–05
Common grasshopper warbler	4.80E–06	5.38E–04	3.18E–05	1.03E–05	4.41E–04	5.79E–04	5.78E–05	6.29E–05
Large gold grasshopper	4.48E–06	3.64E–04	3.15E–05	1.03E–05	2.99E–04	3.45E–04	5.59E–05	5.82E–05
Yellow widelip orchid	4.64E–06	4.46E–04	3.17E–05	1.03E–05	3.60E–04	4.67E–04	5.69E–05	6.06E–05
Cloudberry	4.67E–06	4.87E–04	3.18E–05	1.03E–05	3.99E–04	5.25E–04	5.76E–05	6.10E–05
Short-eared owl (AIR)	5.00E–06	6.12E–04	3.18E–05	1.03E–05	5.10E–04	6.20E–04	5.80E–05	6.74E–05
Geyer’s whorl snail	4.62E–06	4.59E–04	3.17E–05	1.03E–05	3.79E–04	4.86E–04	5.72E–05	6.02E–05
Slender green feather moss	4.23E–06	1.05E–04	2.75E–05	9.93E–06	9.97E–05	7.57E–05	4.11E–05	5.02E–05
Eurasian lynx	5.14E–06	8.04E–04	3.19E–05	1.03E–05	7.07E–04	6.43E–04	5.81E–05	8.24E–05
Flea sedge	4.64E–06	4.46E–04	3.17E–05	1.03E–05	3.60E–04	4.67E–04	5.69E–05	6.06E–05
Omphalina philonotis	4.48E–06	3.66E–04	3.15E–05	1.03E–05	3.00E–04	3.47E–04	5.60E–05	5.83E–05
Red fox	5.12E–06	7.28E–04	3.19E–05	1.03E–05	6.28E–04	6.38E–04	5.81E–05	7.61E–05
Roe deer	5.14E–06	8.72E–04	3.19E–05	1.03E–05	7.71E–04	6.44E–04	5.81E–05	8.56E–05
Yellow foot	4.48E–06	3.66E–04	3.15E–05	1.03E–05	3.00E–04	3.47E–04	5.60E–05	5.83E–05
Eurasian bittern	5.07E–06	6.68E–04	3.18E–05	1.03E–05	5.66E–04	6.32E–04	5.80E–05	7.11E–05
Knowlton’s thread-moss	4.23E–06	1.05E–04	2.75E–05	9.93E–06	9.97E–05	7.57E–05	4.11E–05	5.02E–05
Mountain hare	5.16E–06	1.12E–03	3.19E–05	1.03E–05	1.01E–03	6.48E–04	5.81E–05	9.79E–05
Spotted crake	5.07E–06	6.68E–04	3.18E–05	1.03E–05	5.66E–04	6.32E–04	5.80E–05	7.11E–05
Grass snake	4.98E–06	5.92E–04	3.18E–05	1.03E–05	4.92E–04	6.00E–04	5.80E–05	6.69E–05
Scots pine	5.16E–06	1.05E–03	3.19E–05	1.03E–05	9.64E–04	6.48E–04	5.81E–05	9.88E–05
Scapania apiculata	4.23E–06	1.05E–04	2.75E–05	9.93E–06	9.97E–05	7.57E–05	4.11E–05	5.02E–05
Cranberry	4.67E–06	4.87E–04	3.18E–05	1.03E–05	3.99E–04	5.25E–04	5.76E–05	6.10E–05
Chlaenius sulcicollis	4.48E–06	3.64E–04	3.15E–05	1.03E–05	2.99E–04	3.45E–04	5.59E–05	5.82E–05
Common toad	4.89E–06	5.65E–04	3.18E–05	1.03E–05	4.66E–04	5.99E–04	5.78E–05	6.44E–05
Common reed	4.64E–06	4.46E–04	3.17E–05	1.03E–05	3.60E–04	4.67E–04	5.69E–05	6.06E–05
European water vole	4.94E–06	5.83E–04	3.18E–05	1.03E–05	4.82E–04	6.10E–04	5.79E–05	6.54E–05
Sphagnum sp.	4.23E–06	1.05E–04	2.75E–05	9.93E–06	9.97E–05	7.57E–05	4.11E–05	5.02E–05
Marsh fritillary	4.86E–06	5.52E–04	3.18E–05	1.03E–05	4.54E–04	5.91E–04	5.78E–05	6.37E–05
Nephroma laevigatum	4.76E–06	5.24E–04	3.18E–05	1.03E–05	4.28E–04	5.64E–04	5.78E–05	6.24E–05
Eurasian elk (U.S.: Moose)	5.16E–06	1.18E–03	3.19E–05	1.03E–05	1.06E–03	6.48E–04	5.81E–05	1.01E–04
Singa nitidula	4.48E–06	3.64E–04	3.15E–05	1.03E–05	2.99E–04	3.45E–04	5.59E–05	5.82E–05
European otter (T)	5.11E–06	7.48E–04	3.19E–05	1.03E–05	6.47E–04	6.39E–04	5.81E–05	7.71E–05
White-tailed eagle(T)	5.08E–06	6.80E–04	3.18E–05	1.03E–05	5.78E–04	6.33E–04	5.81E–05	7.21E–05
Common kingfisher(T)	4.81E–06	5.39E–04	3.18E–05	1.03E–05	4.42E–04	5.80E–04	5.78E–05	6.30E–05
Ruddy turnstone(T)	5.04E–06	6.33E–04	3.18E–05	1.03E–05	5.31E–04	6.25E–04	5.80E–05	6.87E–05
Northern crested newt (T)	4.91E–06	5.71E–04	3.18E–05	1.03E–05	4.71E–04	6.04E–04	5.79E–05	6.47E–05
Black tern(T)	4.83E–06	5.48E–04	3.18E–05	1.03E–05	4.50E–04	5.87E–04	5.79E–05	6.35E–05
European otter(T)	5.11E–06	7.48E–04	3.19E–05	1.03E–05	6.47E–04	6.39E–04	5.81E–05	7.71E–05
Ringed seal(T)	5.15E–06	9.61E–04	3.19E–05	1.03E–05	8.61E–04	6.46E–04	5.81E–05	9.12E–05
Sea birds (T)	5.07E-06	6.68E-04	3.18E-05	1.03E-05	5.66E-04	6.32E-04	5.80E-05	7.11E-05

Table F-7. Continued.

Representative Species	Dose Conversion Coefficient of internal high energy beta (> 10 keV) and gamma continued							
	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
Pygmy damselfly	8.25E–06	7.01E–06	3.44E–06	7.45E–06	1.22E–04	6.39E–06	5.61E–06	1.03E–05
Pool frog	8.20E–06	6.97E–06	3.40E–06	7.39E–06	1.20E–04	6.33E–06	5.55E–06	1.03E–05
European alder	8.60E–06	7.28E–06	3.75E–06	7.81E–06	1.87E–04	6.70E–06	5.87E–06	1.03E–05
Silver birch	8.60E–06	7.28E–06	3.75E–06	7.81E–06	1.87E–04	6.70E–06	5.87E–06	1.03E–05
Dwarf neckera	8.17E–06	6.94E–06	3.37E–06	7.35E–06	1.19E–04	6.29E–06	5.52E–06	1.03E–05
Ruff	8.28E–06	7.05E–06	3.47E–06	7.50E–06	1.24E–04	6.44E–06	5.65E–06	1.03E–05
Lumbricus sp.	8.07E–06	6.85E–06	3.29E–06	7.22E–06	1.17E–04	6.17E–06	5.42E–06	1.03E–05
Bottle sedge	8.05E–06	6.83E–06	3.28E–06	7.20E–06	1.16E–04	6.16E–06	5.40E–06	1.03E–05
Natterer’s bat	8.25E–06	7.02E–06	3.44E–06	7.46E–06	1.22E–04	6.40E–06	5.61E–06	1.03E–05
European hare	8.59E–06	7.28E–06	3.75E–06	7.80E–06	1.86E–04	6.70E–06	5.87E–06	1.03E–05
Norway spruce	8.60E–06	7.28E–06	3.75E–06	7.81E–06	1.87E–04	6.70E–06	5.87E–06	1.03E–05
Common grasshopper warbler	8.20E–06	6.97E–06	3.40E–06	7.39E–06	1.20E–04	6.34E–06	5.56E–06	1.03E–05
Large gold grasshopper	7.88E–06	6.67E–06	3.15E–06	7.00E–06	1.12E–04	5.97E–06	5.24E–06	1.03E–05
Yellow widelip orchid	8.05E–06	6.83E–06	3.28E–06	7.20E–06	1.16E–04	6.16E–06	5.40E–06	1.03E–05
Cloudberry	8.08E–06	6.86E–06	3.30E–06	7.24E–06	1.17E–04	6.19E–06	5.43E–06	1.03E–05
Short-eared owl (AIR)	8.37E–06	7.13E–06	3.55E–06	7.62E–06	1.28E–04	6.54E–06	5.74E–06	1.03E–05
Geyer’s whorl snail	8.03E–06	6.81E–06	3.26E–06	7.18E–06	1.16E–04	6.14E–06	5.39E–06	1.03E–05
Slender green feather moss	7.11E–06	6.13E–06	2.91E–06	6.51E–06	9.58E–05	5.60E–06	4.92E–06	1.00E–05
Eurasian lynx	8.52E–06	7.24E–06	3.68E–06	7.77E–06	1.55E–04	6.67E–06	5.85E–06	1.03E–05
Flea sedge	8.05E–06	6.83E–06	3.28E–06	7.20E–06	1.16E–04	6.16E–06	5.40E–06	1.03E–05
Omphalina philonotis	7.88E–06	6.67E–06	3.16E–06	7.00E–06	1.12E–04	5.98E–06	5.24E–06	1.03E–05
Red fox	8.48E–06	7.22E–06	3.65E–06	7.74E–06	1.44E–04	6.65E–06	5.84E–06	1.03E–05
Roe deer	8.53E–06	7.25E–06	3.69E–06	7.77E–06	1.61E–04	6.67E–06	5.85E–06	1.03E–05
Yellow foot	7.88E–06	6.67E–06	3.16E–06	7.00E–06	1.12E–04	5.98E–06	5.24E–06	1.03E–05
Eurasian bittern	8.43E–06	7.18E–06	3.60E–06	7.69E–06	1.35E–04	6.61E–06	5.80E–06	1.03E–05
Knowlton’s thread-moss	7.11E–06	6.13E–06	2.91E–06	6.51E–06	9.58E–05	5.60E–06	4.92E–06	1.00E–05
Mountain hare	8.59E–06	7.28E–06	3.75E–06	7.80E–06	1.86E–04	6.70E–06	5.87E–06	1.03E–05
Spotted crake	8.43E–06	7.18E–06	3.60E–06	7.69E–06	1.35E–04	6.61E–06	5.80E–06	1.03E–05
Grass snake	8.35E–06	7.11E–06	3.53E–06	7.59E–06	1.27E–04	6.52E–06	5.72E–06	1.03E–05
Scots pine	8.60E–06	7.28E–06	3.75E–06	7.81E–06	1.87E–04	6.70E–06	5.87E–06	1.03E–05
Scapania apiculata	7.11E–06	6.13E–06	2.91E–06	6.51E–06	9.58E–05	5.60E–06	4.92E–06	1.00E–05
Cranberry	8.08E–06	6.86E–06	3.30E–06	7.24E–06	1.17E–04	6.19E–06	5.43E–06	1.03E–05
Chlaenius sulcicollis	7.88E–06	6.67E–06	3.15E–06	7.00E–06	1.12E–04	5.97E–06	5.24E–06	1.03E–05
Common toad	8.28E–06	7.04E–06	3.47E–06	7.50E–06	1.23E–04	6.43E–06	5.64E–06	1.03E–05
Common reed	8.05E–06	6.83E–06	3.28E–06	7.20E–06	1.16E–04	6.16E–06	5.40E–06	1.03E–05
European water vole	8.31E–06	7.08E–06	3.50E–06	7.55E–06	1.25E–04	6.48E–06	5.68E–06	1.03E–05
Sphagnum sp.	7.11E–06	6.13E–06	2.91E–06	6.51E–06	9.58E–05	5.60E–06	4.92E–06	1.00E–05
Marsh fritillary	8.25E–06	7.01E–06	3.44E–06	7.45E–06	1.22E–04	6.39E–06	5.61E–06	1.03E–05
Nephroma laevigatum	8.17E–06	6.94E–06	3.37E–06	7.35E–06	1.19E–04	6.29E–06	5.52E–06	1.03E–05
Eurasian elk (U.S.: Moose)	8.61E–06	7.29E–06	3.76E–06	7.81E–06	1.91E–04	6.70E–06	5.87E–06	1.03E–05
Singa nitidula	7.88E–06	6.67E–06	3.15E–06	7.00E–06	1.12E–04	5.97E–06	5.24E–06	1.03E–05
European otter (T)	8.48E–06	7.22E–06	3.65E–06	7.74E–06	1.46E–04	6.65E–06	5.83E–06	1.03E–05
White-tailed eagle(T)	8.44E–06	7.19E–06	3.62E–06	7.71E–06	1.37E–04	6.62E–06	5.81E–06	1.03E–05
Common kingfisher(T)	8.20E–06	6.98E–06	3.40E–06	7.40E–06	1.20E–04	6.34E–06	5.56E–06	1.03E–05
Ruddy turnstone(T)	8.40E–06	7.15E–06	3.57E–06	7.65E–06	1.31E–04	6.57E–06	5.77E–06	1.03E–05
Northern crested newt (T)	8.29E–06	7.06E–06	3.48E–06	7.51E–06	1.24E–04	6.44E–06	5.66E–06	1.03E–05
Black tern(T)	8.23E–06	7.00E–06	3.42E–06	7.43E–06	1.21E–04	6.37E–06	5.59E–06	1.03E–05
European otter(T)	8.48E–06	7.22E–06	3.65E–06	7.74E–06	1.46E–04	6.65E–06	5.83E–06	1.03E–05
Ringed seal(T)	8.56E–06	7.26E–06	3.72E–06	7.79E–06	1.72E–04	6.68E–06	5.86E–06	1.03E–05
Sea birds (T)	8.43E-06	7.18E-06	3.60E-06	7.69E-06	1.35E-04	6.61E-06	5.80E-06	1.03E-05

Table F-8. Dose conversion coefficients for external exposure of terrestrial representative species to high energy beta (> 10 keV) and gamma radiation in relation to soil (µGy/h)/(Bq/kg) and air (µGy/h)/(Bq/m^3).

Representative species	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma in soil							
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244
Pygmy damselfly	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pool frog	5.00E–08	8.53E–04	6.03E–06	7.71E–05	0.00E+00	8.29E–09	7.98E–08	1.58E–07
European alder	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver birch	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dwarf neckera	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ruff	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lumbricus sp.	5.05E–08	8.60E–04	6.10E–06	7.77E–05	0.00E+00	8.50E–09	8.04E–08	1.62E–07
Bottle sedge	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Natterer’s bat	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European hare	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Norway spruce	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common grasshopper warbler	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Large gold grasshopper	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Yellow widelip orchid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cloudberry	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Short-eared owl (AIR)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Geyer’s whorl snail	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Slender green feather moss	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian lynx	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Flea sedge	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Omphalina philonotis	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Red fox	2.99E–08	5.86E–04	3.26E–06	5.42E–05	0.00E+00	8.86E–11	5.44E–08	9.75E–09
Roe deer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Yellow foot	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian bittern	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Knowlton’s thread-moss	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mountain hare	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Spotted crake	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Grass snake	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scots pine	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scapania apiculata	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cranberry	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chlaenius sulcicollis	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common toad	4.92E–08	8.42E–04	5.92E–06	7.61E–05	0.00E+00	7.96E–09	7.87E–08	1.52E–07
Common reed	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European water vole	4.83E–08	8.30E–04	5.79E–06	7.51E–05	0.00E+00	7.58E–09	7.76E–08	1.45E–07
Sphagnum sp.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Marsh fritillary	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nephroma laevigatum	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian elk (U.S.: Moose)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Singa nitidula	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European otter (T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
White-tailed eagle(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common kingfisher(T)	4.96E–08	8.47E–04	5.97E–06	7.66E–05	0.00E+00	8.12E–09	7.92E–08	1.55E–07
Ruddy turnstone(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Northern crested newt (T)	4.88E–08	8.36E–04	5.86E–06	7.56E–05	0.00E+00	7.78E–09	7.82E–08	1.49E–07
Black tern(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European otter(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ringed seal(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sea birds (T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-8. Continued.

Representative species	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma in soil continued							
	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m	I-129	Nb-94	Ni-59
Pygmy damselfly	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pool frog	2.79E–05	1.42E–07	0.00E+00	3.01E–04	8.94E–04	3.46E–06	8.35E–04	1.00E–07
European alder	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver birch	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dwarf neckera	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ruff	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lumbricus sp.	2.81E–05	1.45E–07	0.00E+00	3.03E–04	9.01E–04	3.52E–06	8.41E–04	1.03E–07
Bottle sedge	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Natterer’s bat	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European hare	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Norway spruce	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common grasshopper warbler	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Large gold grasshopper	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Yellow widelip orchid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cloudberry	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Short-eared owl (AIR)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Geyer’s whorl snail	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Slender green feather moss	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian lynx	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Flea sedge	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Omphalina philonotis	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Red fox	1.99E–05	9.01E–09	0.00E+00	2.06E–04	6.23E–04	1.02E–06	5.85E–04	1.07E–09
Roe deer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Yellow foot	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian bittern	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Knowlton’s thread-moss	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mountain hare	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Spotted crake	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Grass snake	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scots pine	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scapania apiculata	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cranberry	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chlaenius sulcicollis	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common toad	2.75E–05	1.36E–07	0.00E+00	2.97E–04	8.83E–04	3.36E–06	8.24E–04	9.60E–08
Common reed	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European water vole	2.72E–05	1.30E–07	0.00E+00	2.93E–04	8.70E–04	3.24E–06	8.13E–04	9.14E–08
Sphagnum sp.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Marsh fritillary	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nephroma laevigatum	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian elk (U.S.: Moose)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Singa nitidula	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European otter (T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
White-tailed eagle(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common kingfisher(T)	2.77E–05	1.39E–07	0.00E+00	2.99E–04	8.88E–04	3.40E–06	8.29E–04	9.79E–08
Ruddy turnstone(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Northern crested newt (T)	2.74E–05	1.33E–07	0.00E+00	2.95E–04	8.77E–04	3.30E–06	8.19E–04	9.39E–08
Black tern(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European otter(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ringed seal(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sea birds (T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-8. Continued.

Representative species	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma in soil continued							
	Ni-63	Np-237	Pa-231	Pb-210	Pd-107	Po-210	Pu-239	Pu-240
Pygmy damselfly	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pool frog	0.00E+00	7.55E–06	1.77E–05	5.91E–07	0.00E+00	4.51E–09	8.35E–08	1.59E–07
European alder	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver birch	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dwarf neckera	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ruff	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lumbricus sp.	0.00E+00	7.62E–06	1.78E–05	6.01E–07	0.00E+00	4.55E–09	8.52E–08	1.63E–07
Bottle sedge	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Natterer's bat	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European hare	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Norway spruce	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common grasshopper warbler	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Large gold grasshopper	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Yellow widelip orchid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cloudberry	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Short-eared owl (AIR)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Geyer's whorl snail	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Slender green feather moss	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian lynx	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Flea sedge	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Omphalina philonotis	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Red fox	0.00E+00	4.74E–06	1.16E–05	2.03E–07	0.00E+00	3.17E–09	1.89E–08	1.12E–08
Roe deer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Yellow foot	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian bittern	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Knowlton's thread-moss	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mountain hare	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Spotted crake	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Grass snake	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scots pine	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scapania apiculata	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cranberry	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chlaenius sulcicollis	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common toad	0.00E+00	7.43E–06	1.74E–05	5.75E–07	0.00E+00	4.46E–09	8.08E–08	1.53E–07
Common reed	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European water vole	0.00E+00	7.31E–06	1.71E–05	5.57E–07	0.00E+00	4.40E–09	7.78E–08	1.46E–07
Sphagnum sp.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Marsh fritillary	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nephroma laevigatum	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian elk (U.S.: Moose)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Singa nitidula	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European otter (T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
White-tailed eagle(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common kingfisher(T)	0.00E+00	7.49E–06	1.75E–05	5.83E–07	0.00E+00	4.48E–09	8.21E–08	1.56E–07
Ruddy turnstone(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Northern crested newt (T)	0.00E+00	7.37E–06	1.73E–05	5.67E–07	0.00E+00	4.43E–09	7.94E–08	1.50E–07
Black tern(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European otter(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ringed seal(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sea birds (T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-8. Continued.

Representative species	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma in soil continued							
	Pu-242	Ra-226	Se-79	Sm-151	Sn-126	Sr-90	Tc-99	Th-229
Pygmy damselfly	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pool frog	1.33E–07	8.95E–04	0.00E+00	9.61E–10	8.31E–04	1.49E–10	0.00E+00	2.75E–05
European alder	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver birch	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dwarf neckera	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ruff	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lumbricus sp.	1.36E–07	9.02E–04	0.00E+00	9.84E–10	8.37E–04	1.53E–10	0.00E+00	2.77E–05
Bottle sedge	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Natterer's bat	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European hare	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Norway spruce	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common grasshopper warbler	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Large gold grasshopper	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Yellow widelip orchid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cloudberry	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Short-eared owl (AIR)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Geyer's whorl snail	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Slender green feather moss	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian lynx	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Flea sedge	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Omphalina philonotis	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Red fox	9.63E–09	6.48E–04	0.00E+00	7.10E–11	5.72E–04	6.16E–12	0.00E+00	1.93E–05
Roe deer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Yellow foot	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian bittern	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Knowlton's thread-moss	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mountain hare	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Spotted crake	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Grass snake	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scots pine	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scapania apiculata	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cranberry	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chlaenius sulcicollis	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common toad	1.27E–07	8.85E–04	0.00E+00	9.25E–10	8.20E–04	1.43E–10	0.00E+00	2.72E–05
Common reed	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European water vole	1.22E–07	8.74E–04	0.00E+00	8.84E–10	8.08E–04	1.37E–10	0.00E+00	2.68E–05
Sphagnum sp.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Marsh fritillary	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nephroma laevigatum	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian elk (U.S.: Moose)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Singa nitidula	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European otter (T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
White-tailed eagle(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common kingfisher(T)	1.30E–07	8.90E–04	0.00E+00	9.42E–10	8.25E–04	1.46E–10	0.00E+00	2.74E–05
Ruddy turnstone(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Northern crested newt (T)	1.25E–07	8.80E–04	0.00E+00	9.06E–10	8.15E–04	1.40E–10	0.00E+00	2.70E–05
Black tern(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European otter(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ringed seal(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sea birds (T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-8. Continued.

Representative species	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma in soil continued							
	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
Pygmy damselfly	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pool frog	2.06E–07	1.43E–07	2.05E–07	1.71E–07	6.62E–05	1.45E–07	1.21E–07	0.00E+00
European alder	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver birch	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dwarf neckera	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ruff	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lumbricus sp.	2.09E–07	1.45E–07	2.08E–07	1.75E–07	6.67E–05	1.49E–07	1.24E–07	0.00E+00
Bottle sedge	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Natterer's bat	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European hare	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Norway spruce	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common grasshopper warbler	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Large gold grasshopper	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Yellow widelip orchid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cloudberry	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Short-eared owl (AIR)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Geyer's whorl snail	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Slender green feather moss	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian lynx	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Flea sedge	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Omphalina philonotis	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Red fox	7.94E–08	3.55E–08	8.62E–08	2.74E–08	4.55E–05	1.55E–08	8.67E–09	0.00E+00
Roe deer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Yellow foot	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian bittern	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Knowlton's thread-moss	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mountain hare	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Spotted crake	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Grass snake	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scots pine	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scapania apiculata	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cranberry	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chlaenius sulcicollis	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common toad	2.01E–07	1.38E–07	2.00E–07	1.65E–07	6.54E–05	1.40E–07	1.17E–07	0.00E+00
Common reed	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European water vole	1.95E–07	1.33E–07	1.95E–07	1.58E–07	6.44E–05	1.34E–07	1.12E–07	0.00E+00
Sphagnum sp.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Marsh fritillary	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nephroma laevigatum	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian elk (U.S.: Moose)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Singa nitidula	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European otter (T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
White-tailed eagle(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common kingfisher(T)	2.03E–07	1.40E–07	2.03E–07	1.68E–07	6.58E–05	1.43E–07	1.19E–07	0.00E+00
Ruddy turnstone(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Northern crested newt (T)	1.98E–07	1.36E–07	1.98E–07	1.62E–07	6.49E–05	1.37E–07	1.14E–07	0.00E+00
Black tern(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European otter(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ringed seal(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sea birds (T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-8. Continued.

Representative species	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma in air							
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244
Pygmy damselfly	2.21E–08	3.29E–04	2.43E–06	3.49E–05	0.00E+00	8.52E–41	3.04E–08	3.35E–08
Pool frog	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European alder	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver birch	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dwarf neckera	2.21E–08	3.29E–04	2.43E–06	3.49E–05	0.00E+00	8.54E–41	3.04E–08	3.35E–08
Ruff	2.19E–08	3.25E–04	2.53E–06	3.45E–05	0.00E+00	8.46E–41	3.07E–08	4.14E–08
Lumbricus sp.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bottle sedge	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Natterer's bat	2.21E–08	3.29E–04	2.30E–06	3.48E–05	0.00E+00	8.49E–41	2.98E–08	2.54E–08
European hare	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Norway spruce	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common grasshopper warbler	2.21E–08	3.29E–04	2.30E–06	3.49E–05	0.00E+00	8.50E–41	2.98E–08	2.54E–08
Large gold grasshopper	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Yellow widelip orchid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cloudberry	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Short-eared owl (AIR)	2.14E–08	3.20E–04	2.12E–06	3.38E–05	0.00E+00	8.36E–41	2.83E–08	1.69E–08
Geyer's whorl snail	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Slender green feather moss	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian lynx	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Flea sedge	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Omphalina philonotis	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Red fox	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Roe deer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Yellow foot	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian bittern	2.04E–08	3.04E–04	2.38E–06	3.21E–05	0.00E+00	8.28E–41	2.88E–08	3.88E–08
Knowlton's thread-moss	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mountain hare	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Spotted crake	2.04E–08	3.04E–04	2.38E–06	3.21E–05	0.00E+00	8.28E–41	2.88E–08	3.88E–08
Grass snake	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scots pine	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scapania apiculata	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cranberry	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chlaenius sulcicollis	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common toad	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common reed	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European water vole	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sphagnum sp.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Marsh fritillary	2.21E–08	3.29E–04	2.43E–06	3.49E–05	0.00E+00	8.52E–41	3.04E–08	3.35E–08
Nephroma laevigatum	2.21E–08	3.29E–04	2.43E–06	3.49E–05	0.00E+00	8.54E–41	3.04E–08	3.35E–08
Eurasian elk (U.S.: Moose)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Singa nitidula	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European otter (T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
White-tailed eagle(T)	1.95E–08	2.91E–04	1.68E–06	3.07E–05	0.00E+00	8.21E–41	2.31E–08	5.25E–09
Common kingfisher(T)	2.21E–08	3.29E–04	2.30E–06	3.48E–05	0.00E+00	8.49E–41	2.98E–08	2.54E–08
Ruddy turnstone(T)	2.12E–08	3.16E–04	2.22E–06	3.34E–05	0.00E+00	8.41E–41	2.86E–08	2.45E–08
Northern crested newt (T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Black tern(T)	2.20E–08	3.27E–04	2.30E–06	3.47E–05	0.00E+00	8.49E–41	2.96E–08	2.53E–08
European otter(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ringed seal(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sea birds (T)	1.54E–08	2.56E–04	2.38E–06	2.72E–05	0.00E+00	8.06E–46	2.88E–08	3.88E–08

Table F-8. Continued.

Representative species	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma in air continued							
	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m	I-129	Nb-94	Ni-59
Pygmy damselfly	1.35E–05	3.73E–08	0.00E+00	1.12E–04	3.47E–04	1.07E–06	3.13E–04	7.09E–40
Pool frog	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European alder	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver birch	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dwarf neckera	1.35E–05	3.73E–08	0.00E+00	1.12E–04	3.48E–04	1.07E–06	3.13E–04	7.09E–40
Ruff	1.33E–05	3.68E–08	0.00E+00	1.13E–04	3.44E–04	1.13E–06	3.15E–04	1.03E–39
Lumbricus sp.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bottle sedge	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Natterer's bat	1.35E–05	3.72E–08	0.00E+00	1.10E–04	3.47E–04	1.00E–06	3.06E–04	3.87E–40
European hare	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Norway spruce	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common grasshopper warbler	1.35E–05	3.72E–08	0.00E+00	1.10E–04	3.47E–04	1.00E–06	3.06E–04	3.87E–40
Large gold grasshopper	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Yellow widelip orchid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cloudberry	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Short-eared owl (AIR)	1.31E–05	3.59E–08	0.00E+00	1.05E–04	3.38E–04	9.19E–07	2.92E–04	6.55E–41
Geyer's whorl snail	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Slender green feather moss	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian lynx	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Flea sedge	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Omphalina philonotis	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Red fox	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Roe deer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Yellow foot	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian bittern	1.24E–05	3.41E–08	0.00E+00	1.06E–04	3.22E–04	1.06E–06	2.96E–04	1.03E–39
Knowlton's thread-moss	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mountain hare	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Spotted crake	1.24E–05	3.41E–08	0.00E+00	1.06E–04	3.22E–04	1.06E–06	2.96E–04	1.03E–39
Grass snake	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scots pine	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scapania apiculata	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cranberry	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chlaenius sulcicollis	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common toad	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common reed	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European water vole	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sphagnum sp.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Marsh fritillary	1.35E–05	3.73E–08	0.00E+00	1.12E–04	3.47E–04	1.07E–06	3.13E–04	7.09E–40
Nephroma laevigatum	1.35E–05	3.73E–08	0.00E+00	1.12E–04	3.48E–04	1.07E–06	3.13E–04	7.09E–40
Eurasian elk (U.S.: Moose)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Singa nitidula	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European otter (T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
White-tailed eagle(T)	1.19E–05	3.25E–08	0.00E+00	8.56E–05	3.08E–04	6.12E–07	2.40E–04	9.72E–45
Common kingfisher(T)	1.35E–05	3.72E–08	0.00E+00	1.10E–04	3.47E–04	1.00E–06	3.06E–04	3.87E–40
Ruddy turnstone(T)	1.29E–05	3.57E–08	0.00E+00	1.06E–04	3.34E–04	9.70E–07	2.95E–04	3.87E–40
Northern crested newt (T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Black tern(T)	1.34E–05	3.71E–08	0.00E+00	1.10E–04	3.46E–04	1.00E–06	3.05E–04	3.87E–40
European otter(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ringed seal(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sea birds (T)	1.06E–05	5.05E–09	0.00E+00	1.06E–04	2.72E–04	1.06E–06	2.96E–04	1.03E–39

Table F-8. Continued.

Representative species	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma in air continued							
	Ni-63	Np-237	Pa-231	Pb-210	Pd-107	Po-210	Pu-239	Pu-240
Pygmy damselfly	0.00E+00	3.41E–06	7.32E–06	2.38E–07	0.00E+00	1.69E–09	2.69E–08	4.60E–08
Pool frog	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European alder	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver birch	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dwarf neckera	0.00E+00	3.41E–06	7.32E–06	2.38E–07	0.00E+00	1.69E–09	2.69E–08	4.60E–08
Ruff	0.00E+00	3.53E–06	7.23E–06	2.79E–07	0.00E+00	1.70E–09	3.23E–08	5.96E–08
Lumbricus sp.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bottle sedge	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Natterer’s bat	0.00E+00	3.25E–06	7.31E–06	1.96E–07	0.00E+00	1.66E–09	2.13E–08	3.22E–08
European hare	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Norway spruce	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common grasshopper warbler	0.00E+00	3.25E–06	7.32E–06	1.96E–07	0.00E+00	1.66E–09	2.13E–08	3.22E–08
Large gold grasshopper	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Yellow widelip orchid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cloudberry	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Short-eared owl (AIR)	0.00E+00	3.02E–06	7.08E–06	1.51E–07	0.00E+00	1.58E–09	1.54E–08	1.84E–08
Geyer’s whorl snail	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Slender green feather moss	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian lynx	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Flea sedge	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Omphalina philonotis	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Red fox	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Roe deer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Yellow foot	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian bittern	0.00E+00	3.30E–06	6.71E–06	2.61E–07	0.00E+00	1.60E–09	3.02E–08	5.58E–08
Knowlton’s thread-moss	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mountain hare	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Spotted crake	0.00E+00	3.30E–06	6.71E–06	2.61E–07	0.00E+00	1.60E–09	3.02E–08	5.58E–08
Grass snake	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scots pine	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scapania apiculata	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cranberry	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chlaenius sulcicollis	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common toad	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common reed	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European water vole	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sphagnum sp.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Marsh fritillary	0.00E+00	3.41E–06	7.32E–06	2.38E–07	0.00E+00	1.69E–09	2.69E–08	4.60E–08
Nephroma laevigatum	0.00E+00	3.41E–06	7.32E–06	2.38E–07	0.00E+00	1.69E–09	2.69E–08	4.60E–08
Eurasian elk (U.S.: Moose)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Singa nitidula	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European otter (T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
White-tailed eagle(T)	0.00E+00	2.43E–06	6.41E–06	1.05E–07	0.00E+00	1.30E–09	8.82E–09	5.38E–09
Common kingfisher(T)	0.00E+00	3.25E–06	7.31E–06	1.96E–07	0.00E+00	1.66E–09	2.13E–08	3.22E–08
Ruddy turnstone(T)	0.00E+00	3.13E–06	6.99E–06	1.89E–07	0.00E+00	1.59E–09	2.05E–08	3.11E–08
Northern crested newt (T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Black tern(T)	0.00E+00	3.24E–06	7.29E–06	1.95E–07	0.00E+00	1.65E–09	2.12E–08	3.21E–08
European otter(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ringed seal(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sea birds (T)	0.00E+00	3.30E–06	5.38E–06	2.61E–07	0.00E+00	1.60E–09	3.02E–08	5.58E–08

Table F-8. Continued.

Representative species	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma in air continued							
	Pu-242	Ra-226	Se-79	Sm-151	Sn-126	Sr-90	Tc-99	Th-229
Pygmy damselfly	5.00E–08	3.36E–04	0.00E+00	2.43E–10	3.21E–04	1.29E–11	0.00E+00	1.28E–05
Pool frog	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European alder	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver birch	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dwarf neckera	5.01E–08	3.36E–04	0.00E+00	2.44E–10	3.21E–04	1.29E–11	0.00E+00	1.28E–05
Ruff	4.93E–08	3.40E–04	0.00E+00	2.41E–10	3.18E–04	1.59E–11	0.00E+00	1.27E–05
Lumbricus sp.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bottle sedge	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Natterer's bat	4.99E–08	3.29E–04	0.00E+00	2.43E–10	3.21E–04	9.85E–12	0.00E+00	1.28E–05
European hare	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Norway spruce	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common grasshopper warbler	4.99E–08	3.29E–04	0.00E+00	2.43E–10	3.21E–04	9.85E–12	0.00E+00	1.28E–05
Large gold grasshopper	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Yellow widelip orchid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cloudberry	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Short-eared owl (AIR)	4.80E–08	3.15E–04	0.00E+00	2.36E–10	3.12E–04	6.72E–12	0.00E+00	1.25E–05
Geyer's whorl snail	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Slender green feather moss	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian lynx	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Flea sedge	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Omphalina philonotis	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Red fox	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Roe deer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Yellow foot	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian bittern	4.54E–08	3.21E–04	0.00E+00	2.24E–10	2.97E–04	1.50E–11	0.00E+00	1.18E–05
Knowlton's thread-moss	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mountain hare	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Spotted crake	4.54E–08	3.21E–04	0.00E+00	2.24E–10	2.97E–04	1.50E–11	0.00E+00	1.18E–05
Grass snake	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scots pine	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scapania apiculata	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cranberry	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chlaenius sulcicollis	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common toad	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common reed	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European water vole	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sphagnum sp.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Marsh fritillary	5.00E–08	3.36E–04	0.00E+00	2.43E–10	3.21E–04	1.29E–11	0.00E+00	1.28E–05
Nephroma laevigatum	5.01E–08	3.36E–04	0.00E+00	2.44E–10	3.21E–04	1.29E–11	0.00E+00	1.28E–05
Eurasian elk (U.S.: Moose)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Singa nitidula	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European otter (T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
White-tailed eagle(T)	4.32E–08	2.62E–04	0.00E+00	2.14E–10	2.85E–04	1.79E–12	0.00E+00	1.13E–05
Common kingfisher(T)	4.99E–08	3.29E–04	0.00E+00	2.43E–10	3.21E–04	9.85E–12	0.00E+00	1.28E–05
Ruddy turnstone(T)	4.77E–08	3.19E–04	0.00E+00	2.34E–10	3.09E–04	9.52E–12	0.00E+00	1.23E–05
Northern crested newt (T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Black tern(T)	4.97E–08	3.28E–04	0.00E+00	2.42E–10	3.20E–04	9.82E–12	0.00E+00	1.28E–05
European otter(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ringed seal(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sea birds (T)	4.84E–09	3.21E–04	0.00E+00	6.04E–11	2.50E–04	1.50E–11	0.00E+00	1.01E–05

Table F-8. Continued.

Representative species	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma in air continued							
	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
Pygmy damselfly	6.45E–08	3.71E–08	8.70E–08	5.44E–08	2.86E–05	5.81E–08	3.59E–08	0.00E+00
Pool frog	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European alder	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver birch	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dwarf neckera	6.45E–08	3.71E–08	8.70E–08	5.44E–08	2.86E–05	5.82E–08	3.59E–08	0.00E+00
Ruff	7.00E–08	4.24E–08	8.59E–08	6.86E–08	2.90E–05	5.73E–08	4.75E–08	0.00E+00
Lumbricus sp.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bottle sedge	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Natterer’s bat	5.84E–08	3.15E–08	8.69E–08	4.01E–08	2.79E–05	5.79E–08	2.42E–08	0.00E+00
European hare	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Norway spruce	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common grasshopper warbler	5.84E–08	3.15E–08	8.69E–08	4.01E–08	2.79E–05	5.80E–08	2.42E–08	0.00E+00
Large gold grasshopper	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Yellow widelip orchid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cloudberry	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Short-eared owl (AIR)	5.10E–08	2.54E–08	8.39E–08	2.58E–08	2.65E–05	5.58E–08	1.27E–08	0.00E+00
Geyer’s whorl snail	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Slender green feather moss	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian lynx	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Flea sedge	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Omphalina philonotis	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Red fox	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Roe deer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Yellow foot	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eurasian bittern	6.55E–08	3.97E–08	7.95E–08	6.41E–08	2.70E–05	5.27E–08	4.44E–08	0.00E+00
Knowlton’s thread-moss	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mountain hare	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Spotted crake	6.55E–08	3.97E–08	7.95E–08	6.41E–08	2.70E–05	5.27E–08	4.44E–08	0.00E+00
Grass snake	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scots pine	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Scapania apiculata	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cranberry	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chlaenius sulcicollis	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common toad	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common reed	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European water vole	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sphagnum sp.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Marsh fritillary	6.45E–08	3.71E–08	8.70E–08	5.44E–08	2.86E–05	5.81E–08	3.59E–08	0.00E+00
Nephroma laevigatum	6.45E–08	3.71E–08	8.70E–08	5.44E–08	2.86E–05	5.82E–08	3.59E–08	0.00E+00
Eurasian elk (U.S.: Moose)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Singa nitidula	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European otter (T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
White-tailed eagle(T)	3.85E–08	1.74E–08	7.59E–08	1.33E–08	2.16E–05	5.01E–08	3.82E–09	0.00E+00
Common kingfisher(T)	5.84E–08	3.15E–08	8.69E–08	4.01E–08	2.79E–05	5.79E–08	2.42E–08	0.00E+00
Ruddy turnstone(T)	5.62E–08	3.04E–08	8.31E–08	3.86E–08	2.68E–05	5.54E–08	2.33E–08	0.00E+00
Northern crested newt (T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Black tern(T)	5.82E–08	3.14E–08	8.66E–08	4.00E–08	2.78E–05	5.78E–08	2.41E–08	0.00E+00
European otter(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ringed seal(T)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sea birds (T)	6.55E–08	3.97E–08	4.23E–08	6.41E–08	2.70E–05	7.54E–09	4.44E–08	0.00E+00

Table F-8. Continued.

Representative species	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma on soil							
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244
Pygmy damselfly	2.21E–08	3.29E–04	2.56E–06	3.49E–05	0.00E+00	8.54E–41	3.11E–08	4.17E–08
Pool frog	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European alder	1.65E–08	2.59E–04	1.89E–06	2.89E–05	0.00E+00	2.26E–13	2.46E–08	1.08E–08
Silver birch	1.65E–08	2.59E–04	1.89E–06	2.89E–05	0.00E+00	2.26E–13	2.46E–08	1.08E–08
Dwarf neckera	2.21E–08	3.29E–04	2.56E–06	3.49E–05	0.00E+00	8.54E–41	3.11E–08	4.17E–08
Ruff	2.19E–08	3.25E–04	2.53E–06	3.45E–05	0.00E+00	8.47E–41	3.07E–08	4.11E–08
Lumbricus sp.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bottle sedge	2.82E–08	3.25E–04	3.29E–06	3.69E–05	0.00E+00	1.07E–08	3.08E–08	1.26E–07
Natterer’s bat	2.21E–08	3.29E–04	2.56E–06	3.49E–05	0.00E+00	8.54E–41	3.11E–08	4.17E–08
European hare	8.80E–09	1.61E–04	9.21E–07	1.52E–05	0.00E+00	3.25E–41	1.52E–08	1.12E–08
Norway spruce	1.65E–08	2.59E–04	1.89E–06	2.89E–05	0.00E+00	2.26E–13	2.46E–08	1.08E–08
Common grasshopper warbler	2.21E–08	3.29E–04	2.56E–06	3.49E–05	0.00E+00	8.54E–41	3.11E–08	4.17E–08
Large gold grasshopper	2.24E–08	3.32E–04	2.59E–06	3.52E–05	0.00E+00	8.78E–41	3.14E–08	4.27E–08
Yellow widelip orchid	2.82E–08	3.25E–04	3.29E–06	3.69E–05	0.00E+00	1.07E–08	3.08E–08	1.26E–07
Cloudberry	2.18E–08	3.07E–04	2.71E–06	3.44E–05	0.00E+00	7.70E–10	2.92E–08	5.79E–08
Short-eared owl (AIR)	2.15E–08	3.20E–04	2.49E–06	3.39E–05	0.00E+00	8.51E–41	3.02E–08	4.06E–08
Geyer’s whorl snail	2.24E–08	3.31E–04	2.58E–06	3.52E–05	0.00E+00	8.75E–41	3.13E–08	4.25E–08
Slender green feather moss	2.82E–08	3.25E–04	3.29E–06	3.69E–05	0.00E+00	1.07E–08	3.08E–08	1.26E–07
Eurasian lynx	1.25E–08	2.16E–04	1.37E–06	2.12E–05	0.00E+00	3.77E–41	2.03E–08	1.77E–08
Flea sedge	2.82E–08	3.25E–04	3.29E–06	3.69E–05	0.00E+00	1.07E–08	3.08E–08	1.26E–07
Omphalina philonotis	2.82E–08	3.25E–04	3.29E–06	3.69E–05	0.00E+00	1.07E–08	3.08E–08	1.26E–07
Red fox	1.77E–08	2.72E–04	2.04E–06	2.83E–05	0.00E+00	7.34E–41	2.56E–08	3.20E–08
Roe deer	1.25E–08	2.15E–04	1.36E–06	2.11E–05	0.00E+00	3.76E–41	2.02E–08	1.76E–08
Yellow foot	2.82E–08	3.25E–04	3.29E–06	3.69E–05	0.00E+00	1.07E–08	3.08E–08	1.26E–07
Eurasian bittern	2.04E–08	3.05E–04	2.37E–06	3.21E–05	0.00E+00	8.23E–41	2.88E–08	3.82E–08
Knowlton’s thread-moss	2.82E–08	3.25E–04	3.29E–06	3.69E–05	0.00E+00	1.07E–08	3.08E–08	1.26E–07
Mountain hare	8.80E–09	1.61E–04	9.21E–07	1.52E–05	0.00E+00	3.25E–41	1.52E–08	1.12E–08
Spotted crake	2.04E–08	3.05E–04	2.37E–06	3.21E–05	0.00E+00	8.23E–41	2.88E–08	3.82E–08
Grass snake	2.11E–08	3.14E–04	2.44E–06	3.31E–05	0.00E+00	8.54E–41	2.96E–08	3.99E–08
Scots pine	1.65E–08	2.59E–04	1.89E–06	2.89E–05	0.00E+00	2.26E–13	2.46E–08	1.08E–08
Scapania apiculata	2.82E–08	3.25E–04	3.29E–06	3.69E–05	0.00E+00	1.07E–08	3.08E–08	1.26E–07
Cranberry	2.18E–08	3.07E–04	2.71E–06	3.44E–05	0.00E+00	7.70E–10	2.92E–08	5.79E–08
Chlaenius sulcicollis	2.24E–08	3.32E–04	2.59E–06	3.52E–05	0.00E+00	8.78E–41	3.14E–08	4.27E–08
Common toad	2.20E–08	3.28E–04	2.55E–06	3.48E–05	0.00E+00	8.51E–41	3.10E–08	4.15E–08
Common reed	2.82E–08	3.25E–04	3.29E–06	3.69E–05	0.00E+00	1.07E–08	3.08E–08	1.26E–07
European water vole	2.19E–08	3.25E–04	2.53E–06	3.45E–05	0.00E+00	8.47E–41	3.07E–08	4.11E–08
Sphagnum sp.	2.82E–08	3.25E–04	3.29E–06	3.69E–05	0.00E+00	1.07E–08	3.08E–08	1.26E–07
Marsh fritillary	2.21E–08	3.29E–04	2.56E–06	3.49E–05	0.00E+00	8.54E–41	3.11E–08	4.17E–08
Nephroma laevigatum	2.21E–08	3.29E–04	2.56E–06	3.49E–05	0.00E+00	8.54E–41	3.11E–08	4.17E–08
Eurasian elk (U.S.: Moose)	4.61E–09	9.94E–05	4.14E–07	8.37E–06	0.00E+00	2.92E–41	9.29E–09	4.69E–09
Singa nitidula	2.24E–08	3.32E–04	2.59E–06	3.52E–05	0.00E+00	8.78E–41	3.14E–08	4.27E–08
European otter (T)	1.77E–08	2.72E–04	2.04E–06	2.83E–05	0.00E+00	7.34E–41	2.56E–08	3.20E–08
White-tailed eagle(T)	1.94E–08	2.92E–04	2.26E–06	3.07E–05	0.00E+00	7.89E–41	2.75E–08	3.60E–08
Common kingfisher(T)	2.21E–08	3.29E–04	2.56E–06	3.49E–05	0.00E+00	8.54E–41	3.11E–08	4.17E–08
Ruddy turnstone(T)	2.13E–08	3.17E–04	2.46E–06	3.35E–05	0.00E+00	8.53E–41	2.99E–08	4.02E–08
Northern crested newt (T)	2.19E–08	3.26E–04	2.54E–06	3.46E–05	0.00E+00	8.48E–41	3.08E–08	4.13E–08
Black tern(T)	2.20E–08	3.27E–04	2.55E–06	3.47E–05	0.00E+00	8.51E–41	3.09E–08	4.15E–08
European otter(T)	1.77E–08	2.72E–04	2.04E–06	2.83E–05	0.00E+00	7.34E–41	2.56E–08	3.20E–08
Ringed seal(T)	1.17E–08	2.04E–04	1.27E–06	1.99E–05	0.00E+00	3.61E–41	1.92E–08	1.62E–08
Sea birds (T)	2.04E–08	3.05E–04	2.37E–06	3.21E–05	0.00E+00	8.23E–41	2.88E–08	3.82E–08

Table F-8. Continued.

Representative species	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma on soil continued							
	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m	I-129	Nb-94	Ni-59
Pygmy damselfly	1.35E–05	3.74E–08	0.00E+00	1.14E–04	3.48E–04	1.14E–06	3.19E–04	1.03E–39
Pool frog	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European alder	1.13E–05	9.84E–09	0.00E+00	9.03E–05	2.75E–04	8.80E–07	2.51E–04	2.72E–12
Silver birch	1.13E–05	9.84E–09	0.00E+00	9.03E–05	2.75E–04	8.80E–07	2.51E–04	2.72E–12
Dwarf neckera	1.35E–05	3.74E–08	0.00E+00	1.14E–04	3.48E–04	1.14E–06	3.19E–04	1.03E–39
Ruff	1.33E–05	3.68E–08	0.00E+00	1.13E–04	3.44E–04	1.12E–06	3.15E–04	1.02E–39
Lumbricus sp.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bottle sedge	1.47E–05	1.13E–07	0.00E+00	1.13E–04	3.43E–04	1.92E–06	3.12E–04	1.29E–07
Natterer’s bat	1.35E–05	3.74E–08	0.00E+00	1.14E–04	3.48E–04	1.14E–06	3.19E–04	1.03E–39
European hare	5.63E–06	1.01E–08	0.00E+00	5.65E–05	1.70E–04	4.01E–07	1.59E–04	3.92E–40
Norway spruce	1.13E–05	9.84E–09	0.00E+00	9.03E–05	2.75E–04	8.80E–07	2.51E–04	2.72E–12
Common grasshopper warbler	1.35E–05	3.74E–08	0.00E+00	1.14E–04	3.48E–04	1.14E–06	3.19E–04	1.03E–39
Large gold grasshopper	1.36E–05	3.82E–08	0.00E+00	1.16E–04	3.51E–04	1.15E–06	3.22E–04	1.06E–39
Yellow widelip orchid	1.47E–05	1.13E–07	0.00E+00	1.13E–04	3.43E–04	1.92E–06	3.12E–04	1.29E–07
Cloudberry	1.35E–05	5.18E–08	0.00E+00	1.07E–04	3.24E–04	1.56E–06	2.95E–04	9.29E–09
Short-eared owl (AIR)	1.31E–05	3.63E–08	0.00E+00	1.11E–04	3.38E–04	1.11E–06	3.10E–04	1.03E–39
Geyer’s whorl snail	1.36E–05	3.80E–08	0.00E+00	1.15E–04	3.50E–04	1.14E–06	3.21E–04	1.06E–39
Slender green feather moss	1.47E–05	1.13E–07	0.00E+00	1.13E–04	3.43E–04	1.92E–06	3.12E–04	1.29E–07
Eurasian lynx	7.96E–06	1.59E–08	0.00E+00	7.54E–05	2.28E–04	6.03E–07	2.11E–04	4.55E–40
Flea sedge	1.47E–05	1.13E–07	0.00E+00	1.13E–04	3.43E–04	1.92E–06	3.12E–04	1.29E–07
Omphalina philonotis	1.47E–05	1.13E–07	0.00E+00	1.13E–04	3.43E–04	1.92E–06	3.12E–04	1.29E–07
Red fox	1.09E–05	2.86E–08	0.00E+00	9.51E–05	2.89E–04	9.13E–07	2.67E–04	8.86E–40
Roe deer	7.93E–06	1.58E–08	0.00E+00	7.52E–05	2.27E–04	6.00E–07	2.10E–04	4.54E–40
Yellow foot	1.47E–05	1.13E–07	0.00E+00	1.13E–04	3.43E–04	1.92E–06	3.12E–04	1.29E–07
Eurasian bittern	1.24E–05	3.42E–08	0.00E+00	1.06E–04	3.23E–04	1.05E–06	2.97E–04	9.93E–40
Knowlton’s thread-moss	1.47E–05	1.13E–07	0.00E+00	1.13E–04	3.43E–04	1.92E–06	3.12E–04	1.29E–07
Mountain hare	5.63E–06	1.01E–08	0.00E+00	5.65E–05	1.70E–04	4.01E–07	1.59E–04	3.92E–40
Spotted crake	1.24E–05	3.42E–08	0.00E+00	1.06E–04	3.23E–04	1.05E–06	2.97E–04	9.93E–40
Grass snake	1.28E–05	3.57E–08	0.00E+00	1.10E–04	3.32E–04	1.09E–06	3.04E–04	1.03E–39
Scots pine	1.13E–05	9.84E–09	0.00E+00	9.03E–05	2.75E–04	8.80E–07	2.51E–04	2.72E–12
Scapania apiculata	1.47E–05	1.13E–07	0.00E+00	1.13E–04	3.43E–04	1.92E–06	3.12E–04	1.29E–07
Cranberry	1.35E–05	5.18E–08	0.00E+00	1.07E–04	3.24E–04	1.56E–06	2.95E–04	9.29E–09
Chlaenius sulcicollis	1.36E–05	3.82E–08	0.00E+00	1.16E–04	3.51E–04	1.15E–06	3.22E–04	1.06E–39
Common toad	1.34E–05	3.72E–08	0.00E+00	1.14E–04	3.46E–04	1.13E–06	3.18E–04	1.03E–39
Common reed	1.47E–05	1.13E–07	0.00E+00	1.13E–04	3.43E–04	1.92E–06	3.12E–04	1.29E–07
European water vole	1.33E–05	3.68E–08	0.00E+00	1.13E–04	3.44E–04	1.12E–06	3.15E–04	1.02E–39
Sphagnum sp.	1.47E–05	1.13E–07	0.00E+00	1.13E–04	3.43E–04	1.92E–06	3.12E–04	1.29E–07
Marsh fritillary	1.35E–05	3.74E–08	0.00E+00	1.14E–04	3.48E–04	1.14E–06	3.19E–04	1.03E–39
Nephroma laevigatum	1.35E–05	3.74E–08	0.00E+00	1.14E–04	3.48E–04	1.14E–06	3.19E–04	1.03E–39
Eurasian elk (U.S.: Moose)	2.96E–06	4.21E–09	0.00E+00	3.48E–05	1.05E–04	1.74E–07	9.86E–05	3.52E–40
Singa nitidula	1.36E–05	3.82E–08	0.00E+00	1.16E–04	3.51E–04	1.15E–06	3.22E–04	1.06E–39
European otter (T)	1.09E–05	2.86E–08	0.00E+00	9.51E–05	2.89E–04	9.13E–07	2.67E–04	8.86E–40
White-tailed eagle(T)	1.19E–05	3.23E–08	0.00E+00	1.02E–04	3.09E–04	1.01E–06	2.85E–04	9.52E–40
Common kingfisher(T)	1.35E–05	3.74E–08	0.00E+00	1.14E–04	3.48E–04	1.14E–06	3.19E–04	1.03E–39
Ruddy turnstone(T)	1.29E–05	3.60E–08	0.00E+00	1.10E–04	3.34E–04	1.10E–06	3.07E–04	1.03E–39
Northern crested newt (T)	1.34E–05	3.69E–08	0.00E+00	1.14E–04	3.45E–04	1.13E–06	3.16E–04	1.02E–39
Black tern(T)	1.34E–05	3.71E–08	0.00E+00	1.14E–04	3.46E–04	1.13E–06	3.18E–04	1.03E–39
European otter(T)	1.09E–05	2.86E–08	0.00E+00	9.51E–05	2.89E–04	9.13E–07	2.67E–04	8.86E–40
Ringed seal(T)	7.47E–06	1.46E–08	0.00E+00	7.14E–05	2.16E–04	5.60E–07	2.00E–04	4.35E–40
Sea birds (T)	1.24E–05	3.42E–08	0.00E+00	1.06E–04	3.23E–04	1.05E–06	2.97E–04	9.93E–40

Table F-8. Continued.

Representative species	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma on soil continued							
	Ni-63	Np-237	Pa-231	Pb-210	Pd-107	Po-210	Pu-239	Pu-240
Pygmy damselfly	0.00E+00	3.56E–06	7.32E–06	2.82E–07	0.00E+00	1.72E–09	3.26E–08	6.01E–08
Pool frog	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European alder	0.00E+00	2.78E–06	5.65E–06	1.30E–07	0.00E+00	1.36E–09	1.14E–08	1.03E–08
Silver birch	0.00E+00	2.78E–06	5.65E–06	1.30E–07	0.00E+00	1.36E–09	1.14E–08	1.03E–08
Dwarf neckera	0.00E+00	3.56E–06	7.32E–06	2.82E–07	0.00E+00	1.72E–09	3.26E–08	6.01E–08
Ruff	0.00E+00	3.52E–06	7.23E–06	2.77E–07	0.00E+00	1.70E–09	3.20E–08	5.89E–08
Lumbricus sp.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bottle sedge	0.00E+00	4.24E–06	7.91E–06	4.01E–07	0.00E+00	1.69E–09	6.04E–08	1.30E–07
Natterer’s bat	0.00E+00	3.56E–06	7.32E–06	2.82E–07	0.00E+00	1.72E–09	3.26E–08	6.01E–08
European hare	0.00E+00	1.39E–06	3.37E–06	7.78E–08	0.00E+00	8.57E–10	9.58E–09	1.40E–08
Norway spruce	0.00E+00	2.78E–06	5.65E–06	1.30E–07	0.00E+00	1.36E–09	1.14E–08	1.03E–08
Common grasshopper warbler	0.00E+00	3.56E–06	7.32E–06	2.82E–07	0.00E+00	1.72E–09	3.26E–08	6.01E–08
Large gold grasshopper	0.00E+00	3.61E–06	7.40E–06	2.91E–07	0.00E+00	1.74E–09	3.35E–08	6.22E–08
Yellow widelip orchid	0.00E+00	4.24E–06	7.91E–06	4.01E–07	0.00E+00	1.69E–09	6.04E–08	1.30E–07
Cloudberry	0.00E+00	3.57E–06	6.95E–06	2.03E–07	0.00E+00	1.59E–09	3.05E–08	5.56E–08
Short-eared owl (AIR)	0.00E+00	3.46E–06	7.10E–06	2.74E–07	0.00E+00	1.68E–09	3.16E–08	5.83E–08
Geyer’s whorl snail	0.00E+00	3.60E–06	7.40E–06	2.88E–07	0.00E+00	1.74E–09	3.33E–08	6.17E–08
Slender green feather moss	0.00E+00	4.24E–06	7.91E–06	4.01E–07	0.00E+00	1.69E–09	6.04E–08	1.30E–07
Eurasian lynx	0.00E+00	2.00E–06	4.57E–06	1.22E–07	0.00E+00	1.14E–09	1.45E–08	2.27E–08
Flea sedge	0.00E+00	4.24E–06	7.91E–06	4.01E–07	0.00E+00	1.69E–09	6.04E–08	1.30E–07
Omphalina philonotis	0.00E+00	4.24E–06	7.91E–06	4.01E–07	0.00E+00	1.69E–09	6.04E–08	1.30E–07
Red fox	0.00E+00	2.86E–06	5.92E–06	2.14E–07	0.00E+00	1.44E–09	2.48E–08	4.46E–08
Roe deer	0.00E+00	1.99E–06	4.55E–06	1.21E–07	0.00E+00	1.14E–09	1.44E–08	2.25E–08
Yellow foot	0.00E+00	4.24E–06	7.91E–06	4.01E–07	0.00E+00	1.69E–09	6.04E–08	1.30E–07
Eurasian bittern	0.00E+00	3.29E–06	6.70E–06	2.57E–07	0.00E+00	1.60E–09	2.97E–08	5.45E–08
Knowlton’s thread-moss	0.00E+00	4.24E–06	7.91E–06	4.01E–07	0.00E+00	1.69E–09	6.04E–08	1.30E–07
Mountain hare	0.00E+00	1.39E–06	3.37E–06	7.78E–08	0.00E+00	8.57E–10	9.58E–09	1.40E–08
Spotted crake	0.00E+00	3.29E–06	6.70E–06	2.57E–07	0.00E+00	1.60E–09	2.97E–08	5.45E–08
Grass snake	0.00E+00	3.40E–06	6.94E–06	2.69E–07	0.00E+00	1.65E–09	3.11E–08	5.74E–08
Scots pine	0.00E+00	2.78E–06	5.65E–06	1.30E–07	0.00E+00	1.36E–09	1.14E–08	1.03E–08
Scapania apiculata	0.00E+00	4.24E–06	7.91E–06	4.01E–07	0.00E+00	1.69E–09	6.04E–08	1.30E–07
Cranberry	0.00E+00	3.57E–06	6.95E–06	2.03E–07	0.00E+00	1.59E–09	3.05E–08	5.56E–08
Chlaenius sulcicollis	0.00E+00	3.61E–06	7.40E–06	2.91E–07	0.00E+00	1.74E–09	3.35E–08	6.22E–08
Common toad	0.00E+00	3.55E–06	7.29E–06	2.80E–07	0.00E+00	1.72E–09	3.24E–08	5.97E–08
Common reed	0.00E+00	4.24E–06	7.91E–06	4.01E–07	0.00E+00	1.69E–09	6.04E–08	1.30E–07
European water vole	0.00E+00	3.52E–06	7.23E–06	2.77E–07	0.00E+00	1.70E–09	3.20E–08	5.89E–08
Sphagnum sp.	0.00E+00	4.24E–06	7.91E–06	4.01E–07	0.00E+00	1.69E–09	6.04E–08	1.30E–07
Marsh fritillary	0.00E+00	3.56E–06	7.32E–06	2.82E–07	0.00E+00	1.72E–09	3.26E–08	6.01E–08
Nephroma laevigatum	0.00E+00	3.56E–06	7.32E–06	2.82E–07	0.00E+00	1.72E–09	3.26E–08	6.01E–08
Eurasian elk (U.S.: Moose)	0.00E+00	7.02E–07	2.00E–06	3.23E–08	0.00E+00	5.32E–10	4.57E–09	5.66E–09
Singa nitidula	0.00E+00	3.61E–06	7.40E–06	2.91E–07	0.00E+00	1.74E–09	3.35E–08	6.22E–08
European otter (T)	0.00E+00	2.86E–06	5.92E–06	2.14E–07	0.00E+00	1.44E–09	2.48E–08	4.46E–08
White-tailed eagle(T)	0.00E+00	3.14E–06	6.37E–06	2.42E–07	0.00E+00	1.54E–09	2.79E–08	5.09E–08
Common kingfisher(T)	0.00E+00	3.56E–06	7.32E–06	2.82E–07	0.00E+00	1.72E–09	3.26E–08	6.01E–08
Ruddy turnstone(T)	0.00E+00	3.43E–06	7.00E–06	2.71E–07	0.00E+00	1.66E–09	3.13E–08	5.78E–08
Northern crested newt (T)	0.00E+00	3.54E–06	7.26E–06	2.78E–07	0.00E+00	1.71E–09	3.22E–08	5.92E–08
Black tern(T)	0.00E+00	3.55E–06	7.29E–06	2.80E–07	0.00E+00	1.72E–09	3.24E–08	5.96E–08
European otter(T)	0.00E+00	2.86E–06	5.92E–06	2.14E–07	0.00E+00	1.44E–09	2.48E–08	4.46E–08
Ringed seal(T)	0.00E+00	1.87E–06	4.31E–06	1.12E–07	0.00E+00	1.08E–09	1.34E–08	2.06E–08
Sea birds (T)	0.00E+00	3.29E–06	6.70E–06	2.57E–07	0.00E+00	1.60E–09	2.97E–08	5.45E–08

Table F-8. Continued.

Representative species	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma on soil continued							
	Pu-242	Ra-226	Se-79	Sm-151	Sn-126	Sr-90	Tc-99	Th-229
Pygmy damselfly	5.01E–08	3.43E–04	0.00E+00	2.44E–10	3.21E–04	1.60E–11	0.00E+00	1.28E–05
Pool frog	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European alder	8.74E–09	2.72E–04	0.00E+00	8.81E–11	2.54E–04	5.85E–12	0.00E+00	1.08E–05
Silver birch	8.74E–09	2.72E–04	0.00E+00	8.81E–11	2.54E–04	5.85E–12	0.00E+00	1.08E–05
Dwarf neckera	5.01E–08	3.43E–04	0.00E+00	2.44E–10	3.21E–04	1.60E–11	0.00E+00	1.28E–05
Ruff	4.91E–08	3.40E–04	0.00E+00	2.42E–10	3.18E–04	1.58E–11	0.00E+00	1.27E–05
Lumbricus sp.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bottle sedge	1.08E–07	3.35E–04	0.00E+00	8.20E–10	3.18E–04	1.25E–10	0.00E+00	1.42E–05
Natterer’s bat	5.01E–08	3.43E–04	0.00E+00	2.44E–10	3.21E–04	1.60E–11	0.00E+00	1.28E–05
European hare	1.17E–08	1.80E–04	0.00E+00	7.74E–11	1.58E–04	4.68E–12	0.00E+00	5.38E–06
Norway spruce	8.74E–09	2.72E–04	0.00E+00	8.81E–11	2.54E–04	5.85E–12	0.00E+00	1.08E–05
Common grasshopper warbler	5.01E–08	3.43E–04	0.00E+00	2.44E–10	3.21E–04	1.60E–11	0.00E+00	1.28E–05
Large gold grasshopper	5.18E–08	3.45E–04	0.00E+00	2.48E–10	3.24E–04	1.63E–11	0.00E+00	1.30E–05
Yellow widelip orchid	1.08E–07	3.35E–04	0.00E+00	8.20E–10	3.18E–04	1.25E–10	0.00E+00	1.42E–05
Cloudberry	4.63E–08	3.17E–04	0.00E+00	3.28E–10	3.01E–04	5.09E–11	0.00E+00	1.29E–05
Short-eared owl (AIR)	4.86E–08	3.35E–04	0.00E+00	2.38E–10	3.13E–04	1.56E–11	0.00E+00	1.25E–05
Geyer’s whorl snail	5.14E–08	3.45E–04	0.00E+00	2.46E–10	3.24E–04	1.62E–11	0.00E+00	1.29E–05
Slender green feather moss	1.08E–07	3.35E–04	0.00E+00	8.20E–10	3.18E–04	1.25E–10	0.00E+00	1.42E–05
Eurasian lynx	1.89E–08	2.34E–04	0.00E+00	1.19E–10	2.11E–04	7.22E–12	0.00E+00	7.60E–06
Flea sedge	1.08E–07	3.35E–04	0.00E+00	8.20E–10	3.18E–04	1.25E–10	0.00E+00	1.42E–05
Omphalina philonotis	1.08E–07	3.35E–04	0.00E+00	8.20E–10	3.18E–04	1.25E–10	0.00E+00	1.42E–05
Red fox	3.72E–08	2.91E–04	0.00E+00	1.93E–10	2.66E–04	1.25E–11	0.00E+00	1.04E–05
Roe deer	1.88E–08	2.33E–04	0.00E+00	1.19E–10	2.10E–04	7.18E–12	0.00E+00	7.57E–06
Yellow foot	1.08E–07	3.35E–04	0.00E+00	8.20E–10	3.18E–04	1.25E–10	0.00E+00	1.42E–05
Eurasian bittern	4.55E–08	3.21E–04	0.00E+00	2.25E–10	2.98E–04	1.48E–11	0.00E+00	1.19E–05
Knowlton’s thread-moss	1.08E–07	3.35E–04	0.00E+00	8.20E–10	3.18E–04	1.25E–10	0.00E+00	1.42E–05
Mountain hare	1.17E–08	1.80E–04	0.00E+00	7.74E–11	1.58E–04	4.68E–12	0.00E+00	5.38E–06
Spotted crake	4.55E–08	3.21E–04	0.00E+00	2.25E–10	2.98E–04	1.48E–11	0.00E+00	1.19E–05
Grass snake	4.78E–08	3.29E–04	0.00E+00	2.33E–10	3.07E–04	1.54E–11	0.00E+00	1.22E–05
Scots pine	8.74E–09	2.72E–04	0.00E+00	8.81E–11	2.54E–04	5.85E–12	0.00E+00	1.08E–05
Scapania apiculata	1.08E–07	3.35E–04	0.00E+00	8.20E–10	3.18E–04	1.25E–10	0.00E+00	1.42E–05
Cranberry	4.63E–08	3.17E–04	0.00E+00	3.28E–10	3.01E–04	5.09E–11	0.00E+00	1.29E–05
Chlaenius sulcicollis	5.18E–08	3.45E–04	0.00E+00	2.48E–10	3.24E–04	1.63E–11	0.00E+00	1.30E–05
Common toad	4.97E–08	3.42E–04	0.00E+00	2.43E–10	3.20E–04	1.59E–11	0.00E+00	1.28E–05
Common reed	1.08E–07	3.35E–04	0.00E+00	8.20E–10	3.18E–04	1.25E–10	0.00E+00	1.42E–05
European water vole	4.91E–08	3.40E–04	0.00E+00	2.42E–10	3.18E–04	1.58E–11	0.00E+00	1.27E–05
Sphagnum sp.	1.08E–07	3.35E–04	0.00E+00	8.20E–10	3.18E–04	1.25E–10	0.00E+00	1.42E–05
Marsh fritillary	5.01E–08	3.43E–04	0.00E+00	2.44E–10	3.21E–04	1.60E–11	0.00E+00	1.28E–05
Nephroma laevigatum	5.01E–08	3.43E–04	0.00E+00	2.44E–10	3.21E–04	1.60E–11	0.00E+00	1.28E–05
Eurasian elk (U.S.: Moose)	4.75E–09	1.17E–04	0.00E+00	3.28E–11	9.68E–05	2.03E–12	0.00E+00	2.84E–06
Singa nitidula	5.18E–08	3.45E–04	0.00E+00	2.48E–10	3.24E–04	1.63E–11	0.00E+00	1.30E–05
European otter (T)	3.72E–08	2.91E–04	0.00E+00	1.93E–10	2.66E–04	1.25E–11	0.00E+00	1.04E–05
White-tailed eagle(T)	4.24E–08	3.09E–04	0.00E+00	2.15E–10	2.85E–04	1.40E–11	0.00E+00	1.14E–05
Common kingfisher(T)	5.01E–08	3.43E–04	0.00E+00	2.44E–10	3.21E–04	1.60E–11	0.00E+00	1.28E–05
Ruddy turnstone(T)	4.82E–08	3.32E–04	0.00E+00	2.35E–10	3.09E–04	1.55E–11	0.00E+00	1.23E–05
Northern crested newt (T)	4.93E–08	3.41E–04	0.00E+00	2.43E–10	3.19E–04	1.58E–11	0.00E+00	1.27E–05
Black tern(T)	4.97E–08	3.42E–04	0.00E+00	2.43E–10	3.20E–04	1.59E–11	0.00E+00	1.28E–05
European otter(T)	3.72E–08	2.91E–04	0.00E+00	1.93E–10	2.66E–04	1.25E–11	0.00E+00	1.04E–05
Ringed seal(T)	1.72E–08	2.23E–04	0.00E+00	1.10E–10	1.99E–04	6.64E–12	0.00E+00	7.13E–06
Sea birds (T)	4.55E–08	3.21E–04	0.00E+00	2.25E–10	2.98E–04	1.48E–11	0.00E+00	1.19E–05

Table F-8. Continued.

Representative species	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma on soil continued							
	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
Pygmy damselfly	7.07E–08	4.27E–08	8.71E–08	6.92E–08	2.93E–05	5.82E–08	4.79E–08	0.00E+00
Pool frog	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European alder	4.44E–08	2.07E–08	4.69E–08	1.78E–08	2.37E–05	1.10E–08	6.88E–09	0.00E+00
Silver birch	4.44E–08	2.07E–08	4.69E–08	1.78E–08	2.37E–05	1.10E–08	6.88E–09	0.00E+00
Dwarf neckera	7.07E–08	4.27E–08	8.71E–08	6.92E–08	2.93E–05	5.82E–08	4.79E–08	0.00E+00
Ruff	6.97E–08	4.21E–08	8.57E–08	6.78E–08	2.90E–05	5.70E–08	4.69E–08	0.00E+00
Lumbricus sp.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bottle sedge	1.41E–07	1.10E–07	1.30E–07	1.36E–07	3.07E–05	1.20E–07	1.02E–07	0.00E+00
Natterer’s bat	7.07E–08	4.27E–08	8.71E–08	6.92E–08	2.93E–05	5.82E–08	4.79E–08	0.00E+00
European hare	2.52E–08	1.35E–08	3.03E–08	1.71E–08	1.29E–05	1.33E–08	1.03E–08	0.00E+00
Norway spruce	4.44E–08	2.07E–08	4.69E–08	1.78E–08	2.37E–05	1.10E–08	6.88E–09	0.00E+00
Common grasshopper warbler	7.07E–08	4.27E–08	8.71E–08	6.92E–08	2.93E–05	5.82E–08	4.79E–08	0.00E+00
Large gold grasshopper	7.19E–08	4.38E–08	8.91E–08	7.17E–08	2.96E–05	6.06E–08	5.00E–08	0.00E+00
Yellow widelip orchid	1.41E–07	1.10E–07	1.30E–07	1.36E–07	3.07E–05	1.20E–07	1.02E–07	0.00E+00
Cloudberry	7.83E–08	5.01E–08	7.91E–08	5.95E–08	2.83E–05	4.87E–08	3.95E–08	0.00E+00
Short-eared owl (AIR)	6.87E–08	4.15E–08	8.45E–08	6.71E–08	2.85E–05	5.64E–08	4.64E–08	0.00E+00
Geyer’s whorl snail	7.17E–08	4.35E–08	8.87E–08	7.11E–08	2.96E–05	6.00E–08	4.95E–08	0.00E+00
Slender green feather moss	1.41E–07	1.10E–07	1.30E–07	1.36E–07	3.07E–05	1.20E–07	1.02E–07	0.00E+00
Eurasian lynx	3.69E–08	2.03E–08	4.40E–08	2.71E–08	1.79E–05	2.15E–08	1.69E–08	0.00E+00
Flea sedge	1.41E–07	1.10E–07	1.30E–07	1.36E–07	3.07E–05	1.20E–07	1.02E–07	0.00E+00
Omphalina philonotis	1.41E–07	1.10E–07	1.30E–07	1.36E–07	3.07E–05	1.20E–07	1.02E–07	0.00E+00
Red fox	5.58E–08	3.32E–08	6.77E–08	5.14E–08	2.38E–05	4.28E–08	3.49E–08	0.00E+00
Roe deer	3.67E–08	2.02E–08	4.38E–08	2.70E–08	1.78E–05	2.13E–08	1.68E–08	0.00E+00
Yellow foot	1.41E–07	1.10E–07	1.30E–07	1.36E–07	3.07E–05	1.20E–07	1.02E–07	0.00E+00
Eurasian bittern	6.50E–08	3.92E–08	7.95E–08	6.27E–08	2.70E–05	5.27E–08	4.33E–08	0.00E+00
Knowlton’s thread-moss	1.41E–07	1.10E–07	1.30E–07	1.36E–07	3.07E–05	1.20E–07	1.02E–07	0.00E+00
Mountain hare	2.52E–08	1.35E–08	3.03E–08	1.71E–08	1.29E–05	1.33E–08	1.03E–08	0.00E+00
Spotted crake	6.50E–08	3.92E–08	7.95E–08	6.27E–08	2.70E–05	5.27E–08	4.33E–08	0.00E+00
Grass snake	6.74E–08	4.08E–08	8.29E–08	6.60E–08	2.79E–05	5.56E–08	4.58E–08	0.00E+00
Scots pine	4.44E–08	2.07E–08	4.69E–08	1.78E–08	2.37E–05	1.10E–08	6.88E–09	0.00E+00
Scapania apiculata	1.41E–07	1.10E–07	1.30E–07	1.36E–07	3.07E–05	1.20E–07	1.02E–07	0.00E+00
Cranberry	7.83E–08	5.01E–08	7.91E–08	5.95E–08	2.83E–05	4.87E–08	3.95E–08	0.00E+00
Chlaenius sulcicollis	7.19E–08	4.38E–08	8.91E–08	7.17E–08	2.96E–05	6.06E–08	5.00E–08	0.00E+00
Common toad	7.04E–08	4.25E–08	8.66E–08	6.87E–08	2.92E–05	5.78E–08	4.76E–08	0.00E+00
Common reed	1.41E–07	1.10E–07	1.30E–07	1.36E–07	3.07E–05	1.20E–07	1.02E–07	0.00E+00
European water vole	6.97E–08	4.21E–08	8.57E–08	6.78E–08	2.90E–05	5.70E–08	4.69E–08	0.00E+00
Sphagnum sp.	1.41E–07	1.10E–07	1.30E–07	1.36E–07	3.07E–05	1.20E–07	1.02E–07	0.00E+00
Marsh fritillary	7.07E–08	4.27E–08	8.71E–08	6.92E–08	2.93E–05	5.82E–08	4.79E–08	0.00E+00
Nephroma laevigatum	7.07E–08	4.27E–08	8.71E–08	6.92E–08	2.93E–05	5.82E–08	4.79E–08	0.00E+00
Eurasian elk (U.S.: Moose)	1.24E–08	6.23E–09	1.58E–08	7.34E–09	7.16E–06	5.47E–09	4.09E–09	0.00E+00
Singa nitidula	7.19E–08	4.38E–08	8.91E–08	7.17E–08	2.96E–05	6.06E–08	5.00E–08	0.00E+00
European otter (T)	5.58E–08	3.32E–08	6.77E–08	5.14E–08	2.38E–05	4.28E–08	3.49E–08	0.00E+00
White-tailed eagle(T)	6.18E–08	3.71E–08	7.50E–08	5.86E–08	2.58E–05	4.90E–08	4.02E–08	0.00E+00
Common kingfisher(T)	7.07E–08	4.27E–08	8.71E–08	6.92E–08	2.93E–05	5.82E–08	4.79E–08	0.00E+00
Ruddy turnstone(T)	6.80E–08	4.12E–08	8.36E–08	6.65E–08	2.81E–05	5.60E–08	4.61E–08	0.00E+00
Northern crested newt (T)	7.00E–08	4.23E–08	8.61E–08	6.82E–08	2.91E–05	5.73E–08	4.71E–08	0.00E+00
Black tern(T)	7.03E–08	4.25E–08	8.65E–08	6.86E–08	2.92E–05	5.77E–08	4.75E–08	0.00E+00
European otter(T)	5.58E–08	3.32E–08	6.77E–08	5.14E–08	2.38E–05	4.28E–08	3.49E–08	0.00E+00
Ringed seal(T)	3.43E–08	1.88E–08	4.09E–08	2.48E–08	1.68E–05	1.95E–08	1.53E–08	0.00E+00
Sea birds (T)	6.50E–08	3.92E–08	7.95E–08	6.27E–08	2.70E–05	5.27E–08	4.33E–08	0.00E+00

Table F-9. Dose conversion coefficients for internal exposure of freshwater representative species to alpha, low energy beta (≤ 10 keV) and high energy beta (> 10 keV) /gamma radiation (µGy/h)/(Bq/kg).

Representative Species	Dose Conversion Coefficient of internal alpha radiation																		
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m	I-129	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210
European perch	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Duck mussel	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Asp	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Bagous binodulus	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Bagous petro	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Grasswrack pondweed	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Donacia brevitarsis	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Three-lined soldier	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Common pochard	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0 .0E+0	2.8E-3	2.9E-3	0.0E+0
Sigara hellensii	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Chironomidae sp.	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Cloeon schoenemundi	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Donacia dentata	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Pygmy damselfly	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Least stonewort	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
European eel	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Depressed river mussel	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
European crayfish	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Water pygmyweed	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Clubbed general	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Northern pike	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Ruffe	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Pool frog	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Hydaticus continentalis	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Hydrochus megaphallus	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Tanymastix stagnalis	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Chara sp.	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Common kingfisher	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Burbot	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Clam shrimp	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Macroplea appendiculata	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Sheatfish	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0

Representative Species	Dose Conversion Coefficient of internal alpha radiation																		
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m	I-129	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210
Common roach	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Elatine orthosperma	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Anisus spirorbis	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Spatulaleaf loosestrife	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Signal crayfish	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Alisma wahlenbergii	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Tadpole shrimp	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Sphagnum (Subm.) (FW)	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Rugged stonewort	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Slender stonewort	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Starry stonewort	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Bittercress	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Shetland pondweed	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Northern crested newt	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Large mouthed valve snail	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Tench	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Horned grebe	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Black tern	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Thick shelled river mussel	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Flat-stalked pondweed	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Pointed stonewort	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
European otter	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Common toad (FW)	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Water vole (FW)	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Vimba bream	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Slimy-fruited stonewort	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
RS Zooplankton	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Painter's mussel	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Water mudwort	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Persicaria foliosa	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
Microphytobenthos	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0
RS Phytoplankton	3.9E-5	0.0E+0	3.2E-3	3.0E-3	0.0E+0	0.0E+0	0.0E+0	3.3E-3	3.1E-3	3.1E-3	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.9E-3	0.0E+0

Table F-9. Continued

Representative Species	Dose Conversion Coefficient of internal alpha radiation																			
	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226	Se-79	Sm-151	Sn-126	Sr-90	Tc-99	Th-229	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
European perch	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Duck mussel	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Asp	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Bagous binodulus	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Bagous petro	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Grasswrack pondweed	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Donacia brevitarsis	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Three-lined soldier	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Common pochard	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Sigara hellensii	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Chironomidae sp.	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Cloeon schoenemundi	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Donacia dentata	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Pygmy damselfly	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Least stonewort	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
European eel	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Depressed river mussel	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
European crayfish	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Water pygmyweed	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Clubbed general	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Northern pike	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Ruffe	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Pool frog	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Hydaticus continentalis	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Hydrochus megaphallus	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Tanymastix stagnalis	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Chara sp.	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Common kingfisher	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Burbot	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Clam shrimp	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Macroplea appendiculata	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Sheatfish	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0

Representative Species	Dose Conversion Coefficient of internal alpha radiation																			
	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226	Se-79	Sm-151	Sn-126	Sr-90	Tc-99	Th-229	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
Common roach	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Elatine orthosperma	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Anisus spirorbis	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Spatulaleaf loosestrife	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Signal crayfish	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Alisma wahlenbergii	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Tadpole shrimp	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Sphagnum (Subm.) (FW)	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Rugged stonewort	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Slender stonewort	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Starry stonewort	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Bittercress	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Shetland pondweed	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Northern crested newt	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Large mouthed valve snail	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Tench	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Horned grebe	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Black tern	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Thick shelled river mussel	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Flat-stalked pondweed	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Pointed stonewort	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
European otter	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Common toad (FW)	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Water vole (FW)	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Vimba bream	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Slimy-fruited stonewort	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
RS Zooplankton	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Painter's mussel	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Water mudwort	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Persicaria foliosa	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
Microphytobenthos	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0
RS Phytoplankton	0.0E+0	3.1E-3	3.0E-3	3.0E-3	2.8E-3	1.4E-2	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-3	2.7E-3	2.3E-3	2.8E-3	2.7E-3	2.5E-3	2.6E-3	2.4E-3	0.0E+0

Table F-9. Continued

Representative Species	Dose Conversion Coefficient of internal low-energy beta (≤10 keV) beta radiation																		
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m	I-129	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210
European perch	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Duck mussel	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Asp	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Bagous binodulus	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Bagous petro	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Grasswrack pondweed	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Donacia brevitarsis	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Three-lined soldier	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Common pochard	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Sigara hellensii	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Chironomidae sp.	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Cloeon schoenemundi	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Donacia dentata	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Pygmy damselfly	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Least stonewort	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
European eel	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Depressed river mussel	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
European crayfish	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Water pygmyweed	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Clubbed general	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Northern pike	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Ruffe	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Pool frog	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Hydaticus continentalis	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Hydrochus megaphallus	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Tanymastix stagnalis	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Chara sp.	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Common kingfisher	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Burbot	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Clam shrimp	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Macroplea appendiculata	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Sheatfish	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6

Representative Species	Dose Conversion Coefficient of internal low-energy beta (≤10 keV) beta radiation																		
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m	I-129	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210
Common roach	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Elatine orthosperma	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Anisus spirorbis	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Spatulaleaf loosestrife	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Signal crayfish	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Alisma wahlenbergii	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Tadpole shrimp	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Sphagnum (Subm.) (FW)	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Rugged stonewort	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Slender stonewort	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Starry stonewort	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Bittercress	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Shetland pondweed	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Northern crested newt	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Large mouthed valve snail	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Tench	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Horned grebe	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Black tern	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Thick shelled river mussel	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Flat-stalked pondweed	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Pointed stonewort	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
European otter	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Common toad (FW)	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Water vole (FW)	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Vimba bream	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Slimy-fruited stonewort	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
RS Zooplankton	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Painter's mussel	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Water mudwort	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Persicaria foliosa	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
Microphytobenthos	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6
RS Phytoplankton	4.4E-6	1.8E-6	5.7E-6	9.7E-6	3.7E-7	1.3E-6	6.9E-8	7.6E-7	4.9E-6	6.8E-7	3.0E-7	3.7E-7	5.4E-6	4.9E-6	1.3E-7	2.6E-6	1.2E-6	5.5E-6	7.6E-6	4.2E-6

Table F-9. Continued

Representative Species	Dose Conversion Coefficient of internal low-energy beta (≤10 keV) beta radiation																			
	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226	Se-79	Sm-151	Sn-126	Sr-90	Tc-99	Th-229	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
European perch	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Duck mussel	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Asp	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Bagous binodulus	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Bagous petro	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Grasswrack pondweed	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Donacia brevitarsis	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Three-lined soldier	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Common pochard	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Sigara hellensii	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Chironomidae sp.	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Cloeon schoenemundi	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Donacia dentata	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Pygmy damselfly	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Least stonewort	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
European eel	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Depressed river mussel	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
European crayfish	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Water pygmyweed	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Clubbed general	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Northern pike	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Ruffe	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Pool frog	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Hydaticus continentalis	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Hydrochus megaphallus	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Tanymastix stagnalis	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Chara sp.	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Common kingfisher	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Burbot	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Clam shrimp	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Macroplea appendiculata	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Sheatfish	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7

Representative Species	Dose Conversion Coefficient of internal low-energy beta (≤10 keV) beta radiation																			
	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226	Se-79	Sm-151	Sn-126	Sr-90	Tc-99	Th-229	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
Common roach	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Elatine orthosperma	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Anisus spirorbis	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Spatulaleaf loosestrife	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Signal crayfish	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Alisma wahlenbergii	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Tadpole shrimp	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Sphagnum (Subm.) (FW)	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Rugged stonewort	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Slender stonewort	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Starry stonewort	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Bittercress	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Shetland pondweed	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Northern crested newt	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Large mouthed valve snail	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Tench	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Horned grebe	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Black tern	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Thick shelled river mussel	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Flat-stalked pondweed	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Pointed stonewort	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
European otter	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Common toad (FW)	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Water vole (FW)	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Vimba bream	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Slimy-fruited stonewort	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
RS Zooplankton	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Painter's mussel	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Water mudwort	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Persicaria foliosa	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
Microphytobenthos	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7
RS Phytoplankton	1.8E-6	3.7E-13	1.2E-6	8.3E-7	6.9E-7	1.6E-6	3.2E-7	1.1E-6	3.7E-6	1.1E-7	2.0E-7	9.8E-6	6.5E-7	6.4E-7	5.9E-7	8.1E-7	1.2E-5	7.6E-7	6.7E-7	9.8E-7

Table F-9. Continued

Representative Species	Dose Conversion Coefficient of internal high energy beta (> 10 keV) and gamma																		
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m	I-129	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210
European perch	4.7E-6	9.2E-5	2.9E-5	1.6E-4	2.8E-5	2.4E-7	1.5E-4	4.8E-6	3.9E-5	4.5E-6	3.9E-5	1.6E-4	1.3E-4	3.5E-5	1.4E-4	1.3E-6	8.7E-6	4.0E-5	3.6E-5	2.4E-4
Duck mussel	4.7E-6	9.0E-5	2.9E-5	1.6E-4	2.8E-5	2.4E-7	1.5E-4	4.8E-6	3.9E-5	4.5E-6	3.8E-5	1.6E-4	1.2E-4	3.5E-5	1.4E-4	1.3E-6	8.7E-6	4.0E-5	3.6E-5	2.4E-4
Asp	4.7E-6	9.2E-5	2.9E-5	1.6E-4	2.8E-5	2.4E-7	1.5E-4	4.8E-6	3.9E-5	4.5E-6	3.9E-5	1.6E-4	1.3E-4	3.5E-5	1.4E-4	1.3E-6	8.7E-6	4.0E-5	3.6E-5	2.4E-4
Bagous binodulus	4.7E-6	1.9E-5	2.5E-5	1.4E-4	2.7E-5	1.8E-7	1.1E-4	4.2E-6	3.2E-5	4.0E-6	3.7E-5	9.8E-5	6.7E-5	3.1E-5	8.1E-5	7.0E-7	8.6E-6	3.5E-5	3.0E-5	1.3E-4
Bagous petro	4.7E-6	1.9E-5	2.5E-5	1.4E-4	2.7E-5	1.8E-7	1.1E-4	4.2E-6	3.2E-5	4.0E-6	3.7E-5	9.8E-5	6.7E-5	3.1E-5	8.1E-5	7.0E-7	8.6E-6	3.5E-5	3.0E-5	1.3E-4
Grasswrack pondweed	4.7E-6	2.8E-5	2.5E-5	1.4E-4	2.8E-5	1.9E-7	1.2E-4	4.3E-6	3.3E-5	4.0E-6	3.7E-5	1.1E-4	7.1E-5	3.2E-5	8.4E-5	7.9E-7	8.7E-6	3.5E-5	3.0E-5	1.7E-4
Donacia brevitarsis	4.7E-6	1.9E-5	2.5E-5	1.4E-4	2.7E-5	1.8E-7	1.1E-4	4.2E-6	3.2E-5	4.0E-6	3.7E-5	9.8E-5	6.7E-5	3.1E-5	8.1E-5	7.0E-7	8.6E-6	3.5E-5	3.0E-5	1.3E-4
Three-lined soldier	4.7E-6	1.9E-5	2.5E-5	1.4E-4	2.7E-5	1.8E-7	1.1E-4	4.2E-6	3.2E-5	4.0E-6	3.7E-5	9.8E-5	6.7E-5	3.1E-5	8.1E-5	7.0E-7	8.6E-6	3.5E-5	3.0E-5	1.3E-4
Common pochard	4.7E-6	1.8E-4	3.3E-5	1.8E-4	2.8E-5	2.4E-7	1.6E-4	5.0E-6	4.6E-5	4.7E-6	3.9E-5	1.9E-4	2.2E-4	3.9E-5	2.2E-4	1.4E-6	8.7E-6	4.3E-5	3.9E-5	2.4E-4
Sigara hellensii	4.7E-6	1.9E-5	2.5E-5	1.4E-4	2.7E-5	1.8E-7	1.1E-4	4.2E-6	3.2E-5	4.0E-6	3.7E-5	9.8E-5	6.7E-5	3.1E-5	8.1E-5	7.0E-7	8.6E-6	3.5E-5	3.0E-5	1.3E-4
Chironomidae sp.	4.7E-6	1.9E-5	2.5E-5	1.4E-4	2.7E-5	1.8E-7	1.1E-4	4.2E-6	3.2E-5	4.0E-6	3.7E-5	9.8E-5	6.7E-5	3.1E-5	8.1E-5	7.0E-7	8.6E-6	3.5E-5	3.0E-5	1.3E-4
Cloeon schoenemundi	4.7E-6	1.9E-5	2.5E-5	1.4E-4	2.7E-5	1.8E-7	1.1E-4	4.2E-6	3.2E-5	4.0E-6	3.7E-5	9.8E-5	6.7E-5	3.1E-5	8.1E-5	7.0E-7	8.6E-6	3.5E-5	3.0E-5	1.3E-4
Donacia dentata	4.7E-6	1.9E-5	2.5E-5	1.4E-4	2.7E-5	1.8E-7	1.1E-4	4.2E-6	3.2E-5	4.0E-6	3.7E-5	9.8E-5	6.7E-5	3.1E-5	8.1E-5	7.0E-7	8.6E-6	3.5E-5	3.0E-5	1.3E-4
Pygmy damselfly	4.7E-6	1.9E-5	2.5E-5	1.4E-4	2.7E-5	1.8E-7	1.1E-4	4.2E-6	3.2E-5	4.0E-6	3.7E-5	9.8E-5	6.7E-5	3.1E-5	8.1E-5	7.0E-7	8.6E-6	3.5E-5	3.0E-5	1.3E-4
Least stonewort	4.7E-6	2.7E-5	2.5E-5	1.4E-4	2.8E-5	1.9E-7	1.2E-4	4.3E-6	3.3E-5	4.0E-6	3.7E-5	1.1E-4	7.0E-5	3.2E-5	8.5E-5	7.8E-7	8.7E-6	3.5E-5	3.0E-5	1.7E-4
European eel	4.7E-6	9.2E-5	2.9E-5	1.6E-4	2.8E-5	2.4E-7	1.5E-4	4.8E-6	3.9E-5	4.5E-6	3.9E-5	1.6E-4	1.3E-4	3.5E-5	1.4E-4	1.3E-6	8.7E-6	4.0E-5	3.6E-5	2.4E-4
Depressed river mussel	4.7E-6	9.0E-5	2.9E-5	1.6E-4	2.8E-5	2.4E-7	1.5E-4	4.8E-6	3.9E-5	4.5E-6	3.8E-5	1.6E-4	1.2E-4	3.5E-5	1.4E-4	1.3E-6	8.7E-6	4.0E-5	3.6E-5	2.4E-4
European crayfish	4.7E-6	1.2E-4	3.1E-5	1.7E-4	2.8E-5	2.4E-7	1.6E-4	4.9E-6	4.1E-5	4.6E-6	3.9E-5	1.7E-4	1.5E-4	3.7E-5	1.7E-4	1.3E-6	8.7E-6	4.1E-5	3.7E-5	2.4E-4
Water pygmyweed	4.7E-6	2.8E-5	2.5E-5	1.4E-4	2.8E-5	1.9E-7	1.2E-4	4.3E-6	3.3E-5	4.0E-6	3.7E-5	1.1E-4	7.1E-5	3.2E-5	8.4E-5	7.9E-7	8.7E-6	3.5E-5	3.0E-5	1.7E-4
Clubbed general	4.7E-6	1.9E-5	2.5E-5	1.4E-4	2.7E-5	1.8E-7	1.1E-4	4.2E-6	3.2E-5	4.0E-6	3.7E-5	9.8E-5	6.7E-5	3.1E-5	8.1E-5	7.0E-7	8.6E-6	3.5E-5	3.0E-5	1.3E-4
Northern pike	4.7E-6	9.1E-5	2.9E-5	1.6E-4	2.8E-5	2.4E-7	1.5E-4	4.8E-6	3.9E-5	4.5E-6	3.9E-5	1.6E-4	1.2E-4	3.5E-5	1.4E-4	1.3E-6	8.7E-6	4.0E-5	3.6E-5	2.4E-4
Ruffe	4.7E-6	2.8E-5	2.5E-5	1.4E-4	2.8E-5	1.9E-7	1.2E-4	4.3E-6	3.3E-5	4.0E-6	3.7E-5	1.1E-4	7.1E-5	3.2E-5	8.8E-5	8.2E-7	8.7E-6	3.6E-5	3.0E-5	1.7E-4
Pool frog	4.7E-6	7.1E-5	2.8E-5	1.6E-4	2.8E-5	2.3E-7	1.5E-4	4.7E-6	3.7E-5	4.4E-6	3.8E-5	1.5E-4	1.1E-4	3.4E-5	1.3E-4	1.3E-6	8.7E-6	3.9E-5	3.4E-5	2.3E-4
Hydaticus continentalis	4.7E-6	1.9E-5	2.5E-5	1.4E-4	2.7E-5	1.8E-7	1.1E-4	4.2E-6	3.2E-5	4.0E-6	3.7E-5	9.8E-5	6.7E-5	3.1E-5	8.1E-5	7.0E-7	8.6E-6	3.5E-5	3.0E-5	1.3E-4
Hydrochus megaphallus	4.7E-6	1.9E-5	2.5E-5	1.4E-4	2.7E-5	1.8E-7	1.1E-4	4.2E-6	3.2E-5	4.0E-6	3.7E-5	9.8E-5	6.7E-5	3.1E-5	8.1E-5	7.0E-7	8.6E-6	3.5E-5	3.0E-5	1.3E-4
Tanymastix stagnalis	4.7E-6	1.8E-5	2.5E-5	1.4E-4	2.7E-5	1.8E-7	1.0E-4	4.2E-6	3.2E-5	4.0E-6	3.6E-5	9.6E-5	6.6E-5	3.1E-5	7.9E-5	6.9E-7	8.6E-6	3.5E-5	3.0E-5	1.3E-4
Chara sp.	4.7E-6	2.7E-5	2.5E-5	1.4E-4	2.8E-5	1.9E-7	1.2E-4	4.3E-6	3.3E-5	4.0E-6	3.7E-5	1.1E-4	7.0E-5	3.2E-5	8.5E-5	7.8E-7	8.7E-6	3.5E-5	3.0E-5	1.7E-4
Common kingfisher	4.7E-6	7.4E-5	2.8E-5	1.6E-4	2.8E-5	2.3E-7	1.5E-4	4.7E-6	3.7E-5	4.4E-6	3.8E-5	1.5E-4	1.1E-4	3.4E-5	1.3E-4	1.3E-6	8.7E-6	3.9E-5	3.5E-5	2.3E-4
Burbot	4.7E-6	9.2E-5	2.9E-5	1.6E-4	2.8E-5	2.4E-7	1.5E-4	4.8E-6	3.9E-5	4.5E-6	3.9E-5	1.6E-4	1.3E-4	3.5E-5	1.4E-4	1.3E-6	8.7E-6	4.0E-5	3.6E-5	2.4E-4
Clam shrimp	4.7E-6	1.8E-5	2.5E-5	1.4E-4	2.7E-5	1.8E-7	1.0E-4	4.2E-6	3.2E-5	4.0E-6	3.6E-5	9.6E-5	6.6E-5	3.1E-5	7.9E-5	6.9E-7	8.6E-6	3.5E-5	3.0E-5	1.3E-4
Macroplea appendiculata	4.7E-6	1.9E-5	2.5E-5	1.4E-4	2.7E-5	1.8E-7	1.1E-4	4.2E-6	3.2E-5	4.0E-6	3.7E-5	9.8E-5	6.7E-5	3.1E-5	8.1E-5	7.0E-7	8.6E-6	3.5E-5	3.0E-5	1.3E-4
Sheatfish	4.7E-6	1.7E-4	3.2E-5	1.8E-4	2.8E-5	2.4E-7	1.6E-4	5.0E-6	4.5E-5	4.7E-6	3.9E-5	1.9E-4	2.1E-4	3.9E-5	2.2E-4	1.4E-6	8.7E-6	4.3E-5	3.9E-5	2.4E-4

Representative Species	Dose Conversion Coefficient of internal high energy beta (> 10 keV) and gamma																		
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m	I-129	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210
Common roach	4.7E-6	9.3E-5	2.9E-5	1.6E-4	2.8E-5	2.4E-7	1.5E-4	4.8E-6	3.9E-5	4.5E-6	3.9E-5	1.6E-4	1.3E-4	3.5E-5	1.4E-4	1.3E-6	8.7E-6	4.0E-5	3.6E-5	2.4E-4
Elatine orthosperma	4.7E-6	2.8E-5	2.5E-5	1.4E-4	2.8E-5	1.9E-7	1.2E-4	4.3E-6	3.3E-5	4.0E-6	3.7E-5	1.1E-4	7.1E-5	3.2E-5	8.4E-5	7.9E-7	8.7E-6	3.5E-5	3.0E-5	1.7E-4
Anisus spirorbis	4.7E-6	2.0E-5	2.5E-5	1.4E-4	2.7E-5	1.9E-7	1.1E-4	4.3E-6	3.2E-5	4.0E-6	3.7E-5	1.0E-4	6.8E-5	3.1E-5	8.3E-5	7.5E-7	8.6E-6	3.5E-5	3.0E-5	1.4E-4
Spatulaleaf loosestrife	4.7E-6	2.8E-5	2.5E-5	1.4E-4	2.8E-5	1.9E-7	1.2E-4	4.3E-6	3.3E-5	4.0E-6	3.7E-5	1.1E-4	7.1E-5	3.2E-5	8.4E-5	7.9E-7	8.7E-6	3.5E-5	3.0E-5	1.7E-4
Signal crayfish	4.7E-6	1.8E-5	2.5E-5	1.4E-4	2.7E-5	1.8E-7	1.0E-4	4.2E-6	3.2E-5	4.0E-6	3.6E-5	9.6E-5	6.6E-5	3.1E-5	7.9E-5	6.9E-7	8.6E-6	3.5E-5	3.0E-5	1.3E-4
Alisma wahlenbergii	4.7E-6	2.8E-5	2.5E-5	1.4E-4	2.8E-5	1.9E-7	1.2E-4	4.3E-6	3.3E-5	4.0E-6	3.7E-5	1.1E-4	7.1E-5	3.2E-5	8.4E-5	7.9E-7	8.7E-6	3.5E-5	3.0E-5	1.7E-4
Tadpole shrimp	4.7E-6	1.8E-5	2.5E-5	1.4E-4	2.7E-5	1.8E-7	1.0E-4	4.2E-6	3.2E-5	4.0E-6	3.6E-5	9.6E-5	6.6E-5	3.1E-5	7.9E-5	6.9E-7	8.6E-6	3.5E-5	3.0E-5	1.3E-4
Sphagnum (Subm.) (FW)	4.7E-6	2.6E-5	2.5E-5	1.4E-4	2.8E-5	1.9E-7	1.2E-4	4.3E-6	3.3E-5	4.0E-6	3.7E-5	1.1E-4	7.0E-5	3.2E-5	8.7E-5	8.0E-7	8.7E-6	3.5E-5	3.0E-5	1.7E-4
Rugged stonewort	4.7E-6	2.7E-5	2.5E-5	1.4E-4	2.8E-5	1.9E-7	1.2E-4	4.3E-6	3.3E-5	4.0E-6	3.7E-5	1.1E-4	7.0E-5	3.2E-5	8.5E-5	7.8E-7	8.7E-6	3.5E-5	3.0E-5	1.7E-4
Slender stonewort	4.7E-6	2.7E-5	2.5E-5	1.4E-4	2.8E-5	1.9E-7	1.2E-4	4.3E-6	3.3E-5	4.0E-6	3.7E-5	1.1E-4	7.0E-5	3.2E-5	8.5E-5	7.8E-7	8.7E-6	3.5E-5	3.0E-5	1.7E-4
Starry stonewort	4.7E-6	2.7E-5	2.5E-5	1.4E-4	2.8E-5	1.9E-7	1.2E-4	4.3E-6	3.3E-5	4.0E-6	3.7E-5	1.1E-4	7.0E-5	3.2E-5	8.5E-5	7.8E-7	8.7E-6	3.5E-5	3.0E-5	1.7E-4
Bittercress	4.7E-6	2.8E-5	2.5E-5	1.4E-4	2.8E-5	1.9E-7	1.2E-4	4.3E-6	3.3E-5	4.0E-6	3.7E-5	1.1E-4	7.1E-5	3.2E-5	8.4E-5	7.9E-7	8.7E-6	3.5E-5	3.0E-5	1.7E-4
Shetland pondweed	4.7E-6	2.8E-5	2.5E-5	1.4E-4	2.8E-5	1.9E-7	1.2E-4	4.3E-6	3.3E-5	4.0E-6	3.7E-5	1.1E-4	7.1E-5	3.2E-5	8.4E-5	7.9E-7	8.7E-6	3.5E-5	3.0E-5	1.7E-4
Northern crested newt	4.7E-6	9.4E-5	2.9E-5	1.6E-4	2.8E-5	2.4E-7	1.5E-4	4.8E-6	3.9E-5	4.5E-6	3.8E-5	1.6E-4	1.3E-4	3.5E-5	1.5E-4	1.3E-6	8.7E-6	4.0E-5	3.6E-5	2.4E-4
Large mouthed valve snail	4.7E-6	2.2E-5	2.5E-5	1.4E-4	2.8E-5	1.9E-7	1.2E-4	4.3E-6	3.3E-5	4.0E-6	3.7E-5	1.1E-4	6.9E-5	3.2E-5	8.5E-5	7.9E-7	8.6E-6	3.5E-5	3.0E-5	1.5E-4
Tench	4.7E-6	9.9E-5	3.0E-5	1.7E-4	2.8E-5	2.4E-7	1.5E-4	4.9E-6	4.0E-5	4.5E-6	3.9E-5	1.6E-4	1.3E-4	3.6E-5	1.5E-4	1.3E-6	8.7E-6	4.0E-5	3.6E-5	2.4E-4
Horned grebe	4.7E-6	1.8E-4	3.3E-5	1.8E-4	2.8E-5	2.4E-7	1.6E-4	5.0E-6	4.6E-5	4.7E-6	3.9E-5	1.9E-4	2.2E-4	3.9E-5	2.2E-4	1.4E-6	8.7E-6	4.3E-5	3.9E-5	2.4E-4
Black tern	4.7E-6	7.9E-5	2.9E-5	1.6E-4	2.8E-5	2.4E-7	1.5E-4	4.7E-6	3.8E-5	4.4E-6	3.8E-5	1.5E-4	1.1E-4	3.4E-5	1.3E-4	1.3E-6	8.7E-6	3.9E-5	3.5E-5	2.3E-4
Thick shelled river mussel	4.7E-6	9.0E-5	2.9E-5	1.6E-4	2.8E-5	2.4E-7	1.5E-4	4.8E-6	3.9E-5	4.5E-6	3.8E-5	1.6E-4	1.2E-4	3.5E-5	1.4E-4	1.3E-6	8.7E-6	4.0E-5	3.6E-5	2.4E-4
Flat-stalked pondweed	4.7E-6	2.8E-5	2.5E-5	1.4E-4	2.8E-5	1.9E-7	1.2E-4	4.3E-6	3.3E-5	4.0E-6	3.7E-5	1.1E-4	7.1E-5	3.2E-5	8.4E-5	7.9E-7	8.7E-6	3.5E-5	3.0E-5	1.7E-4
Pointed stonewort	4.7E-6	2.7E-5	2.5E-5	1.4E-4	2.8E-5	1.9E-7	1.2E-4	4.3E-6	3.3E-5	4.0E-6	3.7E-5	1.1E-4	7.0E-5	3.2E-5	8.5E-5	7.8E-7	8.7E-6	3.5E-5	3.0E-5	1.7E-4
European otter	4.7E-6	2.6E-4	3.5E-5	1.9E-4	2.8E-5	2.4E-7	1.6E-4	5.1E-6	5.2E-5	4.7E-6	3.9E-5	2.2E-4	3.0E-4	4.1E-5	2.9E-4	1.4E-6	8.7E-6	4.5E-5	4.2E-5	2.4E-4
Common toad (FW)	4.7E-6	9.0E-5	2.9E-5	1.6E-4	2.8E-5	2.4E-7	1.5E-4	4.8E-6	3.9E-5	4.5E-6	3.8E-5	1.6E-4	1.2E-4	3.5E-5	1.4E-4	1.3E-6	8.7E-6	4.0E-5	3.6E-5	2.4E-4
Water vole (FW)	4.7E-6	1.0E-4	3.0E-5	1.7E-4	2.8E-5	2.4E-7	1.5E-4	4.9E-6	4.0E-5	4.5E-6	3.9E-5	1.6E-4	1.4E-4	3.6E-5	1.5E-4	1.3E-6	8.7E-6	4.0E-5	3.6E-5	2.4E-4
Vimba bream	4.7E-6	9.2E-5	2.9E-5	1.6E-4	2.8E-5	2.4E-7	1.5E-4	4.8E-6	3.9E-5	4.5E-6	3.9E-5	1.6E-4	1.3E-4	3.5E-5	1.4E-4	1.3E-6	8.7E-6	4.0E-5	3.6E-5	2.4E-4
Slimy-fruited stonewort	4.7E-6	2.7E-5	2.5E-5	1.4E-4	2.8E-5	1.9E-7	1.2E-4	4.3E-6	3.3E-5	4.0E-6	3.7E-5	1.1E-4	7.0E-5	3.2E-5	8.5E-5	7.8E-7	8.7E-6	3.5E-5	3.0E-5	1.7E-4
RS Zooplankton	4.6E-6	1.2E-5	2.4E-5	1.3E-4	2.7E-5	1.8E-7	7.8E-5	4.2E-6	3.1E-5	3.9E-6	3.6E-5	7.6E-5	6.3E-5	3.1E-5	6.8E-5	6.3E-7	8.6E-6	3.4E-5	2.9E-5	9.5E-5
Painter's mussel	4.7E-6	9.0E-5	2.9E-5	1.6E-4	2.8E-5	2.4E-7	1.5E-4	4.8E-6	3.9E-5	4.5E-6	3.8E-5	1.6E-4	1.2E-4	3.5E-5	1.4E-4	1.3E-6	8.7E-6	4.0E-5	3.6E-5	2.4E-4
Water mudwort	4.7E-6	2.8E-5	2.5E-5	1.4E-4	2.8E-5	1.9E-7	1.2E-4	4.3E-6	3.3E-5	4.0E-6	3.7E-5	1.1E-4	7.1E-5	3.2E-5	8.4E-5	7.9E-7	8.7E-6	3.5E-5	3.0E-5	1.7E-4
Persicaria foliosa	4.7E-6	2.8E-5	2.5E-5	1.4E-4	2.8E-5	1.9E-7	1.2E-4	4.3E-6	3.3E-5	4.0E-6	3.7E-5	1.1E-4	7.1E-5	3.2E-5	8.4E-5	7.9E-7	8.7E-6	3.5E-5	3.0E-5	1.7E-4
Microphytobenthos	4.7E-6	2.8E-5	2.5E-5	1.4E-4	2.8E-5	1.9E-7	1.2E-4	4.3E-6	3.3E-5	4.0E-6	3.7E-5	1.1E-4	7.1E-5	3.2E-5	8.4E-5	7.9E-7	8.7E-6	3.5E-5	3.0E-5	1.7E-4
RS Phytoplankton	4.7E-6	2.8E-5	2.5E-5	1.4E-4	2.8E-5	1.9E-7	1.2E-4	4.3E-6	3.3E-5	4.0E-6	3.7E-5	1.1E-4	7.1E-5	3.2E-5	8.4E-5	7.9E-7	8.7E-6	3.5E-5	3.0E-5	1.7E-4

Table F-9. Continued

Representative Species	Dose Conversion Coefficient of internal high energy beta (> 10 keV) and gamma																			
	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226	Se-79	Sm-151	Sn-126	Sr-90	Tc-99	Th-229	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
European perch	2.4E-4	3.6E-6	3.1E-10	3.0E-6	5.9E-6	4.9E-6	5.7E-4	3.2E-5	4.7E-4	6.0E-4	5.8E-5	6.5E-5	8.3E-6	7.0E-6	3.5E-6	7.5E-6	1.2E-4	6.4E-6	5.6E-6	1.0E-5
Duck mussel	2.4E-4	3.6E-6	2.9E-10	3.0E-6	5.9E-6	4.9E-6	5.7E-4	3.2E-5	4.7E-4	6.0E-4	5.8E-5	6.4E-5	8.3E-6	7.0E-6	3.5E-6	7.5E-6	1.2E-4	6.4E-6	5.6E-6	1.0E-5
Asp	2.4E-4	3.6E-6	3.1E-10	3.0E-6	5.9E-6	4.9E-6	5.7E-4	3.2E-5	4.7E-4	6.0E-4	5.8E-5	6.5E-5	8.3E-6	7.0E-6	3.5E-6	7.5E-6	1.2E-4	6.4E-6	5.6E-6	1.0E-5
Bagous binodulus	1.3E-4	3.5E-6	2.4E-11	2.8E-6	5.3E-6	4.4E-6	2.5E-4	3.1E-5	2.0E-4	2.1E-4	5.3E-5	5.6E-5	7.7E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.1E-6	1.0E-5
Bagous petro	1.3E-4	3.5E-6	2.4E-11	2.8E-6	5.3E-6	4.4E-6	2.5E-4	3.1E-5	2.0E-4	2.1E-4	5.3E-5	5.6E-5	7.7E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.1E-6	1.0E-5
Grasswrack pondweed	1.7E-4	3.5E-6	4.8E-11	2.8E-6	5.4E-6	4.4E-6	3.3E-4	3.1E-5	2.7E-4	3.1E-4	5.3E-5	5.7E-5	7.8E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.2E-6	1.0E-5
Donacia brevitarsis	1.3E-4	3.5E-6	2.4E-11	2.8E-6	5.3E-6	4.4E-6	2.5E-4	3.1E-5	2.0E-4	2.1E-4	5.3E-5	5.6E-5	7.7E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.1E-6	1.0E-5
Three-lined soldier	1.3E-4	3.5E-6	2.4E-11	2.8E-6	5.3E-6	4.4E-6	2.5E-4	3.1E-5	2.0E-4	2.1E-4	5.3E-5	5.6E-5	7.7E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.1E-6	1.0E-5
Common pochard	2.4E-4	3.6E-6	7.3E-10	3.1E-6	6.2E-6	5.1E-6	6.7E-4	3.2E-5	5.7E-4	6.3E-4	5.8E-5	7.1E-5	8.4E-6	7.2E-6	3.6E-6	7.7E-6	1.4E-4	6.6E-6	5.8E-6	1.0E-5
Sigara hellensii	1.3E-4	3.5E-6	2.4E-11	2.8E-6	5.3E-6	4.4E-6	2.5E-4	3.1E-5	2.0E-4	2.1E-4	5.3E-5	5.6E-5	7.7E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.1E-6	1.0E-5
Chironomidae sp.	1.3E-4	3.5E-6	2.4E-11	2.8E-6	5.3E-6	4.4E-6	2.5E-4	3.1E-5	2.0E-4	2.1E-4	5.3E-5	5.6E-5	7.7E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.1E-6	1.0E-5
Cloeon schoenemundi	1.3E-4	3.5E-6	2.4E-11	2.8E-6	5.3E-6	4.4E-6	2.5E-4	3.1E-5	2.0E-4	2.1E-4	5.3E-5	5.6E-5	7.7E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.1E-6	1.0E-5
Donacia dentata	1.3E-4	3.5E-6	2.4E-11	2.8E-6	5.3E-6	4.4E-6	2.5E-4	3.1E-5	2.0E-4	2.1E-4	5.3E-5	5.6E-5	7.7E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.1E-6	1.0E-5
Pygmy damselfly	1.3E-4	3.5E-6	2.4E-11	2.8E-6	5.3E-6	4.4E-6	2.5E-4	3.1E-5	2.0E-4	2.1E-4	5.3E-5	5.6E-5	7.7E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.1E-6	1.0E-5
Least stonewort	1.7E-4	3.5E-6	4.5E-11	2.8E-6	5.4E-6	4.4E-6	3.2E-4	3.1E-5	2.6E-4	3.0E-4	5.3E-5	5.7E-5	7.8E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.2E-6	1.0E-5
European eel	2.4E-4	3.6E-6	3.1E-10	3.0E-6	5.9E-6	4.9E-6	5.7E-4	3.2E-5	4.7E-4	6.0E-4	5.8E-5	6.5E-5	8.3E-6	7.0E-6	3.5E-6	7.5E-6	1.2E-4	6.4E-6	5.6E-6	1.0E-5
Depressed river mussel	2.4E-4	3.6E-6	2.9E-10	3.0E-6	5.9E-6	4.9E-6	5.7E-4	3.2E-5	4.7E-4	6.0E-4	5.8E-5	6.4E-5	8.3E-6	7.0E-6	3.5E-6	7.5E-6	1.2E-4	6.4E-6	5.6E-6	1.0E-5
European crayfish	2.4E-4	3.6E-6	4.4E-10	3.1E-6	6.1E-6	5.0E-6	6.0E-4	3.2E-5	5.0E-4	6.2E-4	5.8E-5	6.7E-5	8.4E-6	7.1E-6	3.5E-6	7.6E-6	1.3E-4	6.5E-6	5.7E-6	1.0E-5
Water pygmyweed	1.7E-4	3.5E-6	4.8E-11	2.8E-6	5.4E-6	4.4E-6	3.3E-4	3.1E-5	2.7E-4	3.1E-4	5.3E-5	5.7E-5	7.8E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.2E-6	1.0E-5
Clubbed general	1.3E-4	3.5E-6	2.4E-11	2.8E-6	5.3E-6	4.4E-6	2.5E-4	3.1E-5	2.0E-4	2.1E-4	5.3E-5	5.6E-5	7.7E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.1E-6	1.0E-5
Northern pike	2.4E-4	3.6E-6	3.0E-10	3.0E-6	5.9E-6	4.9E-6	5.7E-4	3.2E-5	4.7E-4	6.0E-4	5.8E-5	6.5E-5	8.3E-6	7.0E-6	3.5E-6	7.5E-6	1.2E-4	6.4E-6	5.6E-6	1.0E-5
Ruffe	1.7E-4	3.5E-6	4.5E-11	2.8E-6	5.4E-6	4.4E-6	3.3E-4	3.1E-5	2.7E-4	3.0E-4	5.5E-5	5.7E-5	7.8E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.2E-6	1.0E-5
Pool frog	2.3E-4	3.6E-6	2.1E-10	3.0E-6	5.8E-6	4.8E-6	5.3E-4	3.2E-5	4.4E-4	5.8E-4	5.8E-5	6.3E-5	8.2E-6	7.0E-6	3.4E-6	7.4E-6	1.2E-4	6.3E-6	5.6E-6	1.0E-5
Hydaticus continentalis	1.3E-4	3.5E-6	2.4E-11	2.8E-6	5.3E-6	4.4E-6	2.5E-4	3.1E-5	2.0E-4	2.1E-4	5.3E-5	5.6E-5	7.7E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.1E-6	1.0E-5
Hydrochus megaphallus	1.3E-4	3.5E-6	2.4E-11	2.8E-6	5.3E-6	4.4E-6	2.5E-4	3.1E-5	2.0E-4	2.1E-4	5.3E-5	5.6E-5	7.7E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.1E-6	1.0E-5
Tanymastix stagnalis	1.3E-4	3.5E-6	2.2E-11	2.8E-6	5.3E-6	4.4E-6	2.4E-4	3.1E-5	1.9E-4	2.0E-4	5.2E-5	5.6E-5	7.7E-6	6.5E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.1E-6	1.0E-5
Chara sp.	1.7E-4	3.5E-6	4.5E-11	2.8E-6	5.4E-6	4.4E-6	3.2E-4	3.1E-5	2.6E-4	3.0E-4	5.3E-5	5.7E-5	7.8E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.2E-6	1.0E-5
Common kingfisher	2.3E-4	3.6E-6	2.2E-10	3.0E-6	5.8E-6	4.8E-6	5.4E-4	3.2E-5	4.4E-4	5.8E-4	5.8E-5	6.3E-5	8.2E-6	7.0E-6	3.4E-6	7.4E-6	1.2E-4	6.3E-6	5.6E-6	1.0E-5
Burbot	2.4E-4	3.6E-6	3.1E-10	3.0E-6	5.9E-6	4.9E-6	5.7E-4	3.2E-5	4.7E-4	6.0E-4	5.8E-5	6.5E-5	8.3E-6	7.0E-6	3.5E-6	7.5E-6	1.2E-4	6.4E-6	5.6E-6	1.0E-5
Clam shrimp	1.3E-4	3.5E-6	2.2E-11	2.8E-6	5.3E-6	4.4E-6	2.4E-4	3.1E-5	1.9E-4	2.0E-4	5.2E-5	5.6E-5	7.7E-6	6.5E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.1E-6	1.0E-5
Macroplea appendiculata	1.3E-4	3.5E-6	2.4E-11	2.8E-6	5.3E-6	4.4E-6	2.5E-4	3.1E-5	2.0E-4	2.1E-4	5.3E-5	5.6E-5	7.7E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.1E-6	1.0E-5
Sheatfish	2.4E-4	3.6E-6	6.9E-10	3.1E-6	6.2E-6	5.1E-6	6.6E-4	3.2E-5	5.6E-4	6.3E-4	5.8E-5	7.1E-5	8.4E-6	7.2E-6	3.6E-6	7.7E-6	1.3E-4	6.6E-6	5.8E-6	1.0E-5

Representative Species	Dose Conversion Coefficient of internal high energy beta (> 10 keV) and gamma																			
	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226	Se-79	Sm-151	Sn-126	Sr-90	Tc-99	Th-229	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
Common roach	2.4E-4	3.6E-6	3.1E-10	3.0E-6	5.9E-6	4.9E-6	5.7E-4	3.2E-5	4.7E-4	6.0E-4	5.8E-5	6.5E-5	8.3E-6	7.0E-6	3.5E-6	7.5E-6	1.2E-4	6.4E-6	5.6E-6	1.0E-5
Elatine orthosperma	1.7E-4	3.5E-6	4.8E-11	2.8E-6	5.4E-6	4.4E-6	3.3E-4	3.1E-5	2.7E-4	3.1E-4	5.3E-5	5.7E-5	7.8E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.2E-6	1.0E-5
Anisus spirorbis	1.4E-4	3.5E-6	2.6E-11	2.8E-6	5.3E-6	4.4E-6	2.6E-4	3.1E-5	2.1E-4	2.2E-4	5.4E-5	5.7E-5	7.8E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.2E-6	1.0E-5
Spatulaleaf loosestrife	1.7E-4	3.5E-6	4.8E-11	2.8E-6	5.4E-6	4.4E-6	3.3E-4	3.1E-5	2.7E-4	3.1E-4	5.3E-5	5.7E-5	7.8E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.2E-6	1.0E-5
Signal crayfish	1.3E-4	3.5E-6	2.2E-11	2.8E-6	5.3E-6	4.4E-6	2.4E-4	3.1E-5	1.9E-4	2.0E-4	5.2E-5	5.6E-5	7.7E-6	6.5E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.1E-6	1.0E-5
Alisma wahlenbergii	1.7E-4	3.5E-6	4.8E-11	2.8E-6	5.4E-6	4.4E-6	3.3E-4	3.1E-5	2.7E-4	3.1E-4	5.3E-5	5.7E-5	7.8E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.2E-6	1.0E-5
Tadpole shrimp	1.3E-4	3.5E-6	2.2E-11	2.8E-6	5.3E-6	4.4E-6	2.4E-4	3.1E-5	1.9E-4	2.0E-4	5.2E-5	5.6E-5	7.7E-6	6.5E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.1E-6	1.0E-5
Sphagnum (Subm.) (FW)	1.7E-4	3.5E-6	4.2E-11	2.8E-6	5.4E-6	4.4E-6	3.2E-4	3.1E-5	2.6E-4	2.9E-4	5.4E-5	5.7E-5	7.8E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.2E-6	1.0E-5
Rugged stonewort	1.7E-4	3.5E-6	4.5E-11	2.8E-6	5.4E-6	4.4E-6	3.2E-4	3.1E-5	2.6E-4	3.0E-4	5.3E-5	5.7E-5	7.8E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.2E-6	1.0E-5
Slender stonewort	1.7E-4	3.5E-6	4.5E-11	2.8E-6	5.4E-6	4.4E-6	3.2E-4	3.1E-5	2.6E-4	3.0E-4	5.3E-5	5.7E-5	7.8E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.2E-6	1.0E-5
Starry stonewort	1.7E-4	3.5E-6	4.5E-11	2.8E-6	5.4E-6	4.4E-6	3.2E-4	3.1E-5	2.6E-4	3.0E-4	5.3E-5	5.7E-5	7.8E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.2E-6	1.0E-5
Bittercress	1.7E-4	3.5E-6	4.8E-11	2.8E-6	5.4E-6	4.4E-6	3.3E-4	3.1E-5	2.7E-4	3.1E-4	5.3E-5	5.7E-5	7.8E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.2E-6	1.0E-5
Shetland pondweed	1.7E-4	3.5E-6	4.8E-11	2.8E-6	5.4E-6	4.4E-6	3.3E-4	3.1E-5	2.7E-4	3.1E-4	5.3E-5	5.7E-5	7.8E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.2E-6	1.0E-5
Northern crested newt	2.4E-4	3.6E-6	3.1E-10	3.0E-6	6.0E-6	4.9E-6	5.7E-4	3.2E-5	4.7E-4	6.0E-4	5.8E-5	6.5E-5	8.3E-6	7.1E-6	3.5E-6	7.5E-6	1.2E-4	6.4E-6	5.7E-6	1.0E-5
Large mouthed valve snail	1.5E-4	3.5E-6	3.0E-11	2.8E-6	5.4E-6	4.4E-6	2.8E-4	3.1E-5	2.2E-4	2.3E-4	5.4E-5	5.7E-5	7.8E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.2E-6	1.0E-5
Tench	2.4E-4	3.6E-6	3.4E-10	3.0E-6	6.0E-6	4.9E-6	5.8E-4	3.2E-5	4.8E-4	6.1E-4	5.8E-5	6.5E-5	8.3E-6	7.1E-6	3.5E-6	7.5E-6	1.2E-4	6.5E-6	5.7E-6	1.0E-5
Horned grebe	2.4E-4	3.6E-6	7.3E-10	3.1E-6	6.2E-6	5.1E-6	6.7E-4	3.2E-5	5.7E-4	6.3E-4	5.8E-5	7.1E-5	8.4E-6	7.2E-6	3.6E-6	7.7E-6	1.4E-4	6.6E-6	5.8E-6	1.0E-5
Black tern	2.3E-4	3.6E-6	2.5E-10	3.0E-6	5.9E-6	4.8E-6	5.5E-4	3.2E-5	4.5E-4	5.9E-4	5.8E-5	6.4E-5	8.2E-6	7.0E-6	3.4E-6	7.4E-6	1.2E-4	6.4E-6	5.6E-6	1.0E-5
Thick shelled river mussel	2.4E-4	3.6E-6	2.9E-10	3.0E-6	5.9E-6	4.9E-6	5.7E-4	3.2E-5	4.7E-4	6.0E-4	5.8E-5	6.4E-5	8.3E-6	7.0E-6	3.5E-6	7.5E-6	1.2E-4	6.4E-6	5.6E-6	1.0E-5
Flat-stalked pondweed	1.7E-4	3.5E-6	4.8E-11	2.8E-6	5.4E-6	4.4E-6	3.3E-4	3.1E-5	2.7E-4	3.1E-4	5.3E-5	5.7E-5	7.8E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.2E-6	1.0E-5
Pointed stonewort	1.7E-4	3.5E-6	4.5E-11	2.8E-6	5.4E-6	4.4E-6	3.2E-4	3.1E-5	2.6E-4	3.0E-4	5.3E-5	5.7E-5	7.8E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.2E-6	1.0E-5
European otter	2.4E-4	3.6E-6	1.1E-9	3.1E-6	6.2E-6	5.1E-6	7.5E-4	3.2E-5	6.5E-4	6.4E-4	5.8E-5	7.7E-5	8.5E-6	7.2E-6	3.7E-6	7.7E-6	1.5E-4	6.7E-6	5.8E-6	1.0E-5
Common toad (FW)	2.4E-4	3.6E-6	2.9E-10	3.0E-6	5.9E-6	4.9E-6	5.6E-4	3.2E-5	4.7E-4	6.0E-4	5.8E-5	6.4E-5	8.3E-6	7.0E-6	3.5E-6	7.5E-6	1.2E-4	6.4E-6	5.6E-6	1.0E-5
Water vole (FW)	2.4E-4	3.6E-6	3.6E-10	3.0E-6	6.0E-6	4.9E-6	5.8E-4	3.2E-5	4.8E-4	6.1E-4	5.8E-5	6.5E-5	8.3E-6	7.1E-6	3.5E-6	7.5E-6	1.2E-4	6.5E-6	5.7E-6	1.0E-5
Vimba bream	2.4E-4	3.6E-6	3.1E-10	3.0E-6	5.9E-6	4.9E-6	5.7E-4	3.2E-5	4.7E-4	6.0E-4	5.8E-5	6.5E-5	8.3E-6	7.0E-6	3.5E-6	7.5E-6	1.2E-4	6.4E-6	5.6E-6	1.0E-5
Slimy-fruited stonewort	1.7E-4	3.5E-6	4.5E-11	2.8E-6	5.4E-6	4.4E-6	3.2E-4	3.1E-5	2.6E-4	3.0E-4	5.3E-5	5.7E-5	7.8E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.2E-6	1.0E-5
RS Zooplankton	9.5E-5	3.5E-6	1.2E-11	2.7E-6	5.3E-6	4.3E-6	1.8E-4	3.0E-5	1.5E-4	1.4E-4	5.0E-5	5.5E-5	7.6E-6	6.5E-6	3.0E-6	6.8E-6	1.1E-4	5.8E-6	5.1E-6	1.0E-5
Painter's mussel	2.4E-4	3.6E-6	2.9E-10	3.0E-6	5.9E-6	4.9E-6	5.7E-4	3.2E-5	4.7E-4	6.0E-4	5.8E-5	6.4E-5	8.3E-6	7.0E-6	3.5E-6	7.5E-6	1.2E-4	6.4E-6	5.6E-6	1.0E-5
Water mudwort	1.7E-4	3.5E-6	4.8E-11	2.8E-6	5.4E-6	4.4E-6	3.3E-4	3.1E-5	2.7E-4	3.1E-4	5.3E-5	5.7E-5	7.8E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.2E-6	1.0E-5
Persicaria foliosa	1.7E-4	3.5E-6	4.8E-11	2.8E-6	5.4E-6	4.4E-6	3.3E-4	3.1E-5	2.7E-4	3.1E-4	5.3E-5	5.7E-5	7.8E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.2E-6	1.0E-5
Microphytobenthos	1.7E-4	3.5E-6	4.8E-11	2.8E-6	5.4E-6	4.4E-6	3.3E-4	3.1E-5	2.7E-4	3.1E-4	5.3E-5	5.7E-5	7.8E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.2E-6	1.0E-5
RS Phytoplankton	1.7E-4	3.5E-6	4.8E-11	2.8E-6	5.4E-6	4.4E-6	3.3E-4	3.1E-5	2.7E-4	3.1E-4	5.3E-5	5.7E-5	7.8E-6	6.6E-6	3.1E-6	6.9E-6	1.1E-4	5.9E-6	5.2E-6	1.0E-5

Table F-10. Dose conversion coefficients for external exposure of freshwater representative species to low energy beta (≤ 10 keV) and high energy beta (> 10 keV) /gamma radiation (µGy/h)/(Bq/l)

Representative Species	Dose Conversion Coefficient of external low-energy (≤10 keV) beta radiation																		
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m	I-129	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210
European perch	5.1E-28	6.6E-31	0.0E+0	7.8E-29	1.5E-28	0.0E+0	1.9E-29	0.0E+0	0.0E+0	0.0E+0	1.1E-28	4.6E-29	4.2E-28	1.5E-28	4.6E-29	0.0E+0	4.2E-28	0.0E+0	0.0E+0	3.2E-28
Duck mussel	4.1E-15	4.2E-16	3.3E-15	6.0E-15	5.7E-16	4.4E-16	7.9E-17	4.3E-16	2.9E-15	3.8E-16	4.4E-16	2.6E-16	3.9E-15	2.6E-15	1.8E-16	1.4E-15	1.7E-15	3.3E-15	4.1E-15	3.0E-15
Asp	5.1E-28	6.6E-31	0.0E+0	7.8E-29	1.5E-28	0.0E+0	1.9E-29	0.0E+0	0.0E+0	0.0E+0	1.1E-28	4.6E-29	4.2E-28	1.5E-28	4.6E-29	0.0E+0	4.2E-28	0.0E+0	0.0E+0	3.2E-28
Bagous binodulus	8.9E-28	1.1E-30	0.0E+0	1.4E-28	2.6E-28	0.0E+0	3.4E-29	0.0E+0	0.0E+0	0.0E+0	2.0E-28	8.0E-29	7.3E-28	2.7E-28	8.1E-29	0.0E+0	7.3E-28	0.0E+0	0.0E+0	5.7E-28
Bagous petro	8.9E-28	1.1E-30	0.0E+0	1.4E-28	2.6E-28	0.0E+0	3.4E-29	0.0E+0	0.0E+0	0.0E+0	2.0E-28	8.0E-29	7.3E-28	2.7E-28	8.1E-29	0.0E+0	7.3E-28	0.0E+0	0.0E+0	5.7E-28
Grasswrack pondweed	1.3E-11	1.7E-12	1.3E-11	2.4E-11	1.4E-12	1.8E-12	2.1E-13	1.7E-12	1.2E-11	1.5E-12	1.1E-12	7.9E-13	1.3E-11	9.5E-12	4.6E-13	5.7E-12	4.4E-12	1.3E-11	1.7E-11	1.0E-11
Donacia brevitarsis	8.9E-28	1.1E-30	0.0E+0	1.4E-28	2.6E-28	0.0E+0	3.4E-29	0.0E+0	0.0E+0	0.0E+0	2.0E-28	8.0E-29	7.3E-28	2.7E-28	8.1E-29	0.0E+0	7.3E-28	0.0E+0	0.0E+0	5.7E-28
Three-lined soldier	8.9E-28	1.1E-30	0.0E+0	1.4E-28	2.6E-28	0.0E+0	3.4E-29	0.0E+0	0.0E+0	0.0E+0	2.0E-28	8.0E-29	7.3E-28	2.7E-28	8.1E-29	0.0E+0	7.3E-28	0.0E+0	0.0E+0	5.7E-28
Common pochard	4.2E-16	4.1E-17	3.3E-16	6.0E-16	6.2E-17	4.4E-17	8.6E-18	4.2E-17	2.9E-16	3.7E-17	4.9E-17	2.8E-17	4.0E-16	2.6E-16	2.0E-17	1.4E-16	1.8E-16	3.3E-16	4.1E-16	3.1E-16
Sigara hellensii	8.9E-28	1.1E-30	0.0E+0	1.4E-28	2.6E-28	0.0E+0	3.4E-29	0.0E+0	0.0E+0	0.0E+0	2.0E-28	8.0E-29	7.3E-28	2.7E-28	8.1E-29	0.0E+0	7.3E-28	0.0E+0	0.0E+0	5.7E-28
Chironomidae sp.	8.9E-28	1.1E-30	0.0E+0	1.4E-28	2.6E-28	0.0E+0	3.4E-29	0.0E+0	0.0E+0	0.0E+0	2.0E-28	8.0E-29	7.3E-28	2.7E-28	8.1E-29	0.0E+0	7.3E-28	0.0E+0	0.0E+0	5.7E-28
Cloeon schoenemundi	8.9E-28	1.1E-30	0.0E+0	1.4E-28	2.6E-28	0.0E+0	3.4E-29	0.0E+0	0.0E+0	0.0E+0	2.0E-28	8.0E-29	7.3E-28	2.7E-28	8.1E-29	0.0E+0	7.3E-28	0.0E+0	0.0E+0	5.7E-28
Donacia dentata	8.9E-28	1.1E-30	0.0E+0	1.4E-28	2.6E-28	0.0E+0	3.4E-29	0.0E+0	0.0E+0	0.0E+0	2.0E-28	8.0E-29	7.3E-28	2.7E-28	8.1E-29	0.0E+0	7.3E-28	0.0E+0	0.0E+0	5.7E-28
Pygmy damselfly	8.9E-28	1.1E-30	0.0E+0	1.4E-28	2.6E-28	0.0E+0	3.4E-29	0.0E+0	0.0E+0	0.0E+0	2.0E-28	8.0E-29	7.3E-28	2.7E-28	8.1E-29	0.0E+0	7.3E-28	0.0E+0	0.0E+0	5.7E-28
Least stonewort	1.5E-12	1.7E-13	1.4E-12	2.5E-12	1.7E-13	1.8E-13	2.4E-14	1.8E-13	1.2E-12	1.6E-13	1.3E-13	8.8E-14	1.4E-12	9.9E-13	5.4E-14	5.8E-13	5.1E-13	1.4E-12	1.7E-12	1.1E-12
European eel	5.1E-28	6.6E-31	0.0E+0	7.8E-29	1.5E-28	0.0E+0	1.9E-29	0.0E+0	0.0E+0	0.0E+0	1.1E-28	4.6E-29	4.2E-28	1.5E-28	4.6E-29	0.0E+0	4.2E-28	0.0E+0	0.0E+0	3.2E-28
Depressed river mussel	4.1E-15	4.2E-16	3.3E-15	6.0E-15	5.7E-16	4.4E-16	7.9E-17	4.3E-16	2.9E-15	3.8E-16	4.4E-16	2.6E-16	3.9E-15	2.6E-15	1.8E-16	1.4E-15	1.7E-15	3.3E-15	4.1E-15	3.0E-15
European crayfish	4.8E-28	6.2E-31	0.0E+0	7.4E-29	1.4E-28	0.0E+0	1.8E-29	0.0E+0	0.0E+0	0.0E+0	1.1E-28	4.3E-29	3.9E-28	1.5E-28	4.4E-29	0.0E+0	3.9E-28	0.0E+0	0.0E+0	3.1E-28
Water pygmyweed	1.3E-11	1.7E-12	1.3E-11	2.4E-11	1.4E-12	1.8E-12	2.1E-13	1.7E-12	1.2E-11	1.5E-12	1.1E-12	7.9E-13	1.3E-11	9.5E-12	4.6E-13	5.7E-12	4.4E-12	1.3E-11	1.7E-11	1.0E-11
Clubbed general	8.9E-28	1.1E-30	0.0E+0	1.4E-28	2.6E-28	0.0E+0	3.4E-29	0.0E+0	0.0E+0	0.0E+0	2.0E-28	8.0E-29	7.3E-28	2.7E-28	8.1E-29	0.0E+0	7.3E-28	0.0E+0	0.0E+0	5.7E-28
Northern pike	5.1E-28	6.6E-31	0.0E+0	7.8E-29	1.5E-28	0.0E+0	1.9E-29	0.0E+0	0.0E+0	0.0E+0	1.1E-28	4.6E-29	4.2E-28	1.5E-28	4.6E-29	0.0E+0	4.2E-28	0.0E+0	0.0E+0	3.2E-28
Ruffe	6.8E-14	7.2E-15	5.8E-14	1.0E-13	9.2E-15	7.6E-15	1.3E-15	7.4E-15	5.0E-14	6.5E-15	7.2E-15	4.3E-15	6.5E-14	4.4E-14	2.9E-15	2.4E-14	2.7E-14	5.7E-14	7.1E-14	5.1E-14
Pool frog	1.0E-14	1.1E-15	8.5E-15	1.5E-14	1.4E-15	1.1E-15	1.9E-16	1.1E-15	7.4E-15	9.6E-16	1.1E-15	6.5E-16	9.7E-15	6.5E-15	4.4E-16	3.6E-15	4.1E-15	8.4E-15	1.1E-14	7.6E-15
Hydaticus continentalis	8.9E-28	1.1E-30	0.0E+0	1.4E-28	2.6E-28	0.0E+0	3.4E-29	0.0E+0	0.0E+0	0.0E+0	2.0E-28	8.0E-29	7.3E-28	2.7E-28	8.1E-29	0.0E+0	7.3E-28	0.0E+0	0.0E+0	5.7E-28
Hydrochus megaphallus	8.9E-28	1.1E-30	0.0E+0	1.4E-28	2.6E-28	0.0E+0	3.4E-29	0.0E+0	0.0E+0	0.0E+0	2.0E-28	8.0E-29	7.3E-28	2.7E-28	8.1E-29	0.0E+0	7.3E-28	0.0E+0	0.0E+0	5.7E-28
Tanymastix stagnalis	9.0E-28	1.2E-30	0.0E+0	1.4E-28	2.7E-28	0.0E+0	3.4E-29	0.0E+0	0.0E+0	0.0E+0	2.0E-28	8.0E-29	7.3E-28	2.7E-28	8.2E-29	0.0E+0	7.3E-28	0.0E+0	0.0E+0	5.7E-28
Chara sp.	1.5E-12	1.7E-13	1.4E-12	2.5E-12	1.7E-13	1.8E-13	2.4E-14	1.8E-13	1.2E-12	1.6E-13	1.3E-13	8.8E-14	1.4E-12	9.9E-13	5.4E-14	5.8E-13	5.1E-13	1.4E-12	1.7E-12	1.1E-12
Common kingfisher	9.7E-15	1.0E-15	8.2E-15	1.5E-14	1.3E-15	1.1E-15	1.8E-16	1.0E-15	7.1E-15	9.3E-16	1.0E-15	6.2E-16	9.3E-15	6.2E-15	4.2E-16	3.5E-15	3.9E-15	8.1E-15	1.0E-14	7.3E-15
Burbot	5.1E-28	6.6E-31	0.0E+0	7.8E-29	1.5E-28	0.0E+0	1.9E-29	0.0E+0	0.0E+0	0.0E+0	1.1E-28	4.6E-29	4.2E-28	1.5E-28	4.6E-29	0.0E+0	4.2E-28	0.0E+0	0.0E+0	3.2E-28
Clam shrimp	9.0E-28	1.2E-30	0.0E+0	1.4E-28	2.7E-28	0.0E+0	3.4E-29	0.0E+0	0.0E+0	0.0E+0	2.0E-28	8.0E-29	7.3E-28	2.7E-28	8.2E-29	0.0E+0	7.3E-28	0.0E+0	0.0E+0	5.7E-28
Macroplea appendiculata	8.9E-28	1.1E-30	0.0E+0	1.4E-28	2.6E-28	0.0E+0	3.4E-29	0.0E+0	0.0E+0	0.0E+0	2.0E-28	8.0E-29	7.3E-28	2.7E-28	8.1E-29	0.0E+0	7.3E-28	0.0E+0	0.0E+0	5.7E-28
Sheatfish	6.0E-16	6.0E-17	4.8E-16	8.7E-16	8.7E-17	6.4E-17	1.2E-17	6.2E-17	4.2E-16	5.5E-17	6.8E-17	3.9E-17	5.7E-16	3.8E-16	2.7E-17	2.0E-16	2.6E-16	4.8E-16	6.0E-16	4.5E-16

Representative Species	Dose Conversion Coefficient of external low-energy (≤10 keV) beta radiation																		
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m	I-129	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210
Common roach	5.1E-28	6.6E-31	0.0E+0	7.8E-29	1.5E-28	0.0E+0	1.9E-29	0.0E+0	0.0E+0	0.0E+0	1.1E-28	4.6E-29	4.2E-28	1.5E-28	4.6E-29	0.0E+0	4.2E-28	0.0E+0	0.0E+0	3.2E-28
Elatine orthosperma	1.3E-11	1.7E-12	1.3E-11	2.4E-11	1.4E-12	1.8E-12	2.1E-13	1.7E-12	1.2E-11	1.5E-12	1.1E-12	7.9E-13	1.3E-11	9.5E-12	4.6E-13	5.7E-12	4.4E-12	1.3E-11	1.7E-11	1.0E-11
Anisus spirorbis	8.9E-28	1.2E-30	0.0E+0	1.4E-28	2.6E-28	0.0E+0	3.4E-29	0.0E+0	0.0E+0	0.0E+0	2.0E-28	8.0E-29	7.3E-28	2.7E-28	8.1E-29	0.0E+0	7.3E-28	0.0E+0	0.0E+0	5.7E-28
Spatulaleaf loosestrife	1.3E-11	1.7E-12	1.3E-11	2.4E-11	1.4E-12	1.8E-12	2.1E-13	1.7E-12	1.2E-11	1.5E-12	1.1E-12	7.9E-13	1.3E-11	9.5E-12	4.6E-13	5.7E-12	4.4E-12	1.3E-11	1.7E-11	1.0E-11
Signal crayfish	9.0E-28	1.2E-30	0.0E+0	1.4E-28	2.7E-28	0.0E+0	3.4E-29	0.0E+0	0.0E+0	0.0E+0	2.0E-28	8.0E-29	7.3E-28	2.7E-28	8.2E-29	0.0E+0	7.3E-28	0.0E+0	0.0E+0	5.7E-28
Alisma wahlenbergii	1.3E-11	1.7E-12	1.3E-11	2.4E-11	1.4E-12	1.8E-12	2.1E-13	1.7E-12	1.2E-11	1.5E-12	1.1E-12	7.9E-13	1.3E-11	9.5E-12	4.6E-13	5.7E-12	4.4E-12	1.3E-11	1.7E-11	1.0E-11
Tadpole shrimp	9.0E-28	1.2E-30	0.0E+0	1.4E-28	2.7E-28	0.0E+0	3.4E-29	0.0E+0	0.0E+0	0.0E+0	2.0E-28	8.0E-29	7.3E-28	2.7E-28	8.2E-29	0.0E+0	7.3E-28	0.0E+0	0.0E+0	5.7E-28
Sphagnum (Subm.) (FW)	5.4E-15	5.0E-16	4.0E-15	7.2E-15	8.4E-16	5.3E-16	1.2E-16	5.1E-16	3.4E-15	4.5E-16	6.5E-16	3.6E-16	5.1E-15	3.2E-15	2.7E-16	1.7E-15	2.5E-15	3.9E-15	4.9E-15	4.0E-15
Rugged stonewort	1.5E-12	1.7E-13	1.4E-12	2.5E-12	1.7E-13	1.8E-13	2.4E-14	1.8E-13	1.2E-12	1.6E-13	1.3E-13	8.8E-14	1.4E-12	9.9E-13	5.4E-14	5.8E-13	5.1E-13	1.4E-12	1.7E-12	1.1E-12
Slender stonewort	1.5E-12	1.7E-13	1.4E-12	2.5E-12	1.7E-13	1.8E-13	2.4E-14	1.8E-13	1.2E-12	1.6E-13	1.3E-13	8.8E-14	1.4E-12	9.9E-13	5.4E-14	5.8E-13	5.1E-13	1.4E-12	1.7E-12	1.1E-12
Starry stonewort	1.5E-12	1.7E-13	1.4E-12	2.5E-12	1.7E-13	1.8E-13	2.4E-14	1.8E-13	1.2E-12	1.6E-13	1.3E-13	8.8E-14	1.4E-12	9.9E-13	5.4E-14	5.8E-13	5.1E-13	1.4E-12	1.7E-12	1.1E-12
Bittercress	1.3E-11	1.7E-12	1.3E-11	2.4E-11	1.4E-12	1.8E-12	2.1E-13	1.7E-12	1.2E-11	1.5E-12	1.1E-12	7.9E-13	1.3E-11	9.5E-12	4.6E-13	5.7E-12	4.4E-12	1.3E-11	1.7E-11	1.0E-11
Shetland pondweed	1.3E-11	1.7E-12	1.3E-11	2.4E-11	1.4E-12	1.8E-12	2.1E-13	1.7E-12	1.2E-11	1.5E-12	1.1E-12	7.9E-13	1.3E-11	9.5E-12	4.6E-13	5.7E-12	4.4E-12	1.3E-11	1.7E-11	1.0E-11
Northern crested newt	1.8E-15	1.8E-16	1.4E-15	2.6E-15	2.7E-16	1.9E-16	3.6E-17	1.8E-16	1.2E-15	1.6E-16	2.1E-16	1.2E-16	1.7E-15	1.1E-15	8.3E-17	6.1E-16	7.8E-16	1.4E-15	1.8E-15	1.3E-15
Large mouthed valve snail	8.8E-28	1.1E-30	0.0E+0	1.3E-28	2.6E-28	0.0E+0	3.4E-29	0.0E+0	0.0E+0	0.0E+0	2.0E-28	7.9E-29	7.2E-28	2.7E-28	8.0E-29	0.0E+0	7.2E-28	0.0E+0	0.0E+0	5.6E-28
Tench	5.1E-28	6.6E-31	0.0E+0	7.8E-29	1.5E-28	0.0E+0	1.9E-29	0.0E+0	0.0E+0	0.0E+0	1.1E-28	4.6E-29	4.2E-28	1.5E-28	4.6E-29	0.0E+0	4.2E-28	0.0E+0	0.0E+0	3.2E-28
Horned grebe	4.2E-16	4.1E-17	3.3E-16	6.0E-16	6.2E-17	4.4E-17	8.6E-18	4.2E-17	2.9E-16	3.7E-17	4.9E-17	2.8E-17	4.0E-16	2.6E-16	2.0E-17	1.4E-16	1.8E-16	3.3E-16	4.1E-16	3.1E-16
Black tern	4.9E-15	5.1E-16	4.1E-15	7.4E-15	6.9E-16	5.4E-16	9.5E-17	5.2E-16	3.6E-15	4.6E-16	5.4E-16	3.2E-16	4.7E-15	3.1E-15	2.2E-16	1.7E-15	2.0E-15	4.0E-15	5.1E-15	3.7E-15
Thick shelled river mussel	4.1E-15	4.2E-16	3.3E-15	6.0E-15	5.7E-16	4.4E-16	7.9E-17	4.3E-16	2.9E-15	3.8E-16	4.4E-16	2.6E-16	3.9E-15	2.6E-15	1.8E-16	1.4E-15	1.7E-15	3.3E-15	4.1E-15	3.0E-15
Flat-stalked pondweed	1.3E-11	1.7E-12	1.3E-11	2.4E-11	1.4E-12	1.8E-12	2.1E-13	1.7E-12	1.2E-11	1.5E-12	1.1E-12	7.9E-13	1.3E-11	9.5E-12	4.6E-13	5.7E-12	4.4E-12	1.3E-11	1.7E-11	1.0E-11
Pointed stonewort	1.5E-12	1.7E-13	1.4E-12	2.5E-12	1.7E-13	1.8E-13	2.4E-14	1.8E-13	1.2E-12	1.6E-13	1.3E-13	8.8E-14	1.4E-12	9.9E-13	5.4E-14	5.8E-13	5.1E-13	1.4E-12	1.7E-12	1.1E-12
European otter	2.9E-16	2.9E-17	2.3E-16	4.2E-16	4.3E-17	3.1E-17	5.9E-18	3.0E-17	2.0E-16	2.7E-17	3.3E-17	1.9E-17	2.8E-16	1.8E-16	1.3E-17	9.9E-17	1.3E-16	2.3E-16	2.9E-16	2.2E-16
Common toad (FW)	5.8E-15	6.0E-16	4.8E-15	8.7E-15	8.0E-16	6.4E-16	1.1E-16	6.2E-16	4.2E-15	5.5E-16	6.3E-16	3.7E-16	5.5E-15	3.7E-15	2.5E-16	2.0E-15	2.4E-15	4.8E-15	6.0E-15	4.4E-15
Water vole (FW)	5.1E-28	6.6E-31	0.0E+0	7.8E-29	1.5E-28	0.0E+0	1.9E-29	0.0E+0	0.0E+0	0.0E+0	1.1E-28	4.6E-29	4.2E-28	1.5E-28	4.6E-29	0.0E+0	4.2E-28	0.0E+0	0.0E+0	3.3E-28
Vimba bream	5.1E-28	6.6E-31	0.0E+0	7.8E-29	1.5E-28	0.0E+0	1.9E-29	0.0E+0	0.0E+0	0.0E+0	1.1E-28	4.6E-29	4.2E-28	1.5E-28	4.6E-29	0.0E+0	4.2E-28	0.0E+0	0.0E+0	3.2E-28
Slimy-fruited stonewort	1.5E-12	1.7E-13	1.4E-12	2.5E-12	1.7E-13	1.8E-13	2.4E-14	1.8E-13	1.2E-12	1.6E-13	1.3E-13	8.8E-14	1.4E-12	9.9E-13	5.4E-14	5.8E-13	5.1E-13	1.4E-12	1.7E-12	1.1E-12
RS Zooplankton	3.6E-12	4.2E-13	3.3E-12	6.0E-12	4.3E-13	4.4E-13	6.1E-14	4.3E-13	2.9E-12	3.8E-13	3.4E-13	2.2E-13	3.5E-12	2.4E-12	1.4E-13	1.4E-12	1.3E-12	3.3E-12	4.1E-12	2.7E-12
Painter's mussel	4.1E-15	4.2E-16	3.3E-15	6.0E-15	5.7E-16	4.4E-16	7.9E-17	4.3E-16	2.9E-15	3.8E-16	4.4E-16	2.6E-16	3.9E-15	2.6E-15	1.8E-16	1.4E-15	1.7E-15	3.3E-15	4.1E-15	3.0E-15
Water mudwort	1.3E-11	1.7E-12	1.3E-11	2.4E-11	1.4E-12	1.8E-12	2.1E-13	1.7E-12	1.2E-11	1.5E-12	1.1E-12	7.9E-13	1.3E-11	9.5E-12	4.6E-13	5.7E-12	4.4E-12	1.3E-11	1.7E-11	1.0E-11
Persicaria foliosa	1.3E-11	1.7E-12	1.3E-11	2.4E-11	1.4E-12	1.8E-12	2.1E-13	1.7E-12	1.2E-11	1.5E-12	1.1E-12	7.9E-13	1.3E-11	9.5E-12	4.6E-13	5.7E-12	4.4E-12	1.3E-11	1.7E-11	1.0E-11
Microphytobenthos	1.3E-11	1.7E-12	1.3E-11	2.4E-11	1.4E-12	1.8E-12	2.1E-13	1.7E-12	1.2E-11	1.5E-12	1.1E-12	7.9E-13	1.3E-11	9.5E-12	4.6E-13	5.7E-12	4.4E-12	1.3E-11	1.7E-11	1.0E-11
RS Phytoplankton	1.3E-11	1.7E-12	1.3E-11	2.4E-11	1.4E-12	1.8E-12	2.1E-13	1.7E-12	1.2E-11	1.5E-12	1.1E-12	7.9E-13	1.3E-11	9.5E-12	4.6E-13	5.7E-12	4.4E-12	1.3E-11	1.7E-11	1.0E-11

Table F-10. Continued

Representative Species	Dose Conversion Coefficient of external low-energy (≤10 keV) beta radiation																			
	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226	Se-79	Sm-151	Sn-126	Sr-90	Tc-99	Th-229	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
European perch	5.6E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	5.1E-29	1.2E-28	3.8E-28	7.3E-29	4.3E-29	7.5E-29	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	1.2E-28	0.0E+0	0.0E+0	3.7E-28
Duck mussel	2.3E-15	2.0E-22	8.2E-16	4.4E-16	3.7E-16	9.9E-16	4.8E-16	1.5E-15	1.3E-15	1.7E-16	2.9E-16	5.9E-15	3.1E-16	3.1E-16	3.5E-16	4.1E-16	7.1E-15	3.9E-16	3.4E-16	1.4E-15
Asp	5.6E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	5.1E-29	1.2E-28	3.8E-28	7.3E-29	4.3E-29	7.5E-29	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	1.2E-28	0.0E+0	0.0E+0	3.7E-28
Bagous binodulus	9.7E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	8.9E-29	2.2E-28	6.6E-28	1.3E-28	7.5E-29	1.3E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.1E-28	0.0E+0	0.0E+0	6.4E-28
Bagous petro	9.7E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	8.9E-29	2.2E-28	6.6E-28	1.3E-28	7.5E-29	1.3E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.1E-28	0.0E+0	0.0E+0	6.4E-28
Grasswrack pondweed	6.2E-12	7.9E-19	3.3E-12	1.8E-12	1.5E-12	3.7E-12	1.2E-12	4.0E-12	4.8E-12	4.2E-13	7.3E-13	2.4E-11	1.3E-12	1.3E-12	1.4E-12	1.6E-12	2.8E-11	1.6E-12	1.4E-12	3.6E-12
Donacia brevitarsis	9.7E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	8.9E-29	2.2E-28	6.6E-28	1.3E-28	7.5E-29	1.3E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.1E-28	0.0E+0	0.0E+0	6.4E-28
Three-lined soldier	9.7E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	8.9E-29	2.2E-28	6.6E-28	1.3E-28	7.5E-29	1.3E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.1E-28	0.0E+0	0.0E+0	6.4E-28
Common pochard	2.5E-16	2.0E-23	8.1E-17	4.4E-17	3.6E-17	1.0E-16	5.2E-17	1.7E-16	1.3E-16	1.8E-17	3.2E-17	5.8E-16	3.1E-17	3.1E-17	3.4E-17	4.1E-17	7.0E-16	3.8E-17	3.4E-17	1.6E-16
Sigara hellensii	9.7E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	8.9E-29	2.2E-28	6.6E-28	1.3E-28	7.5E-29	1.3E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.1E-28	0.0E+0	0.0E+0	6.4E-28
Chironomidae sp.	9.7E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	8.9E-29	2.2E-28	6.6E-28	1.3E-28	7.5E-29	1.3E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.1E-28	0.0E+0	0.0E+0	6.4E-28
Cloeon schoenemundi	9.7E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	8.9E-29	2.2E-28	6.6E-28	1.3E-28	7.5E-29	1.3E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.1E-28	0.0E+0	0.0E+0	6.4E-28
Donacia dentata	9.7E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	8.9E-29	2.2E-28	6.6E-28	1.3E-28	7.5E-29	1.3E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.1E-28	0.0E+0	0.0E+0	6.4E-28
Pygmy damselfly	9.7E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	8.9E-29	2.2E-28	6.6E-28	1.3E-28	7.5E-29	1.3E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.1E-28	0.0E+0	0.0E+0	6.4E-28
Least stonewort	7.2E-13	8.1E-20	3.4E-13	1.8E-13	1.5E-13	3.9E-13	1.4E-13	4.7E-13	5.1E-13	5.0E-14	8.6E-14	2.4E-12	1.3E-13	1.3E-13	1.4E-13	1.7E-13	2.9E-12	1.6E-13	1.4E-13	4.3E-13
European eel	5.6E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	5.1E-29	1.2E-28	3.8E-28	7.3E-29	4.3E-29	7.5E-29	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	1.2E-28	0.0E+0	0.0E+0	3.7E-28
Depressed river mussel	2.3E-15	2.0E-22	8.2E-16	4.4E-16	3.7E-16	9.9E-16	4.8E-16	1.5E-15	1.3E-15	1.7E-16	2.9E-16	5.9E-15	3.1E-16	3.1E-16	3.5E-16	4.1E-16	7.1E-15	3.9E-16	3.4E-16	1.4E-15
European crayfish	5.3E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	4.8E-29	1.2E-28	3.6E-28	6.9E-29	4.1E-29	7.1E-29	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	1.1E-28	0.0E+0	0.0E+0	3.5E-28
Water pygmyweed	6.2E-12	7.9E-19	3.3E-12	1.8E-12	1.5E-12	3.7E-12	1.2E-12	4.0E-12	4.8E-12	4.2E-13	7.3E-13	2.4E-11	1.3E-12	1.3E-12	1.4E-12	1.6E-12	2.8E-11	1.6E-12	1.4E-12	3.6E-12
Clubbed general	9.7E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	8.9E-29	2.2E-28	6.6E-28	1.3E-28	7.5E-29	1.3E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.1E-28	0.0E+0	0.0E+0	6.4E-28
Northern pike	5.6E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	5.1E-29	1.2E-28	3.8E-28	7.3E-29	4.3E-29	7.5E-29	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	1.2E-28	0.0E+0	0.0E+0	3.7E-28
Ruffe	3.8E-14	3.4E-21	1.4E-14	7.6E-15	6.3E-15	1.7E-14	7.7E-15	2.5E-14	2.2E-14	2.7E-15	4.7E-15	1.0E-13	5.4E-15	5.4E-15	6.0E-15	7.1E-15	1.2E-13	6.7E-15	5.9E-15	2.3E-14
Pool frog	5.7E-15	5.0E-22	2.1E-15	1.1E-15	9.3E-16	2.5E-15	1.2E-15	3.8E-15	3.3E-15	4.1E-16	7.0E-16	1.5E-14	7.9E-16	7.9E-16	8.8E-16	1.0E-15	1.8E-14	9.8E-16	8.6E-16	3.5E-15
Hydaticus continentalis	9.7E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	8.9E-29	2.2E-28	6.6E-28	1.3E-28	7.5E-29	1.3E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.1E-28	0.0E+0	0.0E+0	6.4E-28
Hydrochus megaphallus	9.7E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	8.9E-29	2.2E-28	6.6E-28	1.3E-28	7.5E-29	1.3E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.1E-28	0.0E+0	0.0E+0	6.4E-28
Tanymastix stagnalis	9.8E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	9.0E-29	2.2E-28	6.7E-28	1.3E-28	7.6E-29	1.3E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.1E-28	0.0E+0	0.0E+0	6.4E-28
Chara sp.	7.2E-13	8.1E-20	3.4E-13	1.8E-13	1.5E-13	3.9E-13	1.4E-13	4.7E-13	5.1E-13	5.0E-14	8.6E-14	2.4E-12	1.3E-13	1.3E-13	1.4E-13	1.7E-13	2.9E-12	1.6E-13	1.4E-13	4.3E-13
Common kingfisher	5.4E-15	4.8E-22	2.0E-15	1.1E-15	9.0E-16	2.4E-15	1.1E-15	3.6E-15	3.2E-15	3.8E-16	6.7E-16	1.5E-14	7.7E-16	7.6E-16	8.5E-16	1.0E-15	1.7E-14	9.5E-16	8.3E-16	3.3E-15
Burbot	5.6E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	5.1E-29	1.2E-28	3.8E-28	7.3E-29	4.3E-29	7.5E-29	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	1.2E-28	0.0E+0	0.0E+0	3.7E-28
Clam shrimp	9.8E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	9.0E-29	2.2E-28	6.7E-28	1.3E-28	7.6E-29	1.3E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.1E-28	0.0E+0	0.0E+0	6.4E-28
Macroplea appendiculata	9.7E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	8.9E-29	2.2E-28	6.6E-28	1.3E-28	7.5E-29	1.3E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.1E-28	0.0E+0	0.0E+0	6.4E-28
Sheatfish	3.6E-16	2.9E-23	1.2E-16	6.4E-17	5.3E-17	1.5E-16	7.3E-17	2.3E-16	1.9E-16	2.5E-17	4.4E-17	8.5E-16	4.5E-17	4.5E-17	5.0E-17	5.9E-17	1.0E-15	5.6E-17	4.9E-17	2.2E-16

Representative Species	Dose Conversion Coefficient of external low-energy (≤10 keV) beta radiation																			
	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226	Se-79	Sm-151	Sn-126	Sr-90	Tc-99	Th-229	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
Common roach	5.6E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	5.1E-29	1.2E-28	3.8E-28	7.3E-29	4.3E-29	7.5E-29	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	1.2E-28	0.0E+0	0.0E+0	3.7E-28
Elatine orthosperma	6.2E-12	7.9E-19	3.3E-12	1.8E-12	1.5E-12	3.7E-12	1.2E-12	4.0E-12	4.8E-12	4.2E-13	7.3E-13	2.4E-11	1.3E-12	1.3E-12	1.4E-12	1.6E-12	2.8E-11	1.6E-12	1.4E-12	3.6E-12
Anisus spirorbis	9.8E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	9.0E-29	2.2E-28	6.6E-28	1.3E-28	7.6E-29	1.3E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.1E-28	0.0E+0	0.0E+0	6.4E-28
Spatulaleaf loosestrife	6.2E-12	7.9E-19	3.3E-12	1.8E-12	1.5E-12	3.7E-12	1.2E-12	4.0E-12	4.8E-12	4.2E-13	7.3E-13	2.4E-11	1.3E-12	1.3E-12	1.4E-12	1.6E-12	2.8E-11	1.6E-12	1.4E-12	3.6E-12
Signal crayfish	9.8E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	9.0E-29	2.2E-28	6.7E-28	1.3E-28	7.6E-29	1.3E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.1E-28	0.0E+0	0.0E+0	6.4E-28
Alisma wahlenbergii	6.2E-12	7.9E-19	3.3E-12	1.8E-12	1.5E-12	3.7E-12	1.2E-12	4.0E-12	4.8E-12	4.2E-13	7.3E-13	2.4E-11	1.3E-12	1.3E-12	1.4E-12	1.6E-12	2.8E-11	1.6E-12	1.4E-12	3.6E-12
Tadpole shrimp	9.8E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	9.0E-29	2.2E-28	6.7E-28	1.3E-28	7.6E-29	1.3E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.1E-28	0.0E+0	0.0E+0	6.4E-28
Sphagnum (Subm.) (FW)	3.4E-15	2.3E-22	9.7E-16	5.2E-16	4.3E-16	1.2E-15	7.1E-16	2.2E-15	1.6E-15	2.5E-16	4.3E-16	7.0E-15	3.7E-16	3.7E-16	4.1E-16	4.9E-16	8.5E-15	4.6E-16	4.0E-16	2.1E-15
Rugged stonewort	7.2E-13	8.1E-20	3.4E-13	1.8E-13	1.5E-13	3.9E-13	1.4E-13	4.7E-13	5.1E-13	5.0E-14	8.6E-14	2.4E-12	1.3E-13	1.3E-13	1.4E-13	1.7E-13	2.9E-12	1.6E-13	1.4E-13	4.3E-13
Slender stonewort	7.2E-13	8.1E-20	3.4E-13	1.8E-13	1.5E-13	3.9E-13	1.4E-13	4.7E-13	5.1E-13	5.0E-14	8.6E-14	2.4E-12	1.3E-13	1.3E-13	1.4E-13	1.7E-13	2.9E-12	1.6E-13	1.4E-13	4.3E-13
Starry stonewort	7.2E-13	8.1E-20	3.4E-13	1.8E-13	1.5E-13	3.9E-13	1.4E-13	4.7E-13	5.1E-13	5.0E-14	8.6E-14	2.4E-12	1.3E-13	1.3E-13	1.4E-13	1.7E-13	2.9E-12	1.6E-13	1.4E-13	4.3E-13
Bittercress	6.2E-12	7.9E-19	3.3E-12	1.8E-12	1.5E-12	3.7E-12	1.2E-12	4.0E-12	4.8E-12	4.2E-13	7.3E-13	2.4E-11	1.3E-12	1.3E-12	1.4E-12	1.6E-12	2.8E-11	1.6E-12	1.4E-12	3.6E-12
Shetland pondweed	6.2E-12	7.9E-19	3.3E-12	1.8E-12	1.5E-12	3.7E-12	1.2E-12	4.0E-12	4.8E-12	4.2E-13	7.3E-13	2.4E-11	1.3E-12	1.3E-12	1.4E-12	1.6E-12	2.8E-11	1.6E-12	1.4E-12	3.6E-12
Northern crested newt	1.1E-15	8.5E-23	3.5E-16	1.9E-16	1.6E-16	4.3E-16	2.2E-16	7.1E-16	5.7E-16	7.7E-17	1.3E-16	2.5E-15	1.3E-16	1.3E-16	1.5E-16	1.8E-16	3.1E-15	1.7E-16	1.5E-16	6.6E-16
Large mouthed valve snail	9.6E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	8.8E-29	2.2E-28	6.6E-28	1.3E-28	7.4E-29	1.3E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.0E-28	0.0E+0	0.0E+0	6.3E-28
Tench	5.6E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	5.1E-29	1.2E-28	3.8E-28	7.3E-29	4.3E-29	7.5E-29	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	1.2E-28	0.0E+0	0.0E+0	3.7E-28
Horned grebe	2.5E-16	2.0E-23	8.1E-17	4.4E-17	3.6E-17	1.0E-16	5.2E-17	1.7E-16	1.3E-16	1.8E-17	3.2E-17	5.8E-16	3.1E-17	3.1E-17	3.4E-17	4.1E-17	7.0E-16	3.8E-17	3.4E-17	1.6E-16
Black tern	2.8E-15	2.4E-22	1.0E-15	5.4E-16	4.5E-16	1.2E-15	5.8E-16	1.9E-15	1.6E-15	2.0E-16	3.5E-16	7.2E-15	3.8E-16	3.8E-16	4.2E-16	5.0E-16	8.6E-15	4.7E-16	4.2E-16	1.7E-15
Thick shelled river mussel	2.3E-15	2.0E-22	8.2E-16	4.4E-16	3.7E-16	9.9E-16	4.8E-16	1.5E-15	1.3E-15	1.7E-16	2.9E-16	5.9E-15	3.1E-16	3.1E-16	3.5E-16	4.1E-16	7.1E-15	3.9E-16	3.4E-16	1.4E-15
Flat-stalked pondweed	6.2E-12	7.9E-19	3.3E-12	1.8E-12	1.5E-12	3.7E-12	1.2E-12	4.0E-12	4.8E-12	4.2E-13	7.3E-13	2.4E-11	1.3E-12	1.3E-12	1.4E-12	1.6E-12	2.8E-11	1.6E-12	1.4E-12	3.6E-12
Pointed stonewort	7.2E-13	8.1E-20	3.4E-13	1.8E-13	1.5E-13	3.9E-13	1.4E-13	4.7E-13	5.1E-13	5.0E-14	8.6E-14	2.4E-12	1.3E-13	1.3E-13	1.4E-13	1.7E-13	2.9E-12	1.6E-13	1.4E-13	4.3E-13
European otter	1.7E-16	1.4E-23	5.7E-17	3.1E-17	2.6E-17	7.1E-17	3.6E-17	1.1E-16	9.3E-17	1.2E-17	2.2E-17	4.1E-16	2.2E-17	2.2E-17	2.4E-17	2.9E-17	5.0E-16	2.7E-17	2.4E-17	1.1E-16
Common toad (FW)	3.3E-15	2.9E-22	1.2E-15	6.4E-16	5.3E-16	1.4E-15	6.7E-16	2.2E-15	1.9E-15	2.3E-16	4.1E-16	8.6E-15	4.5E-16	4.5E-16	5.0E-16	5.9E-16	1.0E-14	5.6E-16	4.9E-16	2.0E-15
Water vole (FW)	5.6E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	5.1E-29	1.2E-28	3.8E-28	7.3E-29	4.3E-29	7.5E-29	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	1.2E-28	0.0E+0	0.0E+0	3.7E-28
Vimba bream	5.6E-28	0.0E+0	0.0E+0	0.0E+0	0.0E+0	5.1E-29	1.2E-28	3.8E-28	7.3E-29	4.3E-29	7.5E-29	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	1.2E-28	0.0E+0	0.0E+0	3.7E-28
Slimy-fruited stonewort	7.2E-13	8.1E-20	3.4E-13	1.8E-13	1.5E-13	3.9E-13	1.4E-13	4.7E-13	5.1E-13	5.0E-14	8.6E-14	2.4E-12	1.3E-13	1.3E-13	1.4E-13	1.7E-13	2.9E-12	1.6E-13	1.4E-13	4.3E-13
RS Zooplankton	1.8E-12	2.0E-19	8.2E-13	4.4E-13	3.7E-13	9.5E-13	3.6E-13	1.2E-12	1.2E-12	1.3E-13	2.2E-13	5.9E-12	3.1E-13	3.1E-13	3.5E-13	4.1E-13	7.0E-12	3.9E-13	3.4E-13	1.1E-12
Painter's mussel	2.3E-15	2.0E-22	8.2E-16	4.4E-16	3.7E-16	9.9E-16	4.8E-16	1.5E-15	1.3E-15	1.7E-16	2.9E-16	5.9E-15	3.1E-16	3.1E-16	3.5E-16	4.1E-16	7.1E-15	3.9E-16	3.4E-16	1.4E-15
Water mudwort	6.2E-12	7.9E-19	3.3E-12	1.8E-12	1.5E-12	3.7E-12	1.2E-12	4.0E-12	4.8E-12	4.2E-13	7.3E-13	2.4E-11	1.3E-12	1.3E-12	1.4E-12	1.6E-12	2.8E-11	1.6E-12	1.4E-12	3.6E-12
Persicaria foliosa	6.2E-12	7.9E-19	3.3E-12	1.8E-12	1.5E-12	3.7E-12	1.2E-12	4.0E-12	4.8E-12	4.2E-13	7.3E-13	2.4E-11	1.3E-12	1.3E-12	1.4E-12	1.6E-12	2.8E-11	1.6E-12	1.4E-12	3.6E-12
Microphytobenthos	6.2E-12	7.9E-19	3.3E-12	1.8E-12	1.5E-12	3.7E-12	1.2E-12	4.0E-12	4.8E-12	4.2E-13	7.3E-13	2.4E-11	1.3E-12	1.3E-12	1.4E-12	1.6E-12	2.8E-11	1.6E-12	1.4E-12	3.6E-12
RS Phytoplankton	6.2E-12	7.9E-19	3.3E-12	1.8E-12	1.5E-12	3.7E-12	1.2E-12	4.0E-12	4.8E-12	4.2E-13	7.3E-13	2.4E-11	1.3E-12	1.3E-12	1.4E-12	1.6E-12	2.8E-11	1.6E-12	1.4E-12	3.6E-12

Table F-10. Continued

Representative Species	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma continued																		
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m	I-129	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210
European perch	8.3E-8	8.9E-4	1.4E-5	1.2E-4	3.8E-8	4.5E-9	2.9E-6	3.4E-7	4.9E-5	3.0E-7	8.8E-8	3.1E-4	9.5E-4	1.1E-5	8.6E-4	5.4E-8	2.9E-9	1.5E-5	2.2E-5	9.0E-6
Duck mussel	8.4E-8	8.9E-4	1.4E-5	1.2E-4	4.6E-8	5.5E-9	3.3E-6	3.5E-7	4.9E-5	3.1E-7	1.1E-7	3.1E-4	9.5E-4	1.1E-5	8.6E-4	6.6E-8	2.9E-9	1.5E-5	2.2E-5	9.0E-6
Asp	8.3E-8	8.9E-4	1.4E-5	1.2E-4	3.8E-8	4.5E-9	2.9E-6	3.4E-7	4.9E-5	3.0E-7	8.8E-8	3.1E-4	9.5E-4	1.1E-5	8.6E-4	5.4E-8	2.9E-9	1.5E-5	2.2E-5	9.0E-6
Bagous binodulus	1.5E-7	9.6E-4	1.8E-5	1.5E-4	8.2E-7	5.7E-8	5.0E-5	9.2E-7	5.6E-5	8.3E-7	2.0E-6	3.7E-4	1.0E-3	1.5E-5	9.2E-4	6.9E-7	5.4E-8	2.0E-5	2.8E-5	1.1E-4
Bagous petro	1.5E-7	9.6E-4	1.8E-5	1.5E-4	8.2E-7	5.7E-8	5.0E-5	9.2E-7	5.6E-5	8.3E-7	2.0E-6	3.7E-4	1.0E-3	1.5E-5	9.2E-4	6.9E-7	5.4E-8	2.0E-5	2.8E-5	1.1E-4
Grasswrack pondweed	1.3E-7	9.5E-4	1.8E-5	1.4E-4	5.5E-7	4.9E-8	3.9E-5	8.6E-7	5.5E-5	7.6E-7	1.6E-6	3.6E-4	1.0E-3	1.4E-5	9.2E-4	6.0E-7	2.1E-8	1.9E-5	2.7E-5	7.7E-5
Donacia brevitarsis	1.5E-7	9.6E-4	1.8E-5	1.5E-4	8.2E-7	5.7E-8	5.0E-5	9.2E-7	5.6E-5	8.3E-7	2.0E-6	3.7E-4	1.0E-3	1.5E-5	9.2E-4	6.9E-7	5.4E-8	2.0E-5	2.8E-5	1.1E-4
Three-lined soldier	1.5E-7	9.6E-4	1.8E-5	1.5E-4	8.2E-7	5.7E-8	5.0E-5	9.2E-7	5.6E-5	8.3E-7	2.0E-6	3.7E-4	1.0E-3	1.5E-5	9.2E-4	6.9E-7	5.4E-8	2.0E-5	2.8E-5	1.1E-4
Common pochard	6.6E-8	8.0E-4	1.1E-5	1.1E-4	1.8E-8	2.0E-9	1.3E-6	1.4E-7	4.2E-5	1.3E-7	4.3E-8	2.8E-4	8.6E-4	7.1E-6	7.8E-4	2.5E-8	1.1E-9	1.2E-5	1.8E-5	3.9E-6
Sigara hellensii	1.5E-7	9.6E-4	1.8E-5	1.5E-4	8.2E-7	5.7E-8	5.0E-5	9.2E-7	5.6E-5	8.3E-7	2.0E-6	3.7E-4	1.0E-3	1.5E-5	9.2E-4	6.9E-7	5.4E-8	2.0E-5	2.8E-5	1.1E-4
Chironomidae sp.	1.5E-7	9.6E-4	1.8E-5	1.5E-4	8.2E-7	5.7E-8	5.0E-5	9.2E-7	5.6E-5	8.3E-7	2.0E-6	3.7E-4	1.0E-3	1.5E-5	9.2E-4	6.9E-7	5.4E-8	2.0E-5	2.8E-5	1.1E-4
Cloeon schoenemundi	1.5E-7	9.6E-4	1.8E-5	1.5E-4	8.2E-7	5.7E-8	5.0E-5	9.2E-7	5.6E-5	8.3E-7	2.0E-6	3.7E-4	1.0E-3	1.5E-5	9.2E-4	6.9E-7	5.4E-8	2.0E-5	2.8E-5	1.1E-4
Donacia dentata	1.5E-7	9.6E-4	1.8E-5	1.5E-4	8.2E-7	5.7E-8	5.0E-5	9.2E-7	5.6E-5	8.3E-7	2.0E-6	3.7E-4	1.0E-3	1.5E-5	9.2E-4	6.9E-7	5.4E-8	2.0E-5	2.8E-5	1.1E-4
Pygmy damselfly	1.5E-7	9.6E-4	1.8E-5	1.5E-4	8.2E-7	5.7E-8	5.0E-5	9.2E-7	5.6E-5	8.3E-7	2.0E-6	3.7E-4	1.0E-3	1.5E-5	9.2E-4	6.9E-7	5.4E-8	2.0E-5	2.8E-5	1.1E-4
Least stonewort	1.3E-7	9.5E-4	1.8E-5	1.4E-4	5.4E-7	5.0E-8	3.8E-5	8.6E-7	5.5E-5	7.7E-7	1.6E-6	3.6E-4	1.0E-3	1.4E-5	9.2E-4	6.1E-7	2.2E-8	1.9E-5	2.7E-5	7.8E-5
European eel	8.3E-8	8.9E-4	1.4E-5	1.2E-4	3.8E-8	4.5E-9	2.9E-6	3.4E-7	4.9E-5	3.0E-7	8.8E-8	3.1E-4	9.5E-4	1.1E-5	8.6E-4	5.4E-8	2.9E-9	1.5E-5	2.2E-5	9.0E-6
Depressed river mussel	8.4E-8	8.9E-4	1.4E-5	1.2E-4	4.6E-8	5.5E-9	3.3E-6	3.5E-7	4.9E-5	3.1E-7	1.1E-7	3.1E-4	9.5E-4	1.1E-5	8.6E-4	6.6E-8	2.9E-9	1.5E-5	2.2E-5	9.0E-6
European crayfish	7.7E-8	8.6E-4	1.3E-5	1.2E-4	3.1E-8	3.5E-9	2.2E-6	2.4E-7	4.7E-5	2.2E-7	7.1E-8	3.0E-4	9.2E-4	9.5E-6	8.4E-4	4.3E-8	2.3E-9	1.4E-5	2.1E-5	6.2E-6
Water pygmyweed	1.3E-7	9.5E-4	1.8E-5	1.4E-4	5.5E-7	4.9E-8	3.9E-5	8.6E-7	5.5E-5	7.6E-7	1.6E-6	3.6E-4	1.0E-3	1.4E-5	9.2E-4	6.0E-7	2.1E-8	1.9E-5	2.7E-5	7.7E-5
Clubbed general	1.5E-7	9.6E-4	1.8E-5	1.5E-4	8.2E-7	5.7E-8	5.0E-5	9.2E-7	5.6E-5	8.3E-7	2.0E-6	3.7E-4	1.0E-3	1.5E-5	9.2E-4	6.9E-7	5.4E-8	2.0E-5	2.8E-5	1.1E-4
Northern pike	8.4E-8	8.9E-4	1.4E-5	1.2E-4	3.8E-8	4.5E-9	3.0E-6	3.4E-7	4.9E-5	3.1E-7	8.8E-8	3.1E-4	9.5E-4	1.1E-5	8.6E-4	5.4E-8	2.9E-9	1.5E-5	2.2E-5	9.3E-6
Ruffe	1.3E-7	9.5E-4	1.8E-5	1.4E-4	4.4E-7	4.7E-8	3.3E-5	8.5E-7	5.5E-5	7.6E-7	1.2E-6	3.5E-4	1.0E-3	1.4E-5	9.2E-4	5.7E-7	2.3E-8	1.9E-5	2.7E-5	7.3E-5
Pool frog	9.2E-8	9.1E-4	1.5E-5	1.3E-4	7.0E-8	8.4E-9	5.0E-6	4.5E-7	5.0E-5	4.0E-7	1.6E-7	3.2E-4	9.7E-4	1.2E-5	8.8E-4	1.0E-7	4.6E-9	1.6E-5	2.3E-5	1.3E-5
Hydaticus continentalis	1.5E-7	9.6E-4	1.8E-5	1.5E-4	8.2E-7	5.7E-8	5.0E-5	9.2E-7	5.6E-5	8.3E-7	2.0E-6	3.7E-4	1.0E-3	1.5E-5	9.2E-4	6.9E-7	5.4E-8	2.0E-5	2.8E-5	1.1E-4
Hydrochus megaphallus	1.5E-7	9.6E-4	1.8E-5	1.5E-4	8.2E-7	5.7E-8	5.0E-5	9.2E-7	5.6E-5	8.3E-7	2.0E-6	3.7E-4	1.0E-3	1.5E-5	9.2E-4	6.9E-7	5.4E-8	2.0E-5	2.8E-5	1.1E-4
Tanymastix stagnalis	1.5E-7	9.6E-4	1.8E-5	1.5E-4	9.0E-7	5.8E-8	5.3E-5	9.3E-7	5.6E-5	8.3E-7	2.2E-6	3.7E-4	1.0E-3	1.5E-5	9.3E-4	7.0E-7	5.7E-8	2.0E-5	2.8E-5	1.1E-4
Chara sp.	1.3E-7	9.5E-4	1.8E-5	1.4E-4	5.4E-7	5.0E-8	3.8E-5	8.6E-7	5.5E-5	7.7E-7	1.6E-6	3.6E-4	1.0E-3	1.4E-5	9.2E-4	6.1E-7	2.2E-8	1.9E-5	2.7E-5	7.8E-5
Common kingfisher	9.0E-8	9.0E-4	1.5E-5	1.2E-4	5.7E-8	6.9E-9	4.6E-6	4.3E-7	5.0E-5	3.9E-7	1.3E-7	3.2E-4	9.7E-4	1.2E-5	8.8E-4	8.3E-8	3.6E-9	1.6E-5	2.3E-5	1.3E-5
Burbot	8.3E-8	8.9E-4	1.4E-5	1.2E-4	3.8E-8	4.5E-9	2.9E-6	3.4E-7	4.9E-5	3.0E-7	8.8E-8	3.1E-4	9.5E-4	1.1E-5	8.6E-4	5.4E-8	2.9E-9	1.5E-5	2.2E-5	9.0E-6
Clam shrimp	1.5E-7	9.6E-4	1.8E-5	1.5E-4	9.0E-7	5.8E-8	5.3E-5	9.3E-7	5.6E-5	8.3E-7	2.2E-6	3.7E-4	1.0E-3	1.5E-5	9.3E-4	7.0E-7	5.7E-8	2.0E-5	2.8E-5	1.1E-4
Macroplea appendiculata	1.5E-7	9.6E-4	1.8E-5	1.5E-4	8.2E-7	5.7E-8	5.0E-5	9.2E-7	5.6E-5	8.3E-7	2.0E-6	3.7E-4	1.0E-3	1.5E-5	9.2E-4	6.9E-7	5.4E-8	2.0E-5	2.8E-5	1.1E-4
Sheatfish	6.7E-8	8.1E-4	1.1E-5	1.1E-4	1.7E-8	1.9E-9	1.3E-6	1.4E-7	4.3E-5	1.3E-7	4.1E-8	2.8E-4	8.7E-4	7.3E-6	7.9E-4	2.3E-8	1.1E-9	1.2E-5	1.9E-5	3.8E-6

Representative Species	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma continued																		
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m	I-129	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210
Common roach	8.3E-8	8.9E-4	1.4E-5	1.2E-4	3.8E-8	4.5E-9	2.9E-6	3.3E-7	4.9E-5	3.0E-7	8.8E-8	3.1E-4	9.5E-4	1.1E-5	8.6E-4	5.4E-8	2.9E-9	1.5E-5	2.2E-5	8.9E-6
Elatine orthosperma	1.3E-7	9.5E-4	1.8E-5	1.4E-4	5.5E-7	4.9E-8	3.9E-5	8.6E-7	5.5E-5	7.6E-7	1.6E-6	3.6E-4	1.0E-3	1.4E-5	9.2E-4	6.0E-7	2.1E-8	1.9E-5	2.7E-5	7.7E-5
Anisus spirorbis	1.4E-7	9.6E-4	1.8E-5	1.4E-4	6.8E-7	5.3E-8	4.6E-5	9.1E-7	5.5E-5	8.2E-7	1.6E-6	3.7E-4	1.0E-3	1.5E-5	9.2E-4	6.4E-7	5.5E-8	2.0E-5	2.7E-5	1.0E-4
Spatulaleaf loosestrife	1.3E-7	9.5E-4	1.8E-5	1.4E-4	5.5E-7	4.9E-8	3.9E-5	8.6E-7	5.5E-5	7.6E-7	1.6E-6	3.6E-4	1.0E-3	1.4E-5	9.2E-4	6.0E-7	2.1E-8	1.9E-5	2.7E-5	7.7E-5
Signal crayfish	1.5E-7	9.6E-4	1.8E-5	1.5E-4	9.0E-7	5.8E-8	5.3E-5	9.3E-7	5.6E-5	8.3E-7	2.2E-6	3.7E-4	1.0E-3	1.5E-5	9.3E-4	7.0E-7	5.7E-8	2.0E-5	2.8E-5	1.1E-4
Alisma wahlenbergii	1.3E-7	9.5E-4	1.8E-5	1.4E-4	5.5E-7	4.9E-8	3.9E-5	8.6E-7	5.5E-5	7.6E-7	1.6E-6	3.6E-4	1.0E-3	1.4E-5	9.2E-4	6.0E-7	2.1E-8	1.9E-5	2.7E-5	7.7E-5
Tadpole shrimp	1.5E-7	9.6E-4	1.8E-5	1.5E-4	9.0E-7	5.8E-8	5.3E-5	9.3E-7	5.6E-5	8.3E-7	2.2E-6	3.7E-4	1.0E-3	1.5E-5	9.3E-4	7.0E-7	5.7E-8	2.0E-5	2.8E-5	1.1E-4
Sphagnum (Subm.) (FW)	1.3E-7	9.5E-4	1.8E-5	1.4E-4	4.9E-7	4.9E-8	3.5E-5	8.6E-7	5.5E-5	7.7E-7	1.3E-6	3.6E-4	1.0E-3	1.4E-5	9.2E-4	5.9E-7	2.5E-8	1.9E-5	2.7E-5	7.8E-5
Rugged stonewort	1.3E-7	9.5E-4	1.8E-5	1.4E-4	5.4E-7	5.0E-8	3.8E-5	8.6E-7	5.5E-5	7.7E-7	1.6E-6	3.6E-4	1.0E-3	1.4E-5	9.2E-4	6.1E-7	2.2E-8	1.9E-5	2.7E-5	7.8E-5
Slender stonewort	1.3E-7	9.5E-4	1.8E-5	1.4E-4	5.4E-7	5.0E-8	3.8E-5	8.6E-7	5.5E-5	7.7E-7	1.6E-6	3.6E-4	1.0E-3	1.4E-5	9.2E-4	6.1E-7	2.2E-8	1.9E-5	2.7E-5	7.8E-5
Starry stonewort	1.3E-7	9.5E-4	1.8E-5	1.4E-4	5.4E-7	5.0E-8	3.8E-5	8.6E-7	5.5E-5	7.7E-7	1.6E-6	3.6E-4	1.0E-3	1.4E-5	9.2E-4	6.1E-7	2.2E-8	1.9E-5	2.7E-5	7.8E-5
Bittercress	1.3E-7	9.5E-4	1.8E-5	1.4E-4	5.5E-7	4.9E-8	3.9E-5	8.6E-7	5.5E-5	7.6E-7	1.6E-6	3.6E-4	1.0E-3	1.4E-5	9.2E-4	6.0E-7	2.1E-8	1.9E-5	2.7E-5	7.7E-5
Shetland pondweed	1.3E-7	9.5E-4	1.8E-5	1.4E-4	5.5E-7	4.9E-8	3.9E-5	8.6E-7	5.5E-5	7.6E-7	1.6E-6	3.6E-4	1.0E-3	1.4E-5	9.2E-4	6.0E-7	2.1E-8	1.9E-5	2.7E-5	7.7E-5
Northern crested newt	8.3E-8	8.8E-4	1.4E-5	1.2E-4	4.3E-8	5.1E-9	3.1E-6	3.3E-7	4.9E-5	2.9E-7	1.0E-7	3.1E-4	9.5E-4	1.1E-5	8.6E-4	6.1E-8	2.7E-9	1.5E-5	2.2E-5	8.5E-6
Large mouthed valve snail	1.4E-7	9.6E-4	1.8E-5	1.4E-4	6.1E-7	4.9E-8	4.2E-5	8.9E-7	5.5E-5	8.0E-7	1.4E-6	3.6E-4	1.0E-3	1.4E-5	9.2E-4	5.9E-7	5.0E-8	1.9E-5	2.7E-5	9.6E-5
Tench	8.2E-8	8.8E-4	1.3E-5	1.2E-4	3.8E-8	4.5E-9	2.7E-6	3.1E-7	4.8E-5	2.7E-7	8.8E-8	3.1E-4	9.5E-4	1.1E-5	8.5E-4	5.4E-8	2.9E-9	1.5E-5	2.1E-5	7.8E-6
Horned grebe	6.6E-8	8.0E-4	1.1E-5	1.1E-4	1.8E-8	2.0E-9	1.3E-6	1.4E-7	4.2E-5	1.3E-7	4.3E-8	2.8E-4	8.6E-4	7.1E-6	7.8E-4	2.5E-8	1.1E-9	1.2E-5	1.8E-5	3.9E-6
Black tern	8.7E-8	9.0E-4	1.4E-5	1.2E-4	4.8E-8	5.7E-9	3.9E-6	4.0E-7	5.0E-5	3.6E-7	1.1E-7	3.2E-4	9.6E-4	1.2E-5	8.7E-4	6.9E-8	3.0E-9	1.6E-5	2.2E-5	1.1E-5
Thick shelled river mussel	8.4E-8	8.9E-4	1.4E-5	1.2E-4	4.6E-8	5.5E-9	3.3E-6	3.5E-7	4.9E-5	3.1E-7	1.1E-7	3.1E-4	9.5E-4	1.1E-5	8.6E-4	6.6E-8	2.9E-9	1.5E-5	2.2E-5	9.0E-6
Flat-stalked pondweed	1.3E-7	9.5E-4	1.8E-5	1.4E-4	5.5E-7	4.9E-8	3.9E-5	8.6E-7	5.5E-5	7.6E-7	1.6E-6	3.6E-4	1.0E-3	1.4E-5	9.2E-4	6.0E-7	2.1E-8	1.9E-5	2.7E-5	7.7E-5
Pointed stonewort	1.3E-7	9.5E-4	1.8E-5	1.4E-4	5.4E-7	5.0E-8	3.8E-5	8.6E-7	5.5E-5	7.7E-7	1.6E-6	3.6E-4	1.0E-3	1.4E-5	9.2E-4	6.1E-7	2.2E-8	1.9E-5	2.7E-5	7.8E-5
European otter	5.5E-8	7.2E-4	8.4E-6	9.1E-5	1.0E-8	1.2E-9	8.3E-7	8.1E-8	3.6E-5	7.3E-8	2.5E-8	2.5E-4	7.8E-4	4.8E-6	7.1E-4	1.4E-8	6.1E-10	9.9E-6	1.6E-5	2.5E-6
Common toad (FW)	8.5E-8	8.9E-4	1.4E-5	1.2E-4	4.9E-8	5.8E-9	3.5E-6	3.5E-7	4.9E-5	3.1E-7	1.1E-7	3.1E-4	9.5E-4	1.1E-5	8.6E-4	7.0E-8	3.1E-9	1.5E-5	2.2E-5	9.3E-6
Water vole (FW)	8.1E-8	8.8E-4	1.3E-5	1.2E-4	3.8E-8	4.5E-9	2.7E-6	2.9E-7	4.8E-5	2.6E-7	8.9E-8	3.1E-4	9.4E-4	1.0E-5	8.5E-4	5.4E-8	2.9E-9	1.5E-5	2.1E-5	7.6E-6
Vimba bream	8.3E-8	8.9E-4	1.4E-5	1.2E-4	3.8E-8	4.5E-9	2.9E-6	3.4E-7	4.9E-5	3.0E-7	8.8E-8	3.1E-4	9.5E-4	1.1E-5	8.6E-4	5.4E-8	2.9E-9	1.5E-5	2.2E-5	9.0E-6
Slimy-fruited stonewort	1.3E-7	9.5E-4	1.8E-5	1.4E-4	5.4E-7	5.0E-8	3.8E-5	8.6E-7	5.5E-5	7.7E-7	1.6E-6	3.6E-4	1.0E-3	1.4E-5	9.2E-4	6.1E-7	2.2E-8	1.9E-5	2.7E-5	7.8E-5
RS Zooplankton	1.5E-7	9.7E-4	1.9E-5	1.6E-4	1.3E-6	6.3E-8	7.9E-5	9.5E-7	5.6E-5	8.6E-7	3.0E-6	3.9E-4	1.0E-3	1.5E-5	9.4E-4	7.6E-7	8.7E-8	2.0E-5	2.8E-5	1.5E-4
Painter's mussel	8.4E-8	8.9E-4	1.4E-5	1.2E-4	4.6E-8	5.5E-9	3.3E-6	3.5E-7	4.9E-5	3.1E-7	1.1E-7	3.1E-4	9.5E-4	1.1E-5	8.6E-4	6.6E-8	2.9E-9	1.5E-5	2.2E-5	9.0E-6
Water mudwort	1.3E-7	9.5E-4	1.8E-5	1.4E-4	5.5E-7	4.9E-8	3.9E-5	8.6E-7	5.5E-5	7.6E-7	1.6E-6	3.6E-4	1.0E-3	1.4E-5	9.2E-4	6.0E-7	2.1E-8	1.9E-5	2.7E-5	7.7E-5
Persicaria foliosa	1.3E-7	9.5E-4	1.8E-5	1.4E-4	5.5E-7	4.9E-8	3.9E-5	8.6E-7	5.5E-5	7.6E-7	1.6E-6	3.6E-4	1.0E-3	1.4E-5	9.2E-4	6.0E-7	2.1E-8	1.9E-5	2.7E-5	7.7E-5
Microphytobenthos	1.3E-7	9.5E-4	1.8E-5	1.4E-4	5.5E-7	4.9E-8	3.9E-5	8.6E-7	5.5E-5	7.6E-7	1.6E-6	3.6E-4	1.0E-3	1.4E-5	9.2E-4	6.0E-7	2.1E-8	1.9E-5	2.7E-5	7.7E-5
RS Phytoplankton	1.3E-7	9.5E-4	1.8E-5	1.4E-4	5.5E-7	4.9E-8	3.9E-5	8.6E-7	5.5E-5	7.6E-7	1.6E-6	3.6E-4	1.0E-3	1.4E-5	9.2E-4	6.0E-7	2.1E-8	1.9E-5	2.7E-5	7.7E-5

Table F-10. Continued

Representative Species	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma continued																			
	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226	Se-79	Sm-151	Sn-126	Sr-90	Tc-99	Th-229	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
European perch	5.7E-10	4.6E-9	1.5E-7	3.1E-7	2.6E-7	1.0E-3	5.0E-8	6.2E-9	9.0E-4	5.2E-5	2.5E-7	4.8E-5	3.6E-7	2.5E-7	3.3E-7	3.1E-7	9.3E-5	2.6E-7	2.2E-7	3.6E-9
Duck mussel	3.6E-10	4.7E-9	1.6E-7	3.2E-7	2.7E-7	1.0E-3	6.1E-8	6.6E-9	9.0E-4	5.1E-5	3.0E-7	4.8E-5	3.7E-7	2.6E-7	3.4E-7	3.2E-7	9.3E-5	2.7E-7	2.3E-7	3.7E-9
Asp	5.7E-10	4.6E-9	1.5E-7	3.1E-7	2.6E-7	1.0E-3	5.0E-8	6.2E-9	9.0E-4	5.2E-5	2.5E-7	4.8E-5	3.6E-7	2.5E-7	3.3E-7	3.1E-7	9.3E-5	2.6E-7	2.2E-7	3.6E-9
Bagous binodulus	1.1E-8	4.9E-9	4.0E-7	9.4E-7	7.8E-7	1.3E-3	1.1E-6	8.1E-8	1.2E-3	4.4E-4	5.3E-6	5.6E-5	9.0E-7	7.4E-7	7.4E-7	9.4E-7	1.1E-4	8.4E-7	7.2E-7	6.6E-8
Bagous petro	1.1E-8	4.9E-9	4.0E-7	9.4E-7	7.8E-7	1.3E-3	1.1E-6	8.1E-8	1.2E-3	4.4E-4	5.3E-6	5.6E-5	9.0E-7	7.4E-7	7.4E-7	9.4E-7	1.1E-4	8.4E-7	7.2E-7	6.6E-8
Grasswrack pondweed	2.2E-9	4.9E-9	3.7E-7	8.6E-7	7.2E-7	1.2E-3	7.5E-7	3.9E-8	1.1E-3	3.4E-4	5.1E-6	5.5E-5	8.2E-7	6.7E-7	6.9E-7	8.7E-7	1.1E-4	7.7E-7	6.7E-7	2.6E-8
Donacia brevitarsis	1.1E-8	4.9E-9	4.0E-7	9.4E-7	7.8E-7	1.3E-3	1.1E-6	8.1E-8	1.2E-3	4.4E-4	5.3E-6	5.6E-5	9.0E-7	7.4E-7	7.4E-7	9.4E-7	1.1E-4	8.4E-7	7.2E-7	6.6E-8
Three-lined soldier	1.1E-8	4.9E-9	4.0E-7	9.4E-7	7.8E-7	1.3E-3	1.1E-6	8.1E-8	1.2E-3	4.4E-4	5.3E-6	5.6E-5	9.0E-7	7.4E-7	7.4E-7	9.4E-7	1.1E-4	8.4E-7	7.2E-7	6.6E-8
Common pochard	1.3E-10	4.2E-9	7.7E-8	1.3E-7	1.1E-7	9.0E-4	2.4E-8	2.6E-9	8.0E-4	2.0E-5	1.2E-7	4.1E-5	2.4E-7	1.4E-7	2.2E-7	1.5E-7	8.1E-5	1.2E-7	9.5E-8	1.4E-9
Sigara hellensii	1.1E-8	4.9E-9	4.0E-7	9.4E-7	7.8E-7	1.3E-3	1.1E-6	8.1E-8	1.2E-3	4.4E-4	5.3E-6	5.6E-5	9.0E-7	7.4E-7	7.4E-7	9.4E-7	1.1E-4	8.4E-7	7.2E-7	6.6E-8
Chironomidae sp.	1.1E-8	4.9E-9	4.0E-7	9.4E-7	7.8E-7	1.3E-3	1.1E-6	8.1E-8	1.2E-3	4.4E-4	5.3E-6	5.6E-5	9.0E-7	7.4E-7	7.4E-7	9.4E-7	1.1E-4	8.4E-7	7.2E-7	6.6E-8
Cloeon schoenemundi	1.1E-8	4.9E-9	4.0E-7	9.4E-7	7.8E-7	1.3E-3	1.1E-6	8.1E-8	1.2E-3	4.4E-4	5.3E-6	5.6E-5	9.0E-7	7.4E-7	7.4E-7	9.4E-7	1.1E-4	8.4E-7	7.2E-7	6.6E-8
Donacia dentata	1.1E-8	4.9E-9	4.0E-7	9.4E-7	7.8E-7	1.3E-3	1.1E-6	8.1E-8	1.2E-3	4.4E-4	5.3E-6	5.6E-5	9.0E-7	7.4E-7	7.4E-7	9.4E-7	1.1E-4	8.4E-7	7.2E-7	6.6E-8
Pygmy damselfly	1.1E-8	4.9E-9	4.0E-7	9.4E-7	7.8E-7	1.3E-3	1.1E-6	8.1E-8	1.2E-3	4.4E-4	5.3E-6	5.6E-5	9.0E-7	7.4E-7	7.4E-7	9.4E-7	1.1E-4	8.4E-7	7.2E-7	6.6E-8
Least stonewort	2.5E-9	4.9E-9	3.7E-7	8.7E-7	7.2E-7	1.2E-3	7.4E-7	4.0E-8	1.1E-3	3.5E-4	5.0E-6	5.5E-5	8.3E-7	6.8E-7	6.9E-7	8.7E-7	1.1E-4	7.8E-7	6.7E-7	2.8E-8
European eel	5.7E-10	4.6E-9	1.5E-7	3.1E-7	2.6E-7	1.0E-3	5.0E-8	6.2E-9	9.0E-4	5.2E-5	2.5E-7	4.8E-5	3.6E-7	2.5E-7	3.3E-7	3.1E-7	9.3E-5	2.6E-7	2.2E-7	3.6E-9
Depressed river mussel	3.6E-10	4.7E-9	1.6E-7	3.2E-7	2.7E-7	1.0E-3	6.1E-8	6.6E-9	9.0E-4	5.1E-5	3.0E-7	4.8E-5	3.7E-7	2.6E-7	3.4E-7	3.2E-7	9.3E-5	2.7E-7	2.3E-7	3.7E-9
European crayfish	4.6E-10	4.5E-9	1.2E-7	2.3E-7	1.9E-7	9.6E-4	4.0E-8	4.8E-9	8.6E-4	3.4E-5	2.0E-7	4.6E-5	3.1E-7	2.0E-7	2.8E-7	2.4E-7	8.9E-5	1.9E-7	1.6E-7	2.8E-9
Water pygmyweed	2.2E-9	4.9E-9	3.7E-7	8.6E-7	7.2E-7	1.2E-3	7.5E-7	3.9E-8	1.1E-3	3.4E-4	5.1E-6	5.5E-5	8.2E-7	6.7E-7	6.9E-7	8.7E-7	1.1E-4	7.7E-7	6.7E-7	2.6E-8
Clubbed general	1.1E-8	4.9E-9	4.0E-7	9.4E-7	7.8E-7	1.3E-3	1.1E-6	8.1E-8	1.2E-3	4.4E-4	5.3E-6	5.6E-5	9.0E-7	7.4E-7	7.4E-7	9.4E-7	1.1E-4	8.4E-7	7.2E-7	6.6E-8
Northern pike	5.7E-10	4.7E-9	1.5E-7	3.2E-7	2.6E-7	1.0E-3	5.0E-8	6.2E-9	9.0E-4	5.4E-5	2.5E-7	4.8E-5	3.6E-7	2.5E-7	3.3E-7	3.1E-7	9.3E-5	2.7E-7	2.2E-7	3.6E-9
Ruffe	3.0E-9	4.9E-9	3.7E-7	8.6E-7	7.1E-7	1.2E-3	5.9E-7	4.0E-8	1.1E-3	3.5E-4	3.7E-6	5.5E-5	8.1E-7	6.6E-7	6.8E-7	8.6E-7	1.1E-4	7.7E-7	6.6E-7	2.9E-8
Pool frog	5.5E-10	4.7E-9	2.0E-7	4.2E-7	3.5E-7	1.0E-3	9.2E-8	9.5E-9	9.3E-4	7.6E-5	4.5E-7	4.9E-5	4.4E-7	3.2E-7	4.0E-7	4.1E-7	9.6E-5	3.6E-7	3.0E-7	5.7E-9
Hydaticus continentalis	1.1E-8	4.9E-9	4.0E-7	9.4E-7	7.8E-7	1.3E-3	1.1E-6	8.1E-8	1.2E-3	4.4E-4	5.3E-6	5.6E-5	9.0E-7	7.4E-7	7.4E-7	9.4E-7	1.1E-4	8.4E-7	7.2E-7	6.6E-8
Hydrochus megaphallus	1.1E-8	4.9E-9	4.0E-7	9.4E-7	7.8E-7	1.3E-3	1.1E-6	8.1E-8	1.2E-3	4.4E-4	5.3E-6	5.6E-5	9.0E-7	7.4E-7	7.4E-7	9.4E-7	1.1E-4	8.4E-7	7.2E-7	6.6E-8
Tanymastix stagnalis	1.2E-8	4.9E-9	4.0E-7	9.5E-7	7.9E-7	1.3E-3	1.2E-6	8.5E-8	1.2E-3	4.5E-4	5.7E-6	5.6E-5	9.2E-7	7.5E-7	7.5E-7	9.5E-7	1.1E-4	8.5E-7	7.3E-7	7.0E-8
Chara sp.	2.5E-9	4.9E-9	3.7E-7	8.7E-7	7.2E-7	1.2E-3	7.4E-7	4.0E-8	1.1E-3	3.5E-4	5.0E-6	5.5E-5	8.3E-7	6.8E-7	6.9E-7	8.7E-7	1.1E-4	7.8E-7	6.7E-7	2.8E-8
Common kingfisher	4.4E-10	4.7E-9	1.9E-7	4.0E-7	3.4E-7	1.0E-3	7.4E-8	8.0E-9	9.2E-4	7.2E-5	3.6E-7	4.9E-5	4.2E-7	3.0E-7	3.9E-7	3.9E-7	9.5E-5	3.4E-7	2.9E-7	4.5E-9
Burbot	5.7E-10	4.6E-9	1.5E-7	3.1E-7	2.6E-7	1.0E-3	5.0E-8	6.2E-9	9.0E-4	5.2E-5	2.5E-7	4.8E-5	3.6E-7	2.5E-7	3.3E-7	3.1E-7	9.3E-5	2.6E-7	2.2E-7	3.6E-9
Clam shrimp	1.2E-8	4.9E-9	4.0E-7	9.5E-7	7.9E-7	1.3E-3	1.2E-6	8.5E-8	1.2E-3	4.5E-4	5.7E-6	5.6E-5	9.2E-7	7.5E-7	7.5E-7	9.5E-7	1.1E-4	8.5E-7	7.3E-7	7.0E-8
Macroplea appendiculata	1.1E-8	4.9E-9	4.0E-7	9.4E-7	7.8E-7	1.3E-3	1.1E-6	8.1E-8	1.2E-3	4.4E-4	5.3E-6	5.6E-5	9.0E-7	7.4E-7	7.4E-7	9.4E-7	1.1E-4	8.4E-7	7.2E-7	6.6E-8
Sheatfish	1.2E-10	4.3E-9	7.8E-8	1.3E-7	1.1E-7	9.1E-4	2.3E-8	2.6E-9	8.0E-4	2.1E-5	1.1E-7	4.2E-5	2.4E-7	1.4E-7	2.2E-7	1.5E-7	8.2E-5	1.2E-7	9.5E-8	1.3E-9

Representative Species	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma continued																			
	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226	Se-79	Sm-151	Sn-126	Sr-90	Tc-99	Th-229	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
Common roach	5.7E-10	4.6E-9	1.5E-7	3.1E-7	2.6E-7	1.0E-3	5.0E-8	6.2E-9	9.0E-4	5.1E-5	2.5E-7	4.8E-5	3.6E-7	2.5E-7	3.3E-7	3.1E-7	9.2E-5	2.6E-7	2.2E-7	3.6E-9
Elatine orthosperma	2.2E-9	4.9E-9	3.7E-7	8.6E-7	7.2E-7	1.2E-3	7.5E-7	3.9E-8	1.1E-3	3.4E-4	5.1E-6	5.5E-5	8.2E-7	6.7E-7	6.9E-7	8.7E-7	1.1E-4	7.7E-7	6.7E-7	2.6E-8
Anisus spirorbis	1.2E-8	4.9E-9	3.9E-7	9.3E-7	7.7E-7	1.3E-3	8.9E-7	8.0E-8	1.2E-3	4.3E-4	4.4E-6	5.6E-5	8.8E-7	7.3E-7	7.2E-7	9.2E-7	1.1E-4	8.2E-7	7.1E-7	6.7E-8
Spatulaleaf loosestrife	2.2E-9	4.9E-9	3.7E-7	8.6E-7	7.2E-7	1.2E-3	7.5E-7	3.9E-8	1.1E-3	3.4E-4	5.1E-6	5.5E-5	8.2E-7	6.7E-7	6.9E-7	8.7E-7	1.1E-4	7.7E-7	6.7E-7	2.6E-8
Signal crayfish	1.2E-8	4.9E-9	4.0E-7	9.5E-7	7.9E-7	1.3E-3	1.2E-6	8.5E-8	1.2E-3	4.5E-4	5.7E-6	5.6E-5	9.2E-7	7.5E-7	7.5E-7	9.5E-7	1.1E-4	8.5E-7	7.3E-7	7.0E-8
Alisma wahlenbergii	2.2E-9	4.9E-9	3.7E-7	8.6E-7	7.2E-7	1.2E-3	7.5E-7	3.9E-8	1.1E-3	3.4E-4	5.1E-6	5.5E-5	8.2E-7	6.7E-7	6.9E-7	8.7E-7	1.1E-4	7.7E-7	6.7E-7	2.6E-8
Tadpole shrimp	1.2E-8	4.9E-9	4.0E-7	9.5E-7	7.9E-7	1.3E-3	1.2E-6	8.5E-8	1.2E-3	4.5E-4	5.7E-6	5.6E-5	9.2E-7	7.5E-7	7.5E-7	9.5E-7	1.1E-4	8.5E-7	7.3E-7	7.0E-8
Sphagnum (Subm.) (FW)	3.2E-9	4.9E-9	3.7E-7	8.7E-7	7.2E-7	1.3E-3	6.6E-7	4.3E-8	1.1E-3	3.7E-4	4.0E-6	5.5E-5	8.2E-7	6.8E-7	6.9E-7	8.7E-7	1.1E-4	7.8E-7	6.7E-7	3.1E-8
Rugged stonewort	2.5E-9	4.9E-9	3.7E-7	8.7E-7	7.2E-7	1.2E-3	7.4E-7	4.0E-8	1.1E-3	3.5E-4	5.0E-6	5.5E-5	8.3E-7	6.8E-7	6.9E-7	8.7E-7	1.1E-4	7.8E-7	6.7E-7	2.8E-8
Slender stonewort	2.5E-9	4.9E-9	3.7E-7	8.7E-7	7.2E-7	1.2E-3	7.4E-7	4.0E-8	1.1E-3	3.5E-4	5.0E-6	5.5E-5	8.3E-7	6.8E-7	6.9E-7	8.7E-7	1.1E-4	7.8E-7	6.7E-7	2.8E-8
Starry stonewort	2.5E-9	4.9E-9	3.7E-7	8.7E-7	7.2E-7	1.2E-3	7.4E-7	4.0E-8	1.1E-3	3.5E-4	5.0E-6	5.5E-5	8.3E-7	6.8E-7	6.9E-7	8.7E-7	1.1E-4	7.8E-7	6.7E-7	2.8E-8
Bittercress	2.2E-9	4.9E-9	3.7E-7	8.6E-7	7.2E-7	1.2E-3	7.5E-7	3.9E-8	1.1E-3	3.4E-4	5.1E-6	5.5E-5	8.2E-7	6.7E-7	6.9E-7	8.7E-7	1.1E-4	7.7E-7	6.7E-7	2.6E-8
Shetland pondweed	2.2E-9	4.9E-9	3.7E-7	8.6E-7	7.2E-7	1.2E-3	7.5E-7	3.9E-8	1.1E-3	3.4E-4	5.1E-6	5.5E-5	8.2E-7	6.7E-7	6.9E-7	8.7E-7	1.1E-4	7.7E-7	6.7E-7	2.6E-8
Northern crested newt	3.4E-10	4.6E-9	1.5E-7	3.1E-7	2.5E-7	1.0E-3	5.6E-8	6.1E-9	8.9E-4	4.8E-5	2.8E-7	4.8E-5	3.6E-7	2.5E-7	3.3E-7	3.1E-7	9.2E-5	2.6E-7	2.2E-7	3.4E-9
Large mouthed valve snail	1.1E-8	4.9E-9	3.8E-7	9.0E-7	7.5E-7	1.3E-3	7.9E-7	7.5E-8	1.1E-3	4.2E-4	3.9E-6	5.5E-5	8.6E-7	7.0E-7	7.1E-7	8.9E-7	1.1E-4	8.0E-7	6.9E-7	6.2E-8
Tench	5.7E-10	4.6E-9	1.4E-7	2.9E-7	2.4E-7	9.9E-4	5.0E-8	6.0E-9	8.9E-4	4.4E-5	2.4E-7	4.7E-5	3.5E-7	2.3E-7	3.2E-7	2.9E-7	9.2E-5	2.4E-7	2.0E-7	3.6E-9
Horned grebe	1.3E-10	4.2E-9	7.7E-8	1.3E-7	1.1E-7	9.0E-4	2.4E-8	2.6E-9	8.0E-4	2.0E-5	1.2E-7	4.1E-5	2.4E-7	1.4E-7	2.2E-7	1.5E-7	8.1E-5	1.2E-7	9.5E-8	1.4E-9
Black tern	3.7E-10	4.7E-9	1.7E-7	3.7E-7	3.1E-7	1.0E-3	6.2E-8	7.0E-9	9.1E-4	6.5E-5	3.1E-7	4.9E-5	4.0E-7	2.8E-7	3.7E-7	3.6E-7	9.4E-5	3.1E-7	2.6E-7	3.8E-9
Thick shelled river mussel	3.6E-10	4.7E-9	1.6E-7	3.2E-7	2.7E-7	1.0E-3	6.1E-8	6.6E-9	9.0E-4	5.1E-5	3.0E-7	4.8E-5	3.7E-7	2.6E-7	3.4E-7	3.2E-7	9.3E-5	2.7E-7	2.3E-7	3.7E-9
Flat-stalked pondweed	2.2E-9	4.9E-9	3.7E-7	8.6E-7	7.2E-7	1.2E-3	7.5E-7	3.9E-8	1.1E-3	3.4E-4	5.1E-6	5.5E-5	8.2E-7	6.7E-7	6.9E-7	8.7E-7	1.1E-4	7.7E-7	6.7E-7	2.6E-8
Pointed stonewort	2.5E-9	4.9E-9	3.7E-7	8.7E-7	7.2E-7	1.2E-3	7.4E-7	4.0E-8	1.1E-3	3.5E-4	5.0E-6	5.5E-5	8.3E-7	6.8E-7	6.9E-7	8.7E-7	1.1E-4	7.8E-7	6.7E-7	2.8E-8
European otter	6.4E-11	3.8E-9	5.3E-8	7.8E-8	6.5E-8	8.2E-4	1.4E-8	1.5E-9	7.2E-4	1.2E-5	7.2E-8	3.5E-5	1.9E-7	1.0E-7	1.7E-7	1.0E-7	7.0E-5	7.5E-8	5.7E-8	7.6E-10
Common toad (FW)	3.8E-10	4.7E-9	1.6E-7	3.2E-7	2.7E-7	1.0E-3	6.4E-8	6.8E-9	9.0E-4	5.2E-5	3.1E-7	4.8E-5	3.7E-7	2.6E-7	3.4E-7	3.2E-7	9.3E-5	2.7E-7	2.3E-7	3.9E-9
Water vole (FW)	5.7E-10	4.6E-9	1.4E-7	2.8E-7	2.3E-7	9.9E-4	5.0E-8	6.0E-9	8.8E-4	4.2E-5	2.5E-7	4.7E-5	3.4E-7	2.3E-7	3.1E-7	2.8E-7	9.1E-5	2.3E-7	1.9E-7	3.6E-9
Vimba bream	5.7E-10	4.6E-9	1.5E-7	3.1E-7	2.6E-7	1.0E-3	5.0E-8	6.2E-9	9.0E-4	5.2E-5	2.5E-7	4.8E-5	3.6E-7	2.5E-7	3.3E-7	3.1E-7	9.3E-5	2.6E-7	2.2E-7	3.6E-9
Slimy-fruited stonewort	2.5E-9	4.9E-9	3.7E-7	8.7E-7	7.2E-7	1.2E-3	7.4E-7	4.0E-8	1.1E-3	3.5E-4	5.0E-6	5.5E-5	8.3E-7	6.8E-7	6.9E-7	8.7E-7	1.1E-4	7.8E-7	6.7E-7	2.8E-8
RS Zooplankton	1.1E-8	4.9E-9	4.2E-7	9.9E-7	8.2E-7	1.4E-3	1.7E-6	1.3E-7	1.2E-3	5.1E-4	8.4E-6	5.8E-5	1.0E-6	8.3E-7	7.8E-7	1.0E-6	1.1E-4	9.1E-7	7.8E-7	1.1E-7
Painter's mussel	3.6E-10	4.7E-9	1.6E-7	3.2E-7	2.7E-7	1.0E-3	6.1E-8	6.6E-9	9.0E-4	5.1E-5	3.0E-7	4.8E-5	3.7E-7	2.6E-7	3.4E-7	3.2E-7	9.3E-5	2.7E-7	2.3E-7	3.7E-9
Water mudwort	2.2E-9	4.9E-9	3.7E-7	8.6E-7	7.2E-7	1.2E-3	7.5E-7	3.9E-8	1.1E-3	3.4E-4	5.1E-6	5.5E-5	8.2E-7	6.7E-7	6.9E-7	8.7E-7	1.1E-4	7.7E-7	6.7E-7	2.6E-8
Persicaria foliosa	2.2E-9	4.9E-9	3.7E-7	8.6E-7	7.2E-7	1.2E-3	7.5E-7	3.9E-8	1.1E-3	3.4E-4	5.1E-6	5.5E-5	8.2E-7	6.7E-7	6.9E-7	8.7E-7	1.1E-4	7.7E-7	6.7E-7	2.6E-8
Microphytobenthos	2.2E-9	4.9E-9	3.7E-7	8.6E-7	7.2E-7	1.2E-3	7.5E-7	3.9E-8	1.1E-3	3.4E-4	5.1E-6	5.5E-5	8.2E-7	6.7E-7	6.9E-7	8.7E-7	1.1E-4	7.7E-7	6.7E-7	2.6E-8
RS Phytoplankton	2.2E-9	4.9E-9	3.7E-7	8.6E-7	7.2E-7	1.2E-3	7.5E-7	3.9E-8	1.1E-3	3.4E-4	5.1E-6	5.5E-5	8.2E-7	6.7E-7	6.9E-7	8.7E-7	1.1E-4	7.7E-7	6.7E-7	2.6E-8

Table F-11. Dose conversion coefficients for internal exposure of marine representative species to alpha, low energy beta (≤ 10 keV) and high energy beta (> 10 keV) /gamma radiation (µGy/h)/(Bq/kg).

Representative Species	Dose Conversion Coefficient of internal alpha radiation													
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m	I-129
RS Phytoplankton	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RS Zooplankton	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Stypocaulon scoparium	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bristly stonewort	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Grasswrack pondweed	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Water pygmyweed	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Elatine orthosperma	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Alisma wahlenbergii	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Flat-stalked pondweed	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Water mudwort	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Baltic macoma	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Polychaete worms	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Idotea balthica	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Vimba bream	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Viviparous eelpout	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Burbot	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lumpsucker	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European eel	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Atlantic herring	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European sprat	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European perch	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Northern pike	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Atlantic salmon	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Brown trout	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zander	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Coregonus sp.	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Greater scaup	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common eider	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European herring gull	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Horned grebe	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Black guillemot	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ruddy turnstone	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
White-tailed eagle	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
European otter	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ringed seal	3.93E-05	0.00E+00	3.16E-03	3.04E-03	0.00E+00	0.00E+00	0.00E+00	3.34E-03	3.09E-03	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-11. Continued

Representative Species	Dose Conversion Coefficient of internal alpha radiation continued													
	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226	Se-79	Sm-151
RS Phytoplankton	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
RS Zooplankton	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
Stypocaulon scoparium	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
Bristly stonewort	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
Grasswrack pondweed	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
Water pygmyweed	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
Elatine orthosperma	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
Alisma wahlenbergii	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
Flat-stalked pondweed	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
Water mudwort	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
Baltic macoma	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
Polychaete worms	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
Idotea balthica	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
Vimba bream	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
Viviparous eelpout	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
Burbot	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
Lumpsucker	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
European eel	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
Atlantic herring	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
European sprat	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
European perch	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
Northern pike	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
Atlantic salmon	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
Brown trout	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
Zander	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
Coregonus sp.	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
Greater scaup	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
Common eider	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
European herring gull	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
Horned grebe	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
Black guillemot	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
Ruddy turnstone	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
White-tailed eagle	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
European otter	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00
Ringed seal	0.00E+00	0.00E+00	0.00E+00	2.75E-03	2.87E-03	0.00E+00	0.00E+00	3.06E-03	2.97E-03	2.97E-03	2.82E-03	1.38E-02	0.00E+00	0.00E+00

Table F-11. Continued

Representative Species	Dose Conversion Coefficient of internal alpha radiation continued											
	Sn-126	Sr-90	Tc-99	Th-229	Th-230	Th-232	U-233	U-234	U-235	U-236	U-238	Zr-93
RS Phytoplankton	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
RS Zooplankton	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
Stypocaulon scoparium	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
Bristly stonewort	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
Grasswrack pondweed	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
Water pygmyweed	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
Elatine orthosperma	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
Alisma wahlenbergii	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
Flat-stalked pondweed	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
Water mudwort	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
Baltic macoma	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
Polychaete worms	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
Idotea balthica	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
Vimba bream	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
Viviparous eelpout	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
Burbot	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
Lumpsucker	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
European eel	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
Atlantic herring	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
European sprat	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
European perch	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
Northern pike	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
Atlantic salmon	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
Brown trout	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
Zander	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
Coregonus sp.	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
Greater scaup	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
Common eider	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
European herring gull	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
Horned grebe	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
Black guillemot	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
Ruddy turnstone	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
White-tailed eagle	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
European otter	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00
Ringed seal	0.00E+00	0.00E+00	0.00E+00	2.81E-03	2.69E-03	2.30E-03	2.78E-03	2.74E-03	2.54E-03	2.60E-03	2.41E-03	0.00E+00

Table F-11. Continued

Representative Species	Dose Conversion Coefficient of internal low-energy (≤ 10 keV) beta radiation													
	Ac-227	**Ag-108m**	**Am-241**	**Am-243**	**C-14**	**Ca-41**	**Cl-36**	**Cm-244**	**Cm-245**	**Cm-246**	**Cs-135**	**Cs-137**	**Ho-166m**	**I-129**
RS Phytoplankton	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
RS Zooplankton	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
Stypocaulon scoparium	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
Bristly stonewort	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
Grasswrack pondweed	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
Water pygmyweed	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
Elatine orthosperma	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
Alisma wahlenbergii	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
Flat-stalked pondweed	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
Water mudwort	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
Baltic macoma	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
Polychaete worms	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
Idotea balthica	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
Vimba bream	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
Viviparous eelpout	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
Burbot	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
Lumpsucker	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
European eel	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
Atlantic herring	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
European sprat	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
European perch	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
Northern pike	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
Atlantic salmon	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
Brown trout	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
Zander	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
Coregonus sp.	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
Greater scaup	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
Common eider	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
European herring gull	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
Horned grebe	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
Black guillemot	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
Ruddy turnstone	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
White-tailed eagle	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
European otter	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06
Ringed seal	4.45E-06	1.81E-06	5.73E-06	9.72E-06	3.73E-07	1.35E-06	6.91E-08	7.62E-07	4.93E-06	6.77E-07	3.05E-07	3.71E-07	5.42E-06	4.94E-06

Table F-11. Continued

Representative Species	Dose Conversion Coefficient of internal low-energy (≤ 10 keV) beta radiation continued													
	Nb-94	**Ni-59**	**Ni-63**	**Np-237**	**Pa-231**	**Pb-210**	**Pd-107**	**Po-210**	**Pu-239**	**Pu-240**	**Pu-242**	**Ra-226**	**Se-79**	**Sm-151**
RS Phytoplankton	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
RS Zooplankton	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
Stypocaulon scoparium	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
Bristly stonewort	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
Grasswrack pondweed	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
Water pygmyweed	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
Elatine orthosperma	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
Alisma wahlenbergii	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
Flat-stalked pondweed	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
Water mudwort	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
Baltic macoma	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
Polychaete worms	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
Idotea balthica	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
Vimba bream	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
Viviparous eelpout	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
Burbot	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
Lumpsucker	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
European eel	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
Atlantic herring	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
European sprat	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
European perch	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
Northern pike	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
Atlantic salmon	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
Brown trout	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
Zander	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
Coregonus sp.	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
Greater scaup	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
Common eider	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
European herring gull	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
Horned grebe	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
Black guillemot	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
Ruddy turnstone	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
White-tailed eagle	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
European otter	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06
Ringed seal	1.25E-07	2.63E-06	1.21E-06	5.49E-06	7.58E-06	4.23E-06	1.79E-06	3.66E-13	1.18E-06	8.28E-07	6.87E-07	1.63E-06	3.19E-07	1.11E-06

Table F-11. Continued

Representative Species	Dose Conversion Coefficient of internal low-energy (≤ 10 keV) beta radiation continued											
	Sn-126	**Sr-90**	**Tc-99**	**Th-229**	**Th-230**	**Th-232**	**U-233**	**U-234**	**U-235**	**U-236**	**U-238**	**Zr-93**
RS Phytoplankton	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
RS Zooplankton	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
Stypocaulon scoparium	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
Bristly stonewort	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
Grasswrack pondweed	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
Water pygmyweed	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
Elatine orthosperma	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
Alisma wahlenbergii	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
Flat-stalked pondweed	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
Water mudwort	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
Baltic macoma	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
Polychaete worms	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
Idotea balthica	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
Vimba bream	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
Viviparous eelpout	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
Burbot	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
Lumpsucker	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
European eel	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
Atlantic herring	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
European sprat	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
European perch	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
Northern pike	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
Atlantic salmon	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
Brown trout	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
Zander	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
Coregonus sp.	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
Greater scaup	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
Common eider	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
European herring gull	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
Horned grebe	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
Black guillemot	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
Ruddy turnstone	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
White-tailed eagle	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
European otter	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07
Ringed seal	3.70E-06	1.12E-07	1.95E-07	9.75E-06	6.49E-07	6.44E-07	5.93E-07	8.07E-07	1.23E-05	7.59E-07	6.68E-07	9.76E-07

Table F-11. Continued

Representative Species	Dose Conversion Coefficient of internal high energy beta (> 10 keV) and gamma													
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m	I-129
RS Phytoplankton	4.65E-06	1.89E-05	2.45E-05	1.30E-04	2.67E-05	1.80E-07	1.00E-04	4.23E-06	3.10E-05	3.97E-06	3.49E-05	9.22E-05	6.42E-05	3.07E-05
RS Zooplankton	4.67E-06	2.74E-05	2.52E-05	1.47E-04	2.77E-05	2.00E-07	1.28E-04	4.31E-06	3.31E-05	4.04E-06	3.76E-05	1.17E-04	7.19E-05	3.19E–05
Stypocaulon scoparium	4.65E-06	1.89E-05	2.45E-05	1.30E-04	2.67E-05	1.80E-07	1.00E-04	4.23E-06	3.10E-05	3.97E-06	3.49E-05	9.22E-05	6.42E-05	3.07E-05
Bristly stonewort	4.67E-06	2.70E-05	2.50E-05	1.41E-04	2.76E-05	1.91E-07	1.20E-04	4.29E-06	3.26E-05	4.02E-06	3.70E-05	1.11E-04	7.02E-05	3.17E-05
Grasswrack pondweed	4.67E-06	2.81E-05	2.50E-05	1.40E-04	2.76E-05	1.92E-07	1.19E-04	4.29E-06	3.27E-05	4.03E-06	3.70E-05	1.10E-04	7.07E-05	3.17E-05
Water pygmyweed	4.67E-06	2.81E-05	2.50E-05	1.40E-04	2.76E-05	1.92E-07	1.19E-04	4.29E-06	3.27E-05	4.03E-06	3.70E-05	1.10E-04	7.07E-05	3.17E-05
Elatine orthosperma	4.67E-06	2.81E-05	2.50E-05	1.40E-04	2.76E-05	1.92E-07	1.19E-04	4.29E-06	3.27E-05	4.03E-06	3.70E-05	1.10E-04	7.07E-05	3.17E-05
Alisma wahlenbergii	4.67E-06	2.81E-05	2.50E-05	1.40E-04	2.76E-05	1.92E-07	1.19E-04	4.29E-06	3.27E-05	4.03E-06	3.70E-05	1.10E-04	7.07E-05	3.17E-05
Flat-stalked pondweed	4.67E-06	2.81E-05	2.50E-05	1.40E-04	2.76E-05	1.92E-07	1.19E-04	4.29E-06	3.27E-05	4.03E-06	3.70E-05	1.10E-04	7.07E-05	3.17E-05
Water mudwort	4.67E-06	2.81E-05	2.50E-05	1.40E-04	2.76E-05	1.92E-07	1.19E-04	4.29E-06	3.27E-05	4.03E-06	3.70E-05	1.10E-04	7.07E-05	3.17E-05
Baltic macoma	4.69E-06	5.21E-05	2.68E-05	1.55E-04	2.80E-05	2.25E-07	1.49E-04	4.53E-06	3.54E-05	4.24E-06	3.83E-05	1.41E-04	8.80E-05	3.30E-05
Polychaete worms	4.70E-06	5.94E-05	2.73E-05	1.58E-04	2.81E-05	2.31E-07	1.49E-04	4.59E-06	3.61E-05	4.29E-06	3.84E-05	1.44E-04	9.49E-05	3.34E-05
Idotea balthica	4.68E-06	4.16E-05	2.60E-05	1.52E-04	2.80E-05	2.15E-07	1.43E-04	4.42E-06	3.43E-05	4.14E-06	3.81E-05	1.33E-04	7.99E-05	3.25E-05
Vimba bream	4.72E-06	9.10E-05	2.93E-05	1.64E-04	2.81E-05	2.36E-07	1.54E-04	4.82E-06	3.89E-05	4.50E-06	3.85E-05	1.58E-04	1.24E-04	3.51E-05
Viviparous eelpout	4.72E-06	9.10E-05	2.93E-05	1.64E-04	2.81E-05	2.36E-07	1.54E-04	4.82E-06	3.89E-05	4.50E-06	3.85E-05	1.58E-04	1.24E-04	3.51E-05
Burbot	4.72E-06	9.10E-05	2.93E-05	1.64E-04	2.81E-05	2.36E-07	1.54E-04	4.82E-06	3.89E-05	4.50E-06	3.85E-05	1.58E-04	1.24E-04	3.51E-05
Lumpsucker	4.72E-06	9.10E-05	2.93E-05	1.64E-04	2.81E-05	2.36E-07	1.54E-04	4.82E-06	3.89E-05	4.50E-06	3.85E-05	1.58E-04	1.24E-04	3.51E-05
European eel	4.72E-06	9.10E-05	2.93E-05	1.64E-04	2.81E-05	2.36E-07	1.54E-04	4.82E-06	3.89E-05	4.50E-06	3.85E-05	1.58E-04	1.24E-04	3.51E-05
Atlantic herring	4.72E-06	9.10E-05	2.93E-05	1.64E-04	2.81E-05	2.36E-07	1.54E-04	4.82E-06	3.89E-05	4.50E-06	3.85E-05	1.58E-04	1.24E-04	3.51E-05
European sprat	4.72E-06	9.10E-05	2.93E-05	1.64E-04	2.81E-05	2.36E-07	1.54E-04	4.82E-06	3.89E-05	4.50E-06	3.85E-05	1.58E-04	1.24E-04	3.51E-05
European perch	4.72E-06	9.10E-05	2.93E-05	1.64E-04	2.81E-05	2.36E-07	1.54E-04	4.82E-06	3.89E-05	4.50E-06	3.85E-05	1.58E-04	1.24E-04	3.51E-05
Northern pike	4.71E-06	7.84E-05	2.85E-05	1.62E-04	2.81E-05	2.36E-07	1.54E-04	4.73E-06	3.79E-05	4.42E-06	3.85E-05	1.53E-04	1.12E-04	3.44E-05
Atlantic salmon	4.72E-06	9.10E-05	2.93E-05	1.64E-04	2.81E-05	2.36E-07	1.54E-04	4.82E-06	3.89E-05	4.50E-06	3.85E-05	1.58E-04	1.24E-04	3.51E-05
Brown trout	4.72E-06	9.10E-05	2.93E-05	1.64E-04	2.81E-05	2.36E-07	1.54E-04	4.82E-06	3.89E-05	4.50E-06	3.85E-05	1.58E-04	1.24E-04	3.51E-05
Zander	4.72E-06	9.10E-05	2.93E-05	1.64E-04	2.81E-05	2.36E-07	1.54E-04	4.82E-06	3.89E-05	4.50E-06	3.85E-05	1.58E-04	1.24E-04	3.51E-05
Coregonus sp.	4.72E-06	9.10E-05	2.93E-05	1.64E-04	2.81E-05	2.36E-07	1.54E-04	4.82E-06	3.89E-05	4.50E-06	3.85E-05	1.58E-04	1.24E-04	3.51E-05
Greater scaup	4.74E-06	1.79E-04	3.25E-05	1.80E-04	2.81E-05	2.39E-07	1.56E-04	5.03E-06	4.55E-05	4.69E-06	3.85E-05	1.89E-04	2.16E-04	3.90E-05
Common eider	4.74E-06	1.79E-04	3.25E-05	1.80E-04	2.81E-05	2.39E-07	1.56E-04	5.03E-06	4.55E-05	4.69E-06	3.85E-05	1.89E-04	2.16E-04	3.90E-05
European herring gull	4.74E-06	1.79E-04	3.25E-05	1.80E-04	2.81E-05	2.39E-07	1.56E-04	5.03E-06	4.55E-05	4.69E-06	3.85E-05	1.89E-04	2.16E-04	3.90E-05
Horned grebe	4.74E-06	1.79E-04	3.25E-05	1.80E-04	2.81E-05	2.39E-07	1.56E-04	5.03E-06	4.55E-05	4.69E-06	3.85E-05	1.89E-04	2.16E-04	3.90E-05
Black guillemot	4.74E-06	1.79E-04	3.25E-05	1.80E-04	2.81E-05	2.39E-07	1.56E-04	5.03E-06	4.55E-05	4.69E-06	3.85E-05	1.89E-04	2.16E-04	3.90E-05
Ruddy turnstone	4.73E-06	1.45E-04	3.15E-05	1.74E-04	2.81E-05	2.39E-07	1.56E-04	4.99E-06	4.31E-05	4.65E-06	3.85E-05	1.77E-04	1.80E-04	3.77E-05
White-tailed eagle	4.75E-06	2.48E-04	3.45E-05	1.93E-04	2.81E-05	2.40E-07	1.57E-04	5.09E-06	5.09E-05	4.74E-06	3.86E-05	2.13E-04	2.90E-04	4.10E-05
European otter	4.75E-06	2.56E-04	3.47E-05	1.94E-04	2.81E-05	2.40E-07	1.57E-04	5.09E-06	5.15E-05	4.74E-06	3.86E-05	2.16E-04	2.99E-04	4.12E-05
Ringed seal	4.77E-06	4.69E-04	3.86E-05	2.29E-04	2.81E-05	2.41E-07	1.57E-04	5.13E-06	6.58E-05	4.78E-06	3.86E-05	2.89E-04	5.28E-04	4.39E-05

Table F-11. Continued

Representative Species	Dose Conversion Coefficient of internal high energy beta (> 10 keV) and gamma continued													
	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226	Se-79	Sm-151
RS Phytoplankton	7.41E-05	6.45E-07	8.62E-06	3.46E-05	2.95E-05	1.32E-04	3.55E-06	2.56E-11	2.76E-06	5.32E-06	4.37E-06	2.42E-04	2.99E-05	1.02E-05
RS Zooplankton	9.04E-05	8.84E-07	8.65E-06	3.56E-05	3.07E-05	1.72E-04	3.55E-06	4.51E-11	2.80E-06	5.41E-06	4.45E-06	3.26E-04	3.13E-05	1.03E-05
Stypocaulon scoparium	7.41E-05	6.45E-07	8.62E-06	3.46E-05	2.95E-05	1.32E-04	3.55E-06	2.56E-11	2.76E-06	5.32E-06	4.37E-06	2.42E-04	2.99E-05	1.02E-05
Bristly stonewort	8.49E-05	7.82E-07	8.66E-06	3.54E-05	3.03E-05	1.67E-04	3.55E-06	4.46E-11	2.79E-06	5.39E-06	4.43E-06	3.19E-04	3.11E-05	1.03E-05
Grasswrack pondweed	8.43E-05	7.92E-07	8.66E-06	3.55E-05	3.03E-05	1.68E-04	3.55E-06	4.79E-11	2.79E-06	5.39E-06	4.44E-06	3.26E-04	3.11E-05	1.03E-05
Water pygmyweed	8.43E-05	7.92E-07	8.66E-06	3.55E-05	3.03E-05	1.68E-04	3.55E-06	4.79E-11	2.79E-06	5.39E-06	4.44E-06	3.26E-04	3.11E-05	1.03E-05
Elatine orthosperma	8.43E-05	7.92E-07	8.66E-06	3.55E-05	3.03E-05	1.68E-04	3.55E-06	4.79E-11	2.79E-06	5.39E-06	4.44E-06	3.26E-04	3.11E-05	1.03E-05
Alisma wahlenbergii	8.43E-05	7.92E-07	8.66E-06	3.55E-05	3.03E-05	1.68E-04	3.55E-06	4.79E-11	2.79E-06	5.39E-06	4.44E-06	3.26E-04	3.11E-05	1.03E-05
Flat-stalked pondweed	8.43E-05	7.92E-07	8.66E-06	3.55E-05	3.03E-05	1.68E-04	3.55E-06	4.79E-11	2.79E-06	5.39E-06	4.44E-06	3.26E-04	3.11E-05	1.03E-05
Water mudwort	8.43E-05	7.92E-07	8.66E-06	3.55E-05	3.03E-05	1.68E-04	3.55E-06	4.79E-11	2.79E-06	5.39E-06	4.44E-06	3.26E-04	3.11E-05	1.03E-05
Baltic macoma	1.10E-04	1.20E-06	8.67E-06	3.74E-05	3.29E-05	2.21E-04	3.55E-06	1.25E-10	2.90E-06	5.66E-06	4.66E-06	4.78E-04	3.17E-05	1.03E-05
Polychaete worms	1.16E-04	1.26E-06	8.67E-06	3.79E-05	3.34E-05	2.24E-04	3.55E-06	1.58E-10	2.92E-06	5.71E-06	4.71E-06	5.02E-04	3.18E-05	1.03E-05
Idotea balthica	1.01E-04	1.07E-06	8.66E-06	3.66E-05	3.18E-05	2.09E-04	3.55E-06	8.58E-11	2.85E-06	5.54E-06	4.56E-06	4.28E-04	3.16E-05	1.03E-05
Vimba bream	1.43E-04	1.32E-06	8.67E-06	3.98E-05	3.57E-05	2.36E-04	3.55E-06	2.99E-10	3.01E-06	5.95E-06	4.90E-06	5.66E-04	3.18E-05	1.03E-05
Viviparous eelpout	1.43E-04	1.32E-06	8.67E-06	3.98E-05	3.57E-05	2.36E-04	3.55E-06	2.99E-10	3.01E-06	5.95E-06	4.90E-06	5.66E-04	3.18E-05	1.03E-05
Burbot	1.43E-04	1.32E-06	8.67E-06	3.98E-05	3.57E-05	2.36E-04	3.55E-06	2.99E-10	3.01E-06	5.95E-06	4.90E-06	5.66E-04	3.18E-05	1.03E-05
Lumpsucker	1.43E-04	1.32E-06	8.67E-06	3.98E-05	3.57E-05	2.36E-04	3.55E-06	2.99E-10	3.01E-06	5.95E-06	4.90E-06	5.66E-04	3.18E-05	1.03E-05
European eel	1.43E-04	1.32E-06	8.67E-06	3.98E-05	3.57E-05	2.36E-04	3.55E-06	2.99E-10	3.01E-06	5.95E-06	4.90E-06	5.66E-04	3.18E-05	1.03E-05
Atlantic herring	1.43E-04	1.32E-06	8.67E-06	3.98E-05	3.57E-05	2.36E-04	3.55E-06	2.99E-10	3.01E-06	5.95E-06	4.90E-06	5.66E-04	3.18E-05	1.03E-05
European sprat	1.43E-04	1.32E-06	8.67E-06	3.98E-05	3.57E-05	2.36E-04	3.55E-06	2.99E-10	3.01E-06	5.95E-06	4.90E-06	5.66E-04	3.18E-05	1.03E-05
European perch	1.43E-04	1.32E-06	8.67E-06	3.98E-05	3.57E-05	2.36E-04	3.55E-06	2.99E-10	3.01E-06	5.95E-06	4.90E-06	5.66E-04	3.18E-05	1.03E-05
Northern pike	1.32E-04	1.32E-06	8.67E-06	3.91E-05	3.48E-05	2.33E-04	3.55E-06	2.41E-10	2.98E-06	5.86E-06	4.83E-06	5.46E-04	3.18E-05	1.03E-05
Atlantic salmon	1.43E-04	1.32E-06	8.67E-06	3.98E-05	3.57E-05	2.36E-04	3.55E-06	2.99E-10	3.01E-06	5.95E-06	4.90E-06	5.66E-04	3.18E-05	1.03E-05
Brown trout	1.43E-04	1.32E-06	8.67E-06	3.98E-05	3.57E-05	2.36E-04	3.55E-06	2.99E-10	3.01E-06	5.95E-06	4.90E-06	5.66E-04	3.18E-05	1.03E-05
Zander	1.43E-04	1.32E-06	8.67E-06	3.98E-05	3.57E-05	2.36E-04	3.55E-06	2.99E-10	3.01E-06	5.95E-06	4.90E-06	5.66E-04	3.18E-05	1.03E-05
Coregonus sp.	1.43E-04	1.32E-06	8.67E-06	3.98E-05	3.57E-05	2.36E-04	3.55E-06	2.99E-10	3.01E-06	5.95E-06	4.90E-06	5.66E-04	3.18E-05	1.03E-05
Greater scaup	2.22E-04	1.36E-06	8.68E-06	4.30E-05	3.92E-05	2.41E-04	3.55E-06	7.27E-10	3.10E-06	6.15E-06	5.07E-06	6.68E-04	3.18E-05	1.03E-05
Common eider	2.22E-04	1.36E-06	8.68E-06	4.30E-05	3.92E-05	2.41E-04	3.55E-06	7.27E-10	3.10E-06	6.15E-06	5.07E-06	6.68E-04	3.18E-05	1.03E-05
European herring gull	2.22E-04	1.36E-06	8.68E-06	4.30E-05	3.92E-05	2.41E-04	3.55E-06	7.27E-10	3.10E-06	6.15E-06	5.07E-06	6.68E-04	3.18E-05	1.03E-05
Horned grebe	2.22E-04	1.36E-06	8.68E-06	4.30E-05	3.92E-05	2.41E-04	3.55E-06	7.27E-10	3.10E-06	6.15E-06	5.07E-06	6.68E-04	3.18E-05	1.03E-05
Black guillemot	2.22E-04	1.36E-06	8.68E-06	4.30E-05	3.92E-05	2.41E-04	3.55E-06	7.27E-10	3.10E-06	6.15E-06	5.07E-06	6.68E-04	3.18E-05	1.03E-05
Ruddy turnstone	1.92E-04	1.36E-06	8.68E-06	4.20E-05	3.81E-05	2.40E-04	3.55E-06	5.61E-10	3.08E-06	6.11E-06	5.04E-06	6.33E-04	3.18E-05	1.03E-05
White-tailed eagle	2.85E-04	1.37E-06	8.68E-06	4.49E-05	4.14E-05	2.43E-04	3.55E-06	1.06E-09	3.12E-06	6.20E-06	5.11E-06	7.39E-04	3.19E-05	1.03E-05
European otter	2.93E-04	1.37E-06	8.68E-06	4.51E-05	4.16E-05	2.43E-04	3.55E-06	1.11E-09	3.12E-06	6.21E-06	5.11E-06	7.48E-04	3.19E-05	1.03E-05
Ringed seal	4.90E-04	1.38E-06	8.68E-06	4.92E-05	4.72E-05	2.44E-04	3.55E-06	2.17E-09	3.15E-06	6.25E-06	5.15E-06	9.61E-04	3.19E-05	1.03E-05

Table F-11. Continued

Representative Species	Dose Conversion Coefficient of internal high energy beta (> 10 keV) and gamma continued											
	Sn-126	**Sr-90**	**Tc-99**	**Th-229**	**Th-230**	**Th-232**	**U-233**	**U-234**	**U-235**	**U-236**	**U-238**	**Zr-93**
RS Phytoplankton	1.99E-04	2.06E-04	4.90E-05	5.46E-05	7.66E-06	6.51E-06	3.05E-06	6.83E-06	1.05E-04	5.83E-06	5.12E-06	1.03E-05
RS Zooplankton	2.63E-04	2.92E-04	5.54E-05	5.77E-05	7.84E-06	6.64E-06	3.13E-06	6.96E-06	1.11E-04	5.94E-06	5.21E-06	1.03E-05
Stypocaulon scoparium	1.99E-04	2.06E-04	4.90E-05	5.46E-05	7.66E-06	6.51E-06	3.05E-06	6.83E-06	1.05E-04	5.83E-06	5.12E-06	1.03E-05
Bristly stonewort	2.63E-04	2.97E-04	5.32E-05	5.70E-05	7.81E-06	6.62E-06	3.11E-06	6.94E-06	1.09E-04	5.92E-06	5.19E-06	1.03E-05
Grasswrack pondweed	2.72E-04	3.14E-04	5.30E-05	5.70E-05	7.82E-06	6.62E-06	3.11E-06	6.94E-06	1.09E-04	5.92E-06	5.20E-06	1.03E-05
Water pygmyweed	2.72E-04	3.14E-04	5.30E-05	5.70E-05	7.82E-06	6.62E-06	3.11E-06	6.94E-06	1.09E-04	5.92E-06	5.20E-06	1.03E-05
Elatine orthosperma	2.72E-04	3.14E-04	5.30E-05	5.70E-05	7.82E-06	6.62E-06	3.11E-06	6.94E-06	1.09E-04	5.92E-06	5.20E-06	1.03E-05
Alisma wahlenbergii	2.72E-04	3.14E-04	5.30E-05	5.70E-05	7.82E-06	6.62E-06	3.11E-06	6.94E-06	1.09E-04	5.92E-06	5.20E-06	1.03E-05
Flat-stalked pondweed	2.72E-04	3.14E-04	5.30E-05	5.70E-05	7.82E-06	6.62E-06	3.11E-06	6.94E-06	1.09E-04	5.92E-06	5.20E-06	1.03E-05
Water mudwort	2.72E-04	3.14E-04	5.30E-05	5.70E-05	7.82E-06	6.62E-06	3.11E-06	6.94E-06	1.09E-04	5.92E-06	5.20E-06	1.03E-05
Baltic macoma	3.95E-04	5.14E-04	5.73E-05	6.07E-05	8.07E-06	6.85E-06	3.29E-06	7.22E-06	1.16E-04	6.18E-06	5.42E-06	1.03E-05
Polychaete worms	4.11E-04	5.42E-04	5.77E-05	6.16E-05	8.12E-06	6.89E-06	3.33E-06	7.28E-06	1.18E-04	6.23E-06	5.47E-06	1.03E-05
Idotea balthica	3.54E-04	4.42E-04	5.69E-05	5.94E-05	7.97E-06	6.75E-06	3.22E-06	7.10E-06	1.14E-04	6.06E-06	5.32E-06	1.03E-05
Vimba bream	4.67E-04	6.00E-04	5.78E-05	6.45E-05	8.28E-06	7.05E-06	3.47E-06	7.50E-06	1.23E-04	6.44E-06	5.65E-06	1.03E-05
Viviparous eelpout	4.67E-04	6.00E-04	5.78E-05	6.45E-05	8.28E-06	7.05E-06	3.47E-06	7.50E-06	1.23E-04	6.44E-06	5.65E-06	1.03E-05
Burbot	4.67E-04	6.00E-04	5.78E-05	6.45E-05	8.28E-06	7.05E-06	3.47E-06	7.50E-06	1.23E-04	6.44E-06	5.65E-06	1.03E-05
Lumpsucker	4.67E-04	6.00E-04	5.78E-05	6.45E-05	8.28E-06	7.05E-06	3.47E-06	7.50E-06	1.23E-04	6.44E-06	5.65E-06	1.03E-05
European eel	4.67E-04	6.00E-04	5.78E-05	6.45E-05	8.28E-06	7.05E-06	3.47E-06	7.50E-06	1.23E-04	6.44E-06	5.65E-06	1.03E-05
Atlantic herring	4.67E-04	6.00E-04	5.78E-05	6.45E-05	8.28E-06	7.05E-06	3.47E-06	7.50E-06	1.23E-04	6.44E-06	5.65E-06	1.03E-05
European sprat	4.67E-04	6.00E-04	5.78E-05	6.45E-05	8.28E-06	7.05E-06	3.47E-06	7.50E-06	1.23E-04	6.44E-06	5.65E-06	1.03E-05
European perch	4.67E-04	6.00E-04	5.78E-05	6.45E-05	8.28E-06	7.05E-06	3.47E-06	7.50E-06	1.23E-04	6.44E-06	5.65E-06	1.03E-05
Northern pike	4.48E-04	5.85E-04	5.78E-05	6.34E-05	8.22E-06	6.99E-06	3.42E-06	7.42E-06	1.21E-04	6.36E-06	5.58E-06	1.03E-05
Atlantic salmon	4.67E-04	6.00E-04	5.78E-05	6.45E-05	8.28E-06	7.05E-06	3.47E-06	7.50E-06	1.23E-04	6.44E-06	5.65E-06	1.03E-05
Brown trout	4.67E-04	6.00E-04	5.78E-05	6.45E-05	8.28E-06	7.05E-06	3.47E-06	7.50E-06	1.23E-04	6.44E-06	5.65E-06	1.03E-05
Zander	4.67E-04	6.00E-04	5.78E-05	6.45E-05	8.28E-06	7.05E-06	3.47E-06	7.50E-06	1.23E-04	6.44E-06	5.65E-06	1.03E-05
Coregonus sp.	4.67E-04	6.00E-04	5.78E-05	6.45E-05	8.28E-06	7.05E-06	3.47E-06	7.50E-06	1.23E-04	6.44E-06	5.65E-06	1.03E-05
Greater scaup	5.66E-04	6.32E-04	5.80E-05	7.11E-05	8.43E-06	7.18E-06	3.60E-06	7.69E-06	1.35E-04	6.61E-06	5.80E-06	1.03E-05
Common eider	5.66E-04	6.32E-04	5.80E-05	7.11E-05	8.43E-06	7.18E-06	3.60E-06	7.69E-06	1.35E-04	6.61E-06	5.80E-06	1.03E-05
European herring gull	5.66E-04	6.32E-04	5.80E-05	7.11E-05	8.43E-06	7.18E-06	3.60E-06	7.69E-06	1.35E-04	6.61E-06	5.80E-06	1.03E-05
Horned grebe	5.66E-04	6.32E-04	5.80E-05	7.11E-05	8.43E-06	7.18E-06	3.60E-06	7.69E-06	1.35E-04	6.61E-06	5.80E-06	1.03E-05
Black guillemot	5.66E-04	6.32E-04	5.80E-05	7.11E-05	8.43E-06	7.18E-06	3.60E-06	7.69E-06	1.35E-04	6.61E-06	5.80E-06	1.03E-05
Ruddy turnstone	5.31E-04	6.25E-04	5.80E-05	6.87E-05	8.40E-06	7.15E-06	3.57E-06	7.65E-06	1.31E-04	6.57E-06	5.77E-06	1.03E-05
White-tailed eagle	6.38E-04	6.39E-04	5.81E-05	7.65E-05	8.48E-06	7.21E-06	3.65E-06	7.74E-06	1.45E-04	6.65E-06	5.83E-06	1.03E-05
European otter	6.47E-04	6.39E-04	5.81E-05	7.71E-05	8.48E-06	7.22E-06	3.65E-06	7.74E-06	1.46E-04	6.65E-06	5.83E-06	1.03E-05
Ringed seal	8.61E-04	6.46E-04	5.81E-05	9.12E-05	8.56E-06	7.26E-06	3.72E-06	7.79E-06	1.72E-04	6.68E-06	5.86E-06	1.03E-05

Table F-12. Dose conversion coefficients for external exposure of marine representative species to low energy beta (≤ 10 keV) and high energy beta (> 10 keV) / gamma radiation (µGy/h)/(Bq/l)

Representative Species	Dose Conversion Coefficient of external low-energy (≤10 keV) beta radiation													
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m	I-129
RS Phytoplankton	4.99E-11	6.28E-12	5.04E-11	8.91E-11	5.23E-12	6.69E-12	7.57E-13	6.43E-12	4.38E-11	5.71E-12	4.15E-12	2.94E-12	4.91E-11	3.53E-11
RS Zooplankton	8.20E-28	1.06E-30	0.00E+00	1.26E-28	2.43E-28	0.00E+00	3.13E-29	0.00E+00	0.00E+00	0.00E+00	1.84E-28	7.34E-29	6.70E-28	2.48E-28
Stypocaulon scoparium	4.99E-11	6.28E-12	5.04E-11	8.91E-11	5.23E-12	6.69E-12	7.57E-13	6.43E-12	4.38E-11	5.71E-12	4.15E-12	2.94E-12	4.91E-11	3.53E-11
Bristly stonewort	1.46E-12	1.72E-13	1.38E-12	2.45E-12	1.69E-13	1.83E-13	2.41E-14	1.76E-13	1.20E-12	1.57E-13	1.33E-13	8.84E-14	1.42E-12	9.95E-13
Grasswrack pondweed	1.34E-11	1.67E-12	1.34E-11	2.38E-11	1.43E-12	1.78E-12	2.07E-13	1.71E-12	1.17E-11	1.52E-12	1.14E-12	7.95E-13	1.32E-11	9.46E-12
Water pygmyweed	1.34E-11	1.67E-12	1.34E-11	2.38E-11	1.43E-12	1.78E-12	2.07E-13	1.71E-12	1.17E-11	1.52E-12	1.14E-12	7.95E-13	1.32E-11	9.46E-12
Elatine orthosperma	1.34E-11	1.67E-12	1.34E-11	2.38E-11	1.43E-12	1.78E-12	2.07E-13	1.71E-12	1.17E-11	1.52E-12	1.14E-12	7.95E-13	1.32E-11	9.46E-12
Alisma wahlenbergii	1.34E-11	1.67E-12	1.34E-11	2.38E-11	1.43E-12	1.78E-12	2.07E-13	1.71E-12	1.17E-11	1.52E-12	1.14E-12	7.95E-13	1.32E-11	9.46E-12
Flat-stalked pondweed	1.34E-11	1.67E-12	1.34E-11	2.38E-11	1.43E-12	1.78E-12	2.07E-13	1.71E-12	1.17E-11	1.52E-12	1.14E-12	7.95E-13	1.32E-11	9.46E-12
Water mudwort	1.34E-11	1.67E-12	1.34E-11	2.38E-11	1.43E-12	1.78E-12	2.07E-13	1.71E-12	1.17E-11	1.52E-12	1.14E-12	7.95E-13	1.32E-11	9.46E-12
Baltic macoma	6.59E-28	8.52E-31	0.00E+00	1.01E-28	1.95E-28	0.00E+00	2.51E-29	0.00E+00	0.00E+00	0.00E+00	1.48E-28	5.90E-29	5.38E-28	2.00E-28
Polychaete worms	9.89E-15	1.03E-15	8.27E-15	1.49E-14	1.36E-15	1.10E-15	1.89E-16	1.06E-15	7.20E-15	9.38E-16	1.06E-15	6.34E-16	9.45E-15	6.32E-15
Idotea balthica	2.96E-14	3.10E-15	2.48E-14	4.47E-14	4.07E-15	3.30E-15	5.65E-16	3.17E-15	2.16E-14	2.82E-15	3.18E-15	1.90E-15	2.83E-14	1.89E-14
Vimba bream	5.40E-15	5.60E-16	4.48E-15	8.07E-15	7.49E-16	5.95E-16	1.04E-16	5.73E-16	3.90E-15	5.08E-16	5.84E-16	3.47E-16	5.15E-15	3.43E-15
Viviparous eelpout	5.40E-15	5.60E-16	4.48E-15	8.07E-15	7.49E-16	5.95E-16	1.04E-16	5.73E-16	3.90E-15	5.08E-16	5.84E-16	3.47E-16	5.15E-15	3.43E-15
Burbot	5.40E-15	5.60E-16	4.48E-15	8.07E-15	7.49E-16	5.95E-16	1.04E-16	5.73E-16	3.90E-15	5.08E-16	5.84E-16	3.47E-16	5.15E-15	3.43E-15
Lumpsucker	5.40E-15	5.60E-16	4.48E-15	8.07E-15	7.49E-16	5.95E-16	1.04E-16	5.73E-16	3.90E-15	5.08E-16	5.84E-16	3.47E-16	5.15E-15	3.43E-15
European eel	5.40E-15	5.60E-16	4.48E-15	8.07E-15	7.49E-16	5.95E-16	1.04E-16	5.73E-16	3.90E-15	5.08E-16	5.84E-16	3.47E-16	5.15E-15	3.43E-15
Atlantic herring	5.40E-15	5.60E-16	4.48E-15	8.07E-15	7.49E-16	5.95E-16	1.04E-16	5.73E-16	3.90E-15	5.08E-16	5.84E-16	3.47E-16	5.15E-15	3.43E-15
European sprat	5.40E-15	5.60E-16	4.48E-15	8.07E-15	7.49E-16	5.95E-16	1.04E-16	5.73E-16	3.90E-15	5.08E-16	5.84E-16	3.47E-16	5.15E-15	3.43E-15
European perch	5.40E-15	5.60E-16	4.48E-15	8.07E-15	7.49E-16	5.95E-16	1.04E-16	5.73E-16	3.90E-15	5.08E-16	5.84E-16	3.47E-16	5.15E-15	3.43E-15
Northern pike	5.40E-15	5.60E-16	4.48E-15	8.07E-15	7.49E-16	5.95E-16	1.04E-16	5.73E-16	3.90E-15	5.08E-16	5.84E-16	3.47E-16	5.15E-15	3.43E-15
Atlantic salmon	5.40E-15	5.60E-16	4.48E-15	8.07E-15	7.49E-16	5.95E-16	1.04E-16	5.73E-16	3.90E-15	5.08E-16	5.84E-16	3.47E-16	5.15E-15	3.43E-15
Brown trout	5.40E-15	5.60E-16	4.48E-15	8.07E-15	7.49E-16	5.95E-16	1.04E-16	5.73E-16	3.90E-15	5.08E-16	5.84E-16	3.47E-16	5.15E-15	3.43E-15
Zander	5.40E-15	5.60E-16	4.48E-15	8.07E-15	7.49E-16	5.95E-16	1.04E-16	5.73E-16	3.90E-15	5.08E-16	5.84E-16	3.47E-16	5.15E-15	3.43E-15
Coregonus sp.	5.40E-15	5.60E-16	4.48E-15	8.07E-15	7.49E-16	5.95E-16	1.04E-16	5.73E-16	3.90E-15	5.08E-16	5.84E-16	3.47E-16	5.15E-15	3.43E-15
Greater scaup	4.22E-16	4.13E-17	3.30E-16	5.98E-16	6.24E-17	4.38E-17	8.58E-18	4.22E-17	2.87E-16	3.74E-17	4.85E-17	2.78E-17	3.99E-16	2.60E-16
Common eider	4.22E-16	4.13E-17	3.30E-16	5.98E-16	6.24E-17	4.38E-17	8.58E-18	4.22E-17	2.87E-16	3.74E-17	4.85E-17	2.78E-17	3.99E-16	2.60E-16
European herring gull	4.22E-16	4.13E-17	3.30E-16	5.98E-16	6.24E-17	4.38E-17	8.58E-18	4.22E-17	2.87E-16	3.74E-17	4.85E-17	2.78E-17	3.99E-16	2.60E-16
Horned grebe	4.22E-16	4.13E-17	3.30E-16	5.98E-16	6.24E-17	4.38E-17	8.58E-18	4.22E-17	2.87E-16	3.74E-17	4.85E-17	2.78E-17	3.99E-16	2.60E-16
Black guillemot	4.22E-16	4.13E-17	3.30E-16	5.98E-16	6.24E-17	4.38E-17	8.58E-18	4.22E-17	2.87E-16	3.74E-17	4.85E-17	2.78E-17	3.99E-16	2.60E-16
Ruddy turnstone	4.44E-28	5.74E-31	0.00E+00	6.81E-29	1.31E-28	0.00E+00	1.69E-29	0.00E+00	0.00E+00	0.00E+00	9.96E-29	3.97E-29	3.63E-28	1.34E-28
White-tailed eagle	4.04E-16	4.07E-17	3.26E-16	5.89E-16	5.79E-17	4.33E-17	7.99E-18	4.16E-17	2.84E-16	3.70E-17	4.51E-17	2.63E-17	3.84E-16	2.53E-16
European otter	2.94E-16	2.93E-17	2.34E-16	4.23E-16	4.28E-17	3.11E-17	5.90E-18	2.99E-17	2.04E-16	2.65E-17	3.33E-17	1.92E-17	2.79E-16	1.83E-16
Ringed seal	2.96E-28	3.83E-31	0.00E+00	4.55E-29	8.77E-29	0.00E+00	1.13E-29	0.00E+00	0.00E+00	0.00E+00	6.65E-29	2.65E-29	2.42E-28	8.98E-29

Table F-12. Continued

Representative Species	Dose Conversion Coefficient of external low-energy (≤10 keV) beta radiation continued													
	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226	Se-79	Sm-151
RS Phytoplankton	1.68E-12	2.13E-11	1.61E-11	4.99E-11	6.24E-11	3.86E-11	2.29E-11	2.98E-18	1.24E-11	6.66E-12	5.53E-12	1.38E-11	4.42E-12	1.47E-11
RS Zooplankton	7.48E-29	0.00E+00	6.71E-28	0.00E+00	0.00E+00	5.24E-28	8.97E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.26E-29	2.01E-28	6.12E-28
Stypocaulon scoparium	1.68E-12	2.13E-11	1.61E-11	4.99E-11	6.24E-11	3.86E-11	2.29E-11	2.98E-18	1.24E-11	6.66E-12	5.53E-12	1.38E-11	4.42E-12	1.47E-11
Bristly stonewort	5.39E-14	5.85E-13	5.12E-13	1.37E-12	1.71E-12	1.11E-12	7.23E-13	8.16E-20	3.39E-13	1.83E-13	1.51E-13	3.88E-13	1.43E-13	4.68E-13
Grasswrack pondweed	4.58E-13	5.69E-12	4.39E-12	1.33E-11	1.66E-11	1.04E-11	6.24E-12	7.93E-19	3.30E-12	1.78E-12	1.47E-12	3.70E-12	1.21E-12	4.01E-12
Water pygmyweed	4.58E-13	5.69E-12	4.39E-12	1.33E-11	1.66E-11	1.04E-11	6.24E-12	7.93E-19	3.30E-12	1.78E-12	1.47E-12	3.70E-12	1.21E-12	4.01E-12
Elatine orthosperma	4.58E-13	5.69E-12	4.39E-12	1.33E-11	1.66E-11	1.04E-11	6.24E-12	7.93E-19	3.30E-12	1.78E-12	1.47E-12	3.70E-12	1.21E-12	4.01E-12
Alisma wahlenbergii	4.58E-13	5.69E-12	4.39E-12	1.33E-11	1.66E-11	1.04E-11	6.24E-12	7.93E-19	3.30E-12	1.78E-12	1.47E-12	3.70E-12	1.21E-12	4.01E-12
Flat-stalked pondweed	4.58E-13	5.69E-12	4.39E-12	1.33E-11	1.66E-11	1.04E-11	6.24E-12	7.93E-19	3.30E-12	1.78E-12	1.47E-12	3.70E-12	1.21E-12	4.01E-12
Water mudwort	4.58E-13	5.69E-12	4.39E-12	1.33E-11	1.66E-11	1.04E-11	6.24E-12	7.93E-19	3.30E-12	1.78E-12	1.47E-12	3.70E-12	1.21E-12	4.01E-12
Baltic macoma	6.01E-29	0.00E+00	5.39E-28	0.00E+00	0.00E+00	4.21E-28	7.21E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.64E-29	1.62E-28	4.91E-28
Polychaete worms	4.30E-16	3.51E-15	4.02E-15	8.19E-15	1.02E-14	7.43E-15	5.61E-15	4.89E-22	2.03E-15	1.09E-15	9.08E-16	2.44E-15	1.14E-15	3.68E-15
Idotea balthica	1.28E-15	1.05E-14	1.20E-14	2.46E-14	3.07E-14	2.22E-14	1.68E-14	1.47E-21	6.10E-15	3.28E-15	2.72E-15	7.33E-15	3.41E-15	1.10E-14
Vimba bream	2.36E-16	1.90E-15	2.21E-15	4.44E-15	5.55E-15	4.05E-15	3.08E-15	2.65E-22	1.10E-15	5.93E-16	4.92E-16	1.33E-15	6.28E-16	2.02E-15
Viviparous eelpout	2.36E-16	1.90E-15	2.21E-15	4.44E-15	5.55E-15	4.05E-15	3.08E-15	2.65E-22	1.10E-15	5.93E-16	4.92E-16	1.33E-15	6.28E-16	2.02E-15
Burbot	2.36E-16	1.90E-15	2.21E-15	4.44E-15	5.55E-15	4.05E-15	3.08E-15	2.65E-22	1.10E-15	5.93E-16	4.92E-16	1.33E-15	6.28E-16	2.02E-15
Lumpsucker	2.36E-16	1.90E-15	2.21E-15	4.44E-15	5.55E-15	4.05E-15	3.08E-15	2.65E-22	1.10E-15	5.93E-16	4.92E-16	1.33E-15	6.28E-16	2.02E-15
European eel	2.36E-16	1.90E-15	2.21E-15	4.44E-15	5.55E-15	4.05E-15	3.08E-15	2.65E-22	1.10E-15	5.93E-16	4.92E-16	1.33E-15	6.28E-16	2.02E-15
Atlantic herring	2.36E-16	1.90E-15	2.21E-15	4.44E-15	5.55E-15	4.05E-15	3.08E-15	2.65E-22	1.10E-15	5.93E-16	4.92E-16	1.33E-15	6.28E-16	2.02E-15
European sprat	2.36E-16	1.90E-15	2.21E-15	4.44E-15	5.55E-15	4.05E-15	3.08E-15	2.65E-22	1.10E-15	5.93E-16	4.92E-16	1.33E-15	6.28E-16	2.02E-15
European perch	2.36E-16	1.90E-15	2.21E-15	4.44E-15	5.55E-15	4.05E-15	3.08E-15	2.65E-22	1.10E-15	5.93E-16	4.92E-16	1.33E-15	6.28E-16	2.02E-15
Northern pike	2.36E-16	1.90E-15	2.21E-15	4.44E-15	5.55E-15	4.05E-15	3.08E-15	2.65E-22	1.10E-15	5.93E-16	4.92E-16	1.33E-15	6.28E-16	2.02E-15
Atlantic salmon	2.36E-16	1.90E-15	2.21E-15	4.44E-15	5.55E-15	4.05E-15	3.08E-15	2.65E-22	1.10E-15	5.93E-16	4.92E-16	1.33E-15	6.28E-16	2.02E-15
Brown trout	2.36E-16	1.90E-15	2.21E-15	4.44E-15	5.55E-15	4.05E-15	3.08E-15	2.65E-22	1.10E-15	5.93E-16	4.92E-16	1.33E-15	6.28E-16	2.02E-15
Zander	2.36E-16	1.90E-15	2.21E-15	4.44E-15	5.55E-15	4.05E-15	3.08E-15	2.65E-22	1.10E-15	5.93E-16	4.92E-16	1.33E-15	6.28E-16	2.02E-15
Coregonus sp.	2.36E-16	1.90E-15	2.21E-15	4.44E-15	5.55E-15	4.05E-15	3.08E-15	2.65E-22	1.10E-15	5.93E-16	4.92E-16	1.33E-15	6.28E-16	2.02E-15
Greater scaup	1.96E-17	1.40E-16	1.83E-16	3.27E-16	4.09E-16	3.14E-16	2.54E-16	1.95E-23	8.11E-17	4.37E-17	3.62E-17	1.00E-16	5.23E-17	1.67E-16
Common eider	1.96E-17	1.40E-16	1.83E-16	3.27E-16	4.09E-16	3.14E-16	2.54E-16	1.95E-23	8.11E-17	4.37E-17	3.62E-17	1.00E-16	5.23E-17	1.67E-16
European herring gull	1.96E-17	1.40E-16	1.83E-16	3.27E-16	4.09E-16	3.14E-16	2.54E-16	1.95E-23	8.11E-17	4.37E-17	3.62E-17	1.00E-16	5.23E-17	1.67E-16
Horned grebe	1.96E-17	1.40E-16	1.83E-16	3.27E-16	4.09E-16	3.14E-16	2.54E-16	1.95E-23	8.11E-17	4.37E-17	3.62E-17	1.00E-16	5.23E-17	1.67E-16
Black guillemot	1.96E-17	1.40E-16	1.83E-16	3.27E-16	4.09E-16	3.14E-16	2.54E-16	1.95E-23	8.11E-17	4.37E-17	3.62E-17	1.00E-16	5.23E-17	1.67E-16
Ruddy turnstone	4.05E-29	0.00E+00	3.63E-28	0.00E+00	0.00E+00	2.84E-28	4.86E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.47E-29	1.09E-28	3.31E-28
White-tailed eagle	1.83E-17	1.38E-16	1.70E-16	3.23E-16	4.04E-16	3.02E-16	2.37E-16	1.93E-23	8.00E-17	4.31E-17	3.58E-17	9.77E-17	4.85E-17	1.56E-16
European otter	1.35E-17	9.92E-17	1.26E-16	2.32E-16	2.90E-16	2.19E-16	1.75E-16	1.38E-23	5.75E-17	3.10E-17	2.57E-17	7.06E-17	3.58E-17	1.15E-16
Ringed seal	2.70E-29	0.00E+00	2.42E-28	0.00E+00	0.00E+00	1.89E-28	3.24E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.98E-29	7.27E-29	2.21E-28

Table F-12. Continued

Representative Species	Dose Conversion Coefficient of external low-energy (≤10 keV) beta radiation continued											
	Sn-126	**Sr-90**	**Tc-99**	**Th-229**	**Th-230**	**Th-232**	**U-233**	**U-234**	**U-235**	**U-236**	**U-238**	**Zr-93**
RS Phytoplankton	1.81E-11	1.54E-12	2.68E-12	8.92E-11	4.71E-12	4.70E-12	5.23E-12	6.19E-12	1.04E-10	5.82E-12	5.13E-12	1.33E-11
RS Zooplankton	1.17E-28	6.95E-29	1.20E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.91E-28	0.00E+00	0.00E+00	5.90E-28
Stypocaulon scoparium	1.81E-11	1.54E-12	2.68E-12	8.92E-11	4.71E-12	4.70E-12	5.23E-12	6.19E-12	1.04E-10	5.82E-12	5.13E-12	1.33E-11
Bristly stonewort	5.08E-13	4.97E-14	8.64E-14	2.45E-12	1.29E-13	1.29E-13	1.43E-13	1.70E-13	2.87E-12	1.60E-13	1.40E-13	4.27E-13
Grasswrack pondweed	4.83E-12	4.22E-13	7.34E-13	2.38E-11	1.26E-12	1.25E-12	1.39E-12	1.65E-12	2.78E-11	1.55E-12	1.37E-12	3.63E-12
Water pygmyweed	4.83E-12	4.22E-13	7.34E-13	2.38E-11	1.26E-12	1.25E-12	1.39E-12	1.65E-12	2.78E-11	1.55E-12	1.37E-12	3.63E-12
Elatine orthosperma	4.83E-12	4.22E-13	7.34E-13	2.38E-11	1.26E-12	1.25E-12	1.39E-12	1.65E-12	2.78E-11	1.55E-12	1.37E-12	3.63E-12
Alisma wahlenbergii	4.83E-12	4.22E-13	7.34E-13	2.38E-11	1.26E-12	1.25E-12	1.39E-12	1.65E-12	2.78E-11	1.55E-12	1.37E-12	3.63E-12
Flat-stalked pondweed	4.83E-12	4.22E-13	7.34E-13	2.38E-11	1.26E-12	1.25E-12	1.39E-12	1.65E-12	2.78E-11	1.55E-12	1.37E-12	3.63E-12
Water mudwort	4.83E-12	4.22E-13	7.34E-13	2.38E-11	1.26E-12	1.25E-12	1.39E-12	1.65E-12	2.78E-11	1.55E-12	1.37E-12	3.63E-12
Baltic macoma	9.42E-29	5.59E-29	9.68E-29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E-28	0.00E+00	0.00E+00	4.74E-28
Polychaete worms	3.21E-15	3.97E-16	6.89E-16	1.47E-14	7.74E-16	7.72E-16	8.59E-16	1.02E-15	1.75E-14	9.57E-16	8.42E-16	3.40E-15
Idotea balthica	9.63E-15	1.19E-15	2.06E-15	4.40E-14	2.32E-15	2.32E-15	2.58E-15	3.05E-15	5.25E-14	2.87E-15	2.53E-15	1.02E-14
Vimba bream	1.74E-15	2.19E-16	3.79E-16	7.94E-15	4.19E-16	4.18E-16	4.65E-16	5.51E-16	9.48E-15	5.18E-16	4.56E-16	1.87E-15
Viviparous eelpout	1.74E-15	2.19E-16	3.79E-16	7.94E-15	4.19E-16	4.18E-16	4.65E-16	5.51E-16	9.48E-15	5.18E-16	4.56E-16	1.87E-15
Burbot	1.74E-15	2.19E-16	3.79E-16	7.94E-15	4.19E-16	4.18E-16	4.65E-16	5.51E-16	9.48E-15	5.18E-16	4.56E-16	1.87E-15
Lumpsucker	1.74E-15	2.19E-16	3.79E-16	7.94E-15	4.19E-16	4.18E-16	4.65E-16	5.51E-16	9.48E-15	5.18E-16	4.56E-16	1.87E-15
European eel	1.74E-15	2.19E-16	3.79E-16	7.94E-15	4.19E-16	4.18E-16	4.65E-16	5.51E-16	9.48E-15	5.18E-16	4.56E-16	1.87E-15
Atlantic herring	1.74E-15	2.19E-16	3.79E-16	7.94E-15	4.19E-16	4.18E-16	4.65E-16	5.51E-16	9.48E-15	5.18E-16	4.56E-16	1.87E-15
European sprat	1.74E-15	2.19E-16	3.79E-16	7.94E-15	4.19E-16	4.18E-16	4.65E-16	5.51E-16	9.48E-15	5.18E-16	4.56E-16	1.87E-15
European perch	1.74E-15	2.19E-16	3.79E-16	7.94E-15	4.19E-16	4.18E-16	4.65E-16	5.51E-16	9.48E-15	5.18E-16	4.56E-16	1.87E-15
Northern pike	1.74E-15	2.19E-16	3.79E-16	7.94E-15	4.19E-16	4.18E-16	4.65E-16	5.51E-16	9.48E-15	5.18E-16	4.56E-16	1.87E-15
Atlantic salmon	1.74E-15	2.19E-16	3.79E-16	7.94E-15	4.19E-16	4.18E-16	4.65E-16	5.51E-16	9.48E-15	5.18E-16	4.56E-16	1.87E-15
Brown trout	1.74E-15	2.19E-16	3.79E-16	7.94E-15	4.19E-16	4.18E-16	4.65E-16	5.51E-16	9.48E-15	5.18E-16	4.56E-16	1.87E-15
Zander	1.74E-15	2.19E-16	3.79E-16	7.94E-15	4.19E-16	4.18E-16	4.65E-16	5.51E-16	9.48E-15	5.18E-16	4.56E-16	1.87E-15
Coregonus sp.	1.74E-15	2.19E-16	3.79E-16	7.94E-15	4.19E-16	4.18E-16	4.65E-16	5.51E-16	9.48E-15	5.18E-16	4.56E-16	1.87E-15
Greater scaup	1.32E-16	1.82E-17	3.15E-17	5.85E-16	3.09E-17	3.08E-17	3.43E-17	4.06E-17	7.04E-16	3.82E-17	3.36E-17	1.55E-16
Common eider	1.32E-16	1.82E-17	3.15E-17	5.85E-16	3.09E-17	3.08E-17	3.43E-17	4.06E-17	7.04E-16	3.82E-17	3.36E-17	1.55E-16
European herring gull	1.32E-16	1.82E-17	3.15E-17	5.85E-16	3.09E-17	3.08E-17	3.43E-17	4.06E-17	7.04E-16	3.82E-17	3.36E-17	1.55E-16
Horned grebe	1.32E-16	1.82E-17	3.15E-17	5.85E-16	3.09E-17	3.08E-17	3.43E-17	4.06E-17	7.04E-16	3.82E-17	3.36E-17	1.55E-16
Black guillemot	1.32E-16	1.82E-17	3.15E-17	5.85E-16	3.09E-17	3.08E-17	3.43E-17	4.06E-17	7.04E-16	3.82E-17	3.36E-17	1.55E-16
Ruddy turnstone	6.35E-29	3.76E-29	6.52E-29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-28	0.00E+00	0.00E+00	3.19E-28
White-tailed eagle	1.29E-16	1.69E-17	2.93E-17	5.77E-16	3.05E-17	3.04E-17	3.38E-17	4.00E-17	6.92E-16	3.77E-17	3.32E-17	1.44E-16
European otter	9.29E-17	1.25E-17	2.16E-17	4.15E-16	2.19E-17	2.18E-17	2.43E-17	2.88E-17	4.98E-16	2.71E-17	2.38E-17	1.07E-16
Ringed seal	4.24E-29	2.51E-29	4.35E-29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.91E-29	0.00E+00	0.00E+00	2.13E-28

Table F-12. Continued

Representative Species	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma													
	Ac-227	Ag-108m	Am-241	Am-243	C-14	Ca-41	Cl-36	Cm-244	Cm-245	Cm-246	Cs-135	Cs-137	Ho-166m	I-129
RS Phytoplankton	1.46E-07	9.59E-04	1.85E-05	1.55E-04	1.44E-06	6.16E-08	5.75E-05	9.27E-07	5.67E-05	8.30E-07	3.69E-06	3.76E-04	1.01E-03	1.54E-05
RS Zooplankton	1.31E-07	9.51E-04	1.77E-05	1.39E-04	4.30E-07	4.18E-08	2.99E-05	8.39E-07	5.45E-05	7.53E-07	9.89E-07	3.52E-04	1.01E-03	1.42E-05
Stypocaulon scoparium	1.46E-07	9.59E-04	1.85E-05	1.55E-04	1.44E-06	6.16E-08	5.75E-05	9.27E-07	5.67E-05	8.30E-07	3.69E-06	3.76E-04	1.01E-03	1.54E-05
Bristly stonewort	1.30E-07	9.51E-04	1.80E-05	1.44E-04	5.41E-07	5.02E-08	3.78E-05	8.63E-07	5.51E-05	7.71E-07	1.56E-06	3.58E-04	1.01E-03	1.44E-05
Grasswrack pondweed	1.29E-07	9.50E-04	1.79E-05	1.45E-04	5.49E-07	4.94E-08	3.90E-05	8.56E-07	5.50E-05	7.65E-07	1.55E-06	3.59E-04	1.01E-03	1.43E-05
Water pygmyweed	1.29E-07	9.50E-04	1.79E-05	1.45E-04	5.49E-07	4.94E-08	3.90E-05	8.56E-07	5.50E-05	7.65E-07	1.55E-06	3.59E-04	1.01E-03	1.43E-05
Elatine orthosperma	1.29E-07	9.50E-04	1.79E-05	1.45E-04	5.49E-07	4.94E-08	3.90E-05	8.56E-07	5.50E-05	7.65E-07	1.55E-06	3.59E-04	1.01E-03	1.43E-05
Alisma wahlenbergii	1.29E-07	9.50E-04	1.79E-05	1.45E-04	5.49E-07	4.94E-08	3.90E-05	8.56E-07	5.50E-05	7.65E-07	1.55E-06	3.59E-04	1.01E-03	1.43E-05
Flat-stalked pondweed	1.29E-07	9.50E-04	1.79E-05	1.45E-04	5.49E-07	4.94E-08	3.90E-05	8.56E-07	5.50E-05	7.65E-07	1.55E-06	3.59E-04	1.01E-03	1.43E-05
Water mudwort	1.29E-07	9.50E-04	1.79E-05	1.45E-04	5.49E-07	4.94E-08	3.90E-05	8.56E-07	5.50E-05	7.65E-07	1.55E-06	3.59E-04	1.01E-03	1.43E-05
Baltic macoma	1.04E-07	9.26E-04	1.60E-05	1.30E-04	1.28E-07	1.60E-08	9.07E-06	6.03E-07	5.22E-05	5.39E-07	2.94E-07	3.28E-04	9.90E-04	1.31E-05
Polychaete worms	9.69E-08	9.19E-04	1.54E-05	1.27E-04	7.18E-08	1.03E-08	8.47E-06	5.33E-07	5.14E-05	4.77E-07	1.70E-07	3.25E-04	9.83E-04	1.26E-05
Idotea balthica	1.13E-07	9.36E-04	1.68E-05	1.33E-04	1.89E-07	2.62E-08	1.48E-05	7.13E-07	5.32E-05	6.37E-07	4.41E-07	3.36E-04	9.98E-04	1.36E-05
Vimba bream	8.43E-08	8.87E-04	1.37E-05	1.21E-04	4.84E-08	5.69E-09	3.41E-06	3.40E-07	4.88E-05	3.05E-07	1.12E-07	3.11E-04	9.54E-04	1.10E-05
Viviparous eelpout	8.43E-08	8.87E-04	1.37E-05	1.21E-04	4.84E-08	5.69E-09	3.41E-06	3.40E-07	4.88E-05	3.05E-07	1.12E-07	3.11E-04	9.54E-04	1.10E-05
Burbot	8.43E-08	8.87E-04	1.37E-05	1.21E-04	4.84E-08	5.69E-09	3.41E-06	3.40E-07	4.88E-05	3.05E-07	1.12E-07	3.11E-04	9.54E-04	1.10E-05
Lumpsucker	8.43E-08	8.87E-04	1.37E-05	1.21E-04	4.84E-08	5.69E-09	3.41E-06	3.40E-07	4.88E-05	3.05E-07	1.12E-07	3.11E-04	9.54E-04	1.10E-05
European eel	8.43E-08	8.87E-04	1.37E-05	1.21E-04	4.84E-08	5.69E-09	3.41E-06	3.40E-07	4.88E-05	3.05E-07	1.12E-07	3.11E-04	9.54E-04	1.10E-05
Atlantic herring	8.43E-08	8.87E-04	1.37E-05	1.21E-04	4.84E-08	5.69E-09	3.41E-06	3.40E-07	4.88E-05	3.05E-07	1.12E-07	3.11E-04	9.54E-04	1.10E-05
European sprat	8.43E-08	8.87E-04	1.37E-05	1.21E-04	4.84E-08	5.69E-09	3.41E-06	3.40E-07	4.88E-05	3.05E-07	1.12E-07	3.11E-04	9.54E-04	1.10E-05
European perch	8.43E-08	8.87E-04	1.37E-05	1.21E-04	4.84E-08	5.69E-09	3.41E-06	3.40E-07	4.88E-05	3.05E-07	1.12E-07	3.11E-04	9.54E-04	1.10E-05
Northern pike	8.78E-08	9.00E-04	1.43E-05	1.23E-04	4.84E-08	5.83E-09	4.06E-06	4.04E-07	4.97E-05	3.61E-07	1.12E-07	3.16E-04	9.66E-04	1.16E-05
Atlantic salmon	8.43E-08	8.87E-04	1.37E-05	1.21E-04	4.84E-08	5.69E-09	3.41E-06	3.40E-07	4.88E-05	3.05E-07	1.12E-07	3.11E-04	9.54E-04	1.10E-05
Brown trout	8.43E-08	8.87E-04	1.37E-05	1.21E-04	4.84E-08	5.69E-09	3.41E-06	3.40E-07	4.88E-05	3.05E-07	1.12E-07	3.11E-04	9.54E-04	1.10E-05
Zander	8.43E-08	8.87E-04	1.37E-05	1.21E-04	4.84E-08	5.69E-09	3.41E-06	3.40E-07	4.88E-05	3.05E-07	1.12E-07	3.11E-04	9.54E-04	1.10E-05
Coregonus sp.	8.43E-08	8.87E-04	1.37E-05	1.21E-04	4.84E-08	5.69E-09	3.41E-06	3.40E-07	4.88E-05	3.05E-07	1.12E-07	3.11E-04	9.54E-04	1.10E-05
Greater scaup	6.63E-08	7.99E-04	1.06E-05	1.06E-04	1.81E-08	2.04E-09	1.34E-06	1.41E-07	4.23E-05	1.27E-07	4.26E-08	2.80E-04	8.62E-04	7.10E-06
Common eider	6.63E-08	7.99E-04	1.06E-05	1.06E-04	1.81E-08	2.04E-09	1.34E-06	1.41E-07	4.23E-05	1.27E-07	4.26E-08	2.80E-04	8.62E-04	7.10E-06
European herring gull	6.63E-08	7.99E-04	1.06E-05	1.06E-04	1.81E-08	2.04E-09	1.34E-06	1.41E-07	4.23E-05	1.27E-07	4.26E-08	2.80E-04	8.62E-04	7.10E-06
Horned grebe	6.63E-08	7.99E-04	1.06E-05	1.06E-04	1.81E-08	2.04E-09	1.34E-06	1.41E-07	4.23E-05	1.27E-07	4.26E-08	2.80E-04	8.62E-04	7.10E-06
Black guillemot	6.63E-08	7.99E-04	1.06E-05	1.06E-04	1.81E-08	2.04E-09	1.34E-06	1.41E-07	4.23E-05	1.27E-07	4.26E-08	2.80E-04	8.62E-04	7.10E-06
Ruddy turnstone	7.17E-08	8.33E-04	1.16E-05	1.12E-04	2.30E-08	2.62E-09	1.67E-06	1.86E-07	4.47E-05	1.67E-07	5.36E-08	2.91E-04	8.98E-04	8.38E-06
White-tailed eagle	5.64E-08	7.30E-04	8.62E-06	9.27E-05	1.09E-08	1.22E-09	8.68E-07	8.55E-08	3.70E-05	7.71E-08	2.61E-08	2.56E-04	7.88E-04	5.05E-06
European otter	5.53E-08	7.21E-04	8.40E-06	9.11E-05	1.04E-08	1.16E-09	8.32E-07	8.14E-08	3.63E-05	7.34E-08	2.49E-08	2.53E-04	7.79E-04	4.85E-06
Ringed seal	3.31E-08	5.09E-04	4.48E-06	5.60E-05	4.80E-09	5.36E-10	4.04E-07	3.72E-08	2.20E-05	3.36E-08	1.16E-08	1.80E-04	5.50E-04	2.17E-06

Table F-12. Continued

Representative Species	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma continued													
	Nb-94	Ni-59	Ni-63	Np-237	Pa-231	Pb-210	Pd-107	Po-210	Pu-239	Pu-240	Pu-242	Ra-226	Se-79	Sm-151
RS Phytoplankton	9.30E-04	7.43E-07	5.22E-08	2.03E-05	2.79E-05	1.13E-04	5.04E-09	4.93E-09	4.09E-07	9.51E-07	7.90E-07	1.33E-03	1.96E-06	9.00E-08
RS Zooplankton	9.14E-04	5.04E-07	3.56E-08	1.91E-05	2.66E-05	7.23E-04	7.54E-09	4.91E-09	3.60E-07	8.46E-07	7.03E-07	1.24E-03	5.60E-07	5.39E-08
Stypocaulon scoparium	9.30E-04	7.43E-07	5.22E-08	2.03E-05	2.79E-05	1.13E-04	5.04E-09	4.93E-09	4.09E-07	9.51E-07	7.90E-07	1.33E-03	1.96E-06	9.00E-08
Bristly stonewort	9.20E-04	6.06E-07	2.22E-08	1.94E-05	2.71E-05	7.83E-05	2.54E-09	4.91E-09	3.74E-07	8.71E-07	7.23E-07	1.25E-03	7.41E-07	3.96E-08
Grasswrack pondweed	9.20E-04	5.96E-07	2.11E-08	1.93E-05	2.71E-05	7.69E-05	2.25E-09	4.91E-09	3.72E-07	8.64E-07	7.17E-07	1.24E-03	7.49E-07	3.87E-08
Water pygmyweed	9.20E-04	5.96E-07	2.11E-08	1.93E-05	2.71E-05	7.69E-05	2.25E-09	4.91E-09	3.72E-07	8.64E-07	7.17E-07	1.24E-03	7.49E-07	3.87E-08
Elatine orthosperma	9.20E-04	5.96E-07	2.11E-08	1.93E-05	2.71E-05	7.69E-05	2.25E-09	4.91E-09	3.72E-07	8.64E-07	7.17E-07	1.24E-03	7.49E-07	3.87E-08
Alisma wahlenbergii	9.20E-04	5.96E-07	2.11E-08	1.93E-05	2.71E-05	7.69E-05	2.25E-09	4.91E-09	3.72E-07	8.64E-07	7.17E-07	1.24E-03	7.49E-07	3.87E-08
Flat-stalked pondweed	9.20E-04	5.96E-07	2.11E-08	1.93E-05	2.71E-05	7.69E-05	2.25E-09	4.91E-09	3.72E-07	8.64E-07	7.17E-07	1.24E-03	7.49E-07	3.87E-08
Water mudwort	9.20E-04	5.96E-07	2.11E-08	1.93E-05	2.71E-05	7.69E-05	2.25E-09	4.91E-09	3.72E-07	8.64E-07	7.17E-07	1.24E-03	7.49E-07	3.87E-08
Baltic macoma	8.95E-04	1.93E-07	1.04E-08	1.72E-05	2.43E-05	2.33E-05	2.13E-09	4.83E-09	2.58E-07	5.82E-07	4.83E-07	1.09E-03	1.67E-07	1.79E-08
Polychaete worms	8.88E-04	1.24E-07	4.61E-09	1.66E-05	2.37E-05	2.16E-05	5.62E-10	4.80E-09	2.28E-07	5.05E-07	4.19E-07	1.07E-03	9.42E-08	9.98E-09
Idotea balthica	9.04E-04	3.16E-07	1.26E-08	1.81E-05	2.54E-05	3.61E-05	1.61E-09	4.87E-09	3.06E-07	7.00E-07	5.81E-07	1.14E-03	2.47E-07	2.27E-08
Vimba bream	8.62E-04	6.87E-08	3.07E-09	1.50E-05	2.18E-05	9.16E-06	3.77E-10	4.65E-09	1.54E-07	3.19E-07	2.65E-07	1.00E-03	6.33E-08	6.72E-09
Viviparous eelpout	8.62E-04	6.87E-08	3.07E-09	1.50E-05	2.18E-05	9.16E-06	3.77E-10	4.65E-09	1.54E-07	3.19E-07	2.65E-07	1.00E-03	6.33E-08	6.72E-09
Burbot	8.62E-04	6.87E-08	3.07E-09	1.50E-05	2.18E-05	9.16E-06	3.77E-10	4.65E-09	1.54E-07	3.19E-07	2.65E-07	1.00E-03	6.33E-08	6.72E-09
Lumpsucker	8.62E-04	6.87E-08	3.07E-09	1.50E-05	2.18E-05	9.16E-06	3.77E-10	4.65E-09	1.54E-07	3.19E-07	2.65E-07	1.00E-03	6.33E-08	6.72E-09
European eel	8.62E-04	6.87E-08	3.07E-09	1.50E-05	2.18E-05	9.16E-06	3.77E-10	4.65E-09	1.54E-07	3.19E-07	2.65E-07	1.00E-03	6.33E-08	6.72E-09
Atlantic herring	8.62E-04	6.87E-08	3.07E-09	1.50E-05	2.18E-05	9.16E-06	3.77E-10	4.65E-09	1.54E-07	3.19E-07	2.65E-07	1.00E-03	6.33E-08	6.72E-09
European sprat	8.62E-04	6.87E-08	3.07E-09	1.50E-05	2.18E-05	9.16E-06	3.77E-10	4.65E-09	1.54E-07	3.19E-07	2.65E-07	1.00E-03	6.33E-08	6.72E-09
European perch	8.62E-04	6.87E-08	3.07E-09	1.50E-05	2.18E-05	9.16E-06	3.77E-10	4.65E-09	1.54E-07	3.19E-07	2.65E-07	1.00E-03	6.33E-08	6.72E-09
Northern pike	8.72E-04	7.04E-08	3.07E-09	1.56E-05	2.24E-05	1.17E-05	3.77E-10	4.71E-09	1.77E-07	3.76E-07	3.13E-07	1.02E-03	6.34E-08	7.07E-09
Atlantic salmon	8.62E-04	6.87E-08	3.07E-09	1.50E-05	2.18E-05	9.16E-06	3.77E-10	4.65E-09	1.54E-07	3.19E-07	2.65E-07	1.00E-03	6.33E-08	6.72E-09
Brown trout	8.62E-04	6.87E-08	3.07E-09	1.50E-05	2.18E-05	9.16E-06	3.77E-10	4.65E-09	1.54E-07	3.19E-07	2.65E-07	1.00E-03	6.33E-08	6.72E-09
Zander	8.62E-04	6.87E-08	3.07E-09	1.50E-05	2.18E-05	9.16E-06	3.77E-10	4.65E-09	1.54E-07	3.19E-07	2.65E-07	1.00E-03	6.33E-08	6.72E-09
Coregonus sp.	8.62E-04	6.87E-08	3.07E-09	1.50E-05	2.18E-05	9.16E-06	3.77E-10	4.65E-09	1.54E-07	3.19E-07	2.65E-07	1.00E-03	6.33E-08	6.72E-09
Greater scaup	7.82E-04	2.46E-08	1.11E-09	1.20E-05	1.84E-05	3.89E-06	1.33E-10	4.23E-09	7.74E-08	1.33E-07	1.11E-07	9.00E-04	2.37E-08	2.62E-09
Common eider	7.82E-04	2.46E-08	1.11E-09	1.20E-05	1.84E-05	3.89E-06	1.33E-10	4.23E-09	7.74E-08	1.33E-07	1.11E-07	9.00E-04	2.37E-08	2.62E-09
European herring gull	7.82E-04	2.46E-08	1.11E-09	1.20E-05	1.84E-05	3.89E-06	1.33E-10	4.23E-09	7.74E-08	1.33E-07	1.11E-07	9.00E-04	2.37E-08	2.62E-09
Horned grebe	7.82E-04	2.46E-08	1.11E-09	1.20E-05	1.84E-05	3.89E-06	1.33E-10	4.23E-09	7.74E-08	1.33E-07	1.11E-07	9.00E-04	2.37E-08	2.62E-09
Black guillemot	7.82E-04	2.46E-08	1.11E-09	1.20E-05	1.84E-05	3.89E-06	1.33E-10	4.23E-09	7.74E-08	1.33E-07	1.11E-07	9.00E-04	2.37E-08	2.62E-09
Ruddy turnstone	8.13E-04	3.16E-08	1.71E-09	1.30E-05	1.95E-05	4.81E-06	3.34E-10	4.39E-09	9.46E-08	1.74E-07	1.45E-07	9.36E-04	3.01E-08	3.65E-09
White-tailed eagle	7.19E-04	1.47E-08	6.41E-10	1.01E-05	1.62E-05	2.57E-06	6.87E-11	3.89E-09	5.46E-08	8.20E-08	6.86E-08	8.29E-04	1.43E-08	1.57E-09
European otter	7.12E-04	1.40E-08	6.06E-10	9.89E-06	1.60E-05	2.47E-06	6.43E-11	3.85E-09	5.27E-08	7.82E-08	6.54E-08	8.20E-04	1.36E-08	1.49E-09
Ringed seal	5.15E-04	6.47E-09	2.79E-10	5.72E-06	1.04E-05	1.18E-06	4.30E-11	2.78E-09	2.83E-08	3.65E-08	3.07E-08	6.07E-04	6.32E-09	6.69E-10

Table F-12. Continued

Representative Species	Dose Conversion Coefficient of external high energy beta (> 10 keV) and gamma continued											
	Sn-126	**Sr-90**	**Tc-99**	**Th-229**	**Th-230**	**Th-232**	**U-233**	**U-234**	**U-235**	**U-236**	**U-238**	**Zr-93**
RS Phytoplankton	1.16E-03	4.46E-04	9.12E-06	5.77E-05	9.86E-07	7.93E-07	7.61E-07	9.85E-07	1.11E-04	8.72E-07	7.50E-07	6.47E-08
RS Zooplankton	1.10E-03	3.59E-04	2.75E-06	5.44E-05	7.91E-07	6.46E-07	6.67E-07	8.30E-07	1.05E-04	7.42E-07	6.39E-07	4.39E-08
Stypocaulon scoparium	1.16E-03	4.46E-04	9.12E-06	5.77E-05	9.86E-07	7.93E-07	7.61E-07	9.85E-07	1.11E-04	8.72E-07	7.50E-07	6.47E-08
Bristly stonewort	1.10E-03	3.55E-04	5.00E-06	5.53E-05	8.26E-07	6.79E-07	6.92E-07	8.73E-07	1.07E-04	7.80E-07	6.72E-07	2.76E-08
Grasswrack pondweed	1.09E-03	3.38E-04	5.14E-06	5.53E-05	8.22E-07	6.74E-07	6.88E-07	8.66E-07	1.07E-04	7.73E-07	6.67E-07	2.62E-08
Water pygmyweed	1.09E-03	3.38E-04	5.14E-06	5.53E-05	8.22E-07	6.74E-07	6.88E-07	8.66E-07	1.07E-04	7.73E-07	6.67E-07	2.62E-08
Elatine orthosperma	1.09E-03	3.38E-04	5.14E-06	5.53E-05	8.22E-07	6.74E-07	6.88E-07	8.66E-07	1.07E-04	7.73E-07	6.67E-07	2.62E-08
Alisma wahlenbergii	1.09E-03	3.38E-04	5.14E-06	5.53E-05	8.22E-07	6.74E-07	6.88E-07	8.66E-07	1.07E-04	7.73E-07	6.67E-07	2.62E-08
Flat-stalked pondweed	1.09E-03	3.38E-04	5.14E-06	5.53E-05	8.22E-07	6.74E-07	6.88E-07	8.66E-07	1.07E-04	7.73E-07	6.67E-07	2.62E-08
Water mudwort	1.09E-03	3.38E-04	5.14E-06	5.53E-05	8.22E-07	6.74E-07	6.88E-07	8.66E-07	1.07E-04	7.73E-07	6.67E-07	2.62E-08
Baltic macoma	9.69E-04	1.37E-04	8.12E-07	5.14E-05	5.52E-07	4.27E-07	4.95E-07	5.61E-07	9.94E-05	4.94E-07	4.22E-07	1.28E-08
Polychaete worms	9.53E-04	1.10E-04	5.00E-07	5.04E-05	4.88E-07	3.67E-07	4.45E-07	4.86E-07	9.77E-05	4.24E-07	3.61E-07	5.76E-09
Idotea balthica	1.01E-03	2.09E-04	1.28E-06	5.27E-05	6.52E-07	5.21E-07	5.70E-07	6.84E-07	1.02E-04	6.08E-07	5.22E-07	1.57E-08
Vimba bream	8.97E-04	5.16E-05	3.10E-07	4.79E-05	3.71E-07	2.57E-07	3.38E-07	3.20E-07	9.29E-05	2.71E-07	2.27E-07	3.83E-09
Viviparous eelpout	8.97E-04	5.16E-05	3.10E-07	4.79E-05	3.71E-07	2.57E-07	3.38E-07	3.20E-07	9.29E-05	2.71E-07	2.27E-07	3.83E-09
Burbot	8.97E-04	5.16E-05	3.10E-07	4.79E-05	3.71E-07	2.57E-07	3.38E-07	3.20E-07	9.29E-05	2.71E-07	2.27E-07	3.83E-09
Lumpsucker	8.97E-04	5.16E-05	3.10E-07	4.79E-05	3.71E-07	2.57E-07	3.38E-07	3.20E-07	9.29E-05	2.71E-07	2.27E-07	3.83E-09
European eel	8.97E-04	5.16E-05	3.10E-07	4.79E-05	3.71E-07	2.57E-07	3.38E-07	3.20E-07	9.29E-05	2.71E-07	2.27E-07	3.83E-09
Atlantic herring	8.97E-04	5.16E-05	3.10E-07	4.79E-05	3.71E-07	2.57E-07	3.38E-07	3.20E-07	9.29E-05	2.71E-07	2.27E-07	3.83E-09
European sprat	8.97E-04	5.16E-05	3.10E-07	4.79E-05	3.71E-07	2.57E-07	3.38E-07	3.20E-07	9.29E-05	2.71E-07	2.27E-07	3.83E-09
European perch	8.97E-04	5.16E-05	3.10E-07	4.79E-05	3.71E-07	2.57E-07	3.38E-07	3.20E-07	9.29E-05	2.71E-07	2.27E-07	3.83E-09
Northern pike	9.15E-04	6.66E-05	3.13E-07	4.87E-05	4.01E-07	2.85E-07	3.69E-07	3.67E-07	9.46E-05	3.15E-07	2.65E-07	3.83E-09
Atlantic salmon	8.97E-04	5.16E-05	3.10E-07	4.79E-05	3.71E-07	2.57E-07	3.38E-07	3.20E-07	9.29E-05	2.71E-07	2.27E-07	3.83E-09
Brown trout	8.97E-04	5.16E-05	3.10E-07	4.79E-05	3.71E-07	2.57E-07	3.38E-07	3.20E-07	9.29E-05	2.71E-07	2.27E-07	3.83E-09
Zander	8.97E-04	5.16E-05	3.10E-07	4.79E-05	3.71E-07	2.57E-07	3.38E-07	3.20E-07	9.29E-05	2.71E-07	2.27E-07	3.83E-09
Coregonus sp.	8.97E-04	5.16E-05	3.10E-07	4.79E-05	3.71E-07	2.57E-07	3.38E-07	3.20E-07	9.29E-05	2.71E-07	2.27E-07	3.83E-09
Greater scaup	7.97E-04	2.00E-05	1.20E-07	4.14E-05	2.40E-07	1.43E-07	2.18E-07	1.54E-07	8.10E-05	1.20E-07	9.52E-08	1.38E-09
Common eider	7.97E-04	2.00E-05	1.20E-07	4.14E-05	2.40E-07	1.43E-07	2.18E-07	1.54E-07	8.10E-05	1.20E-07	9.52E-08	1.38E-09
European herring gull	7.97E-04	2.00E-05	1.20E-07	4.14E-05	2.40E-07	1.43E-07	2.18E-07	1.54E-07	8.10E-05	1.20E-07	9.52E-08	1.38E-09
Horned grebe	7.97E-04	2.00E-05	1.20E-07	4.14E-05	2.40E-07	1.43E-07	2.18E-07	1.54E-07	8.10E-05	1.20E-07	9.52E-08	1.38E-09
Black guillemot	7.97E-04	2.00E-05	1.20E-07	4.14E-05	2.40E-07	1.43E-07	2.18E-07	1.54E-07	8.10E-05	1.20E-07	9.52E-08	1.38E-09
Ruddy turnstone	8.33E-04	2.61E-05	1.50E-07	4.38E-05	2.72E-07	1.69E-07	2.48E-07	1.90E-07	8.54E-05	1.52E-07	1.23E-07	2.10E-09
White-tailed eagle	7.25E-04	1.28E-05	7.50E-08	3.60E-05	1.90E-07	1.06E-07	1.74E-07	1.06E-07	7.15E-05	7.83E-08	5.96E-08	8.00E-10
European otter	7.17E-04	1.22E-05	7.16E-08	3.54E-05	1.85E-07	1.03E-07	1.70E-07	1.02E-07	7.04E-05	7.50E-08	5.69E-08	7.56E-10
Ringed seal	5.03E-04	5.63E-06	3.27E-08	2.13E-05	1.03E-07	5.47E-08	9.91E-08	5.17E-08	4.42E-05	3.66E-08	2.67E-08	3.45E-10