SUPPLEMENT TO THE METHODOLOGY
FOR RISK EVALUATION OF BIOCIDES

EMISSION SCENARIO DOCUMENT FOR BIOCIDES USED AS AVICIDES (PRODUCT TYPE 15)

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EUBEES

This report has been developed in the context of the EC project entitled "Gathering, review and development of environmental emission scenarios for biocides (EUBEES 2).
The contents have to be discussed and agreed by the EUBEES 2 working group, consisting of representatives of some Member States, CEFIC and the Commission. The financial support of the French Ministry of ecology and sustainable development is gratefully acknowledged (Ref. BC02000753).

Foreword

This report gives a description of the emission scenarios for avicides used in the European Community (EC). The scenarios and assessments are dealing with the environment including the non-target mammals and birds.

This document describes a method of estimating the emission rates of avicides to the primary receiving environmental compartments (e.g. air, soil, and water). This allows the estimation of a worst case Predicted Environmental Concentration (PEC) for each compartment. The calculation of a realistic worst case PEC using environmental interactions is considered to be fate and behaviour modelling, and is outside the scope of these guidelines.

Discussions in the working group for the EC project "Gathering, review and development of environmental emission scenarios for biocides (EUBEES 2)" (*Baumann, 2000*) and data supplied by Member States and avicide users enabled the update presented in this report. The emission scenarios are applicable in all EC Member States.

Contents

1 Introduction

In the main group of pest control products avicides (Product type 15) are found according to Annex V of the Directive 98/8/EC (Biocidal Products Directive, BPD; *EC, 1998*). Certain application areas are directly related to protection of plants and thereby covered under Directive 91/414/EEC (*EC, 1991*), e.g. preventing the avian activity in crops and grain storage (for example, use of corvicides). Thus, the biocidal products type 15 ("avicides") cover the control of birds in non-agricultural use (*EC, 2001a*). The control of birds is accomplished by application indoors and outdoors.

The format of names, parameters, variables, units and symbols used in the equations cited from EUSES and USES models (*EC, 1996*) and used in the exposure scenarios may have changed from their original references. This was done to bring the nomenclature in agreement with the proposals discussed and agreed by EUBEES working group consisting of representatives of the Commission, some Member States and CEFIC (*van der Poel, 2000*).

If reliable and representative measured data are available, they have to be used instead of modelling values or included in the data used in the modelling.

The information contained in this emission scenario document are based on scientific documentation, web sites consultation and results of a survey performed in Europe (see Appendix 1).

The scenarios in this report are presented in the following way:

Input

[Variable/parameter (unit)]   [Symbol]   [Unit]   S/D/O/P

These parameters are the input to the scenario. The S, D, O or P classification of a parameter indicates the status:

S Parameter must be present in the input data set for the calculation to be executed (there has been no method implemented in the system to estimate this parameter; no default value is set).

D Parameter has a standard value (most defaults can be changed by the user)

O Parameter is the output from another calculation (most output parameters can be overwritten by the user with alternative data).

P Parameter value can be chosen from a "pick-list" of values.

c Default or output parameter is closed and cannot be changed by the user.

Output

[Symbol]   [Description]

Intermediate calculations

Parameter description (Unit)

[Parameter = equation]   (Equation no.)

End calculations

[Parameter = equation]   (Equation no.)

1.1 Bird damages

Bird populations inhabiting urban areas are increasing. The successful adaptation of these wild animals to new environments has to be recognised. However the consequences of this adaptability are of great concerns, namely the propagation of diseases e.g. ornithosis; building degradations due to erosion by acidic faecal deposits; the general unsightliness of droppings; the noise created by birds and the increasingly aggressive behaviour of some species habituated to people and looking for food sources (*Clergeau, 1999*).

Collisions with aircraft and ingestion by jet engines of birds at airport fields may be hazardous. They are quite frequent.

Use of avicides attempts to control bird populations and thus to decrease the likelihood of risks to human health and safety and to damages to buildings. Management of bird species in the EC is controlled under the Council Directive of 2 April 1979 and its subsequent amendments on the conservation of wild birds (*79/409/EEC*; *EC, 1979*). This Directive relates to the conservation and protection of all species of naturally occurring wild birds, their nests and eggs, within the European territory. Examples of some of the bird pests common to the EC territory, together with their common and generic names, are shown in Table 1.1.

Table 1.1: Examples of bird pests (*TNsG, 2002*)

UK COMMON NAME	SPECIES NAME
Great Black-backed gull	*Larus marinus*
Lesser Black-backed gull Herring gull	*Larus fuscus* *Larus argentatus*
Common gull	*Larus canus*
Black headed gull	*Larus ridibundus*
Crow	*Corvus corone*
Rook	*Corvus frugilegus*
Jackdaw	*Corvus monedula*
Jay	*Garrulus glandarius*
Magpie	*Pica pica*
Starling	*Sturnus vulgaris*
Collared dove	*Streptopelia decaocto*
Feral pigeon	*Columba livia*
Wood pigeon	*Columba palumbus*
House sparrow	*Passer domesticus*
Canada goose	*Branta canadensis*
Brent goose	*Branta bernicla*

Remark: These examples are not intended to be exhaustive with respect to target organisms or prescriptive with respect to data generation. Care should be taken in the choice of target organism(s) with all due consideration given to local laws and regulations (*EC, 1992*) (for example, feral pigeon is listed on Annex II/1 of the Council Directive of 2 April 1979 on the conservation of wild birds (*79/409/EEC*) and so, may be hunted in the geographical sea and land area where this Directive applies whereas herring gull is listed on the Annex II/2 and so, may be hunted only in the Member States in respect of which they are indicated). Genus of species will vary across Member States.

1.2 Bird control

As mentioned above, problems associated with birds in non-agricultural area are very large, depending on the species that are involved and on the location of the problems. It must be emphasised that the saving non-chemical methods to overcome problems with birds are strongly preferred. Therefore, the bird controlling methods using avicides described in this document should be applied only in cases all other approaches have failed. Furthermore, stringent conditions and guidelines should be set at international level to prevent misuse.

An observation period is essential for applicators to select the most appropriate method to tackle birds. Before controlling an area, surveys should be conducted early in the morning, midday, and again in the evening to analyse accurately the problem and the different activity periods in order to minimise risks. The survey should document both the target and non-target species involved, census the target population and identify bird status as to resident or migrant/adult or juvenile. An attempt should be made to identify the activity as feeding, roosting, nesting or loafing, determine sources of food and liquids, and estimate health and damage risks presented by their presence. To assess control options it is helpful to determine what attracts the birds to the site, which non-targets are resident, where they might disperse to and if exclusion or habitat modification is a viable option. Public relations and legal ramification should not be overlooked.

1.2.1 Methods using avicides

They are less often used than the physical methods (see details in section 1.2.2). Avicides are generally either slow acting and reversible or fast acting. The mode of action of avicides will depend on the chemical used. Some avicides may be repellent (product type 19) in nature or may act by suffocating bird embryos in eggs. The available data should give brief details to indicate the route of exposure (e.g. oral, contact or inhalation) and the nature of the effect (e.g. stupefying, toxicant, chemosterilant, repellent). Products may be used both indoors such as in factories, farm buildings or outdoors in a variety of situations such as on rooftops, at airports, in courtyards or other areas where pest birds may be nesting, roosting or feeding.

1.2.1.1 Active substances

A limited number of biocidal products are currently available in the EC for the control of birds. The limited number is mainly due to legislation prohibiting or limiting the use of various control methods, including biocides. This legislation is in place, in part, to protect non-target wildlife from accidental poisoning and to protect public health.
Within the EC, Member States have different legislation concerning the use of avicides to tackle birds. In Germany, Denmark, Finland and Austria, the national laws do not allow the use of any biocidal product to control birds. In Sweden and Italy, use of avicides is allowed but such products are not currently used. In France and UK, avicides are used.

A list of the existing active substances for avicides identified or notified according to the BPD can be found in the ECB homepage: http://ecb.jrc.it/biocides. Only alphachloralose and CO_2 are listed as avicides.

The used paraffin oils have been identified but the corresponding type of product is not specified on Internet.

In UK, 2 products are currently approved as “bird stupefying baits” under the control of pesticides Regulations 1986. Both are only registered for house sparrow and feral pigeon control. These products are bait concentrates containing **alphachloralose** as the active substance. Alphachloralose is a narcotic. *Buckle (1994)* described that it slows down a number of essential metabolic processes. Therefore it is most effective against small birds because they have a high surface to volume ratio.
Physical properties of alphachloralose are presented below (*Rentokil, 2001*):
Molecular formula: $C_8H_{11}Cl_3$
Molecular weight: 309.5 g
Form: crystalline powder
Melting point: 187°C
Vapour pressure: negligible at room temperature
Solubility in water: 4.44 $g.l^{-1}$ (15°C)
Stability: converted by acids and alkalis into glucose and chloral.

Remark: There is a widely held perception that the house sparrow is in serious decline in Britain, and this perception is also held in some other parts of Europe (for example, in the Netherlands). In this document, environmental releases due to the use of avicide product to control house sparrows has been included, as alphachloralose has been found to be registered for this species in UK, even though its actual use in this country is not reported and should be very limited. Nevertheless, if a decline is really confirmed by observation, it is obvious that the use of avicide to tackle House sparrows should be at least severely restricted, or banned.

Carbon dioxide (CO_2) gas is an EC approved euthanasia method, which is used to kill birds that are captured in traps or by stupefaction and when relocation is not a feasible option (*EC, 1993*). Live birds are placed in a container or chamber into which CO_2 gas is released. The birds quickly expire after inhaling the gas. CO_2 gas is a by-product of animal respiration, is common in the atmosphere, and is required by plants for photosynthesis. It is used to carbonate beverages for human consumption. In its frozen form, it is commonly known as dry ice. The use of CO_2 in EC for euthanasia purposes is exceedingly minor and inconsequential to climate change problems.

Eliminating reproduction of nuisance birds can be carried out by applying a small quantity of food grade vegetable oil or mineral oil on eggs in nests. According to European Commission (*EC, 2003a*), no matter which of 2 different processes that might be involved by the use of a chemical, either (i) suffocating (prevention of penetration of oxygen) or (ii) penetration of toxic components into the egg, these products are within the scope of the Biocidal Products Directive, BPD (*EC, 1998)*. Therefore, **egg-oil products** when used to fight against birds have to be considered as avicide products. The oil prevents exchange of gases and causes asphyxiation of developing embryos and has been found to be 96-100% effective in reducing hatchability (*US Department of Agriculture Animal Plant Health Inspection Service Wildlife Services, 2002*). It should be noted that the typically used product is paraffin oil, in which formalin is added at 1-2%. The latter is being used to increase the lifetime of the product.
In UK and France, this method is currently used to fight against ground-nesting species, especially goose (Canada goose, greylag goose) and large gulls (herring gulls, lesser black-backed gull,

greater black-backed gull). In UK, the use of liquid paraffin BP (also known as paraffin oil or light white mineral oil) has been approved under the Control of Pesticides Regulations (COPR) but can only be used under a license issued by the Department of Environment, Food and Rural Affairs (DEFRA) under Section 16(1) of the Wildlife and Countryside Act, 1981. The UK approval refers to use of egg-oil by egg immersing (DEFRA, 2001), but in France, gull control experience has shown that sprays were extensively used. Therefore, both ways of egg-oil application are covered in this document.

As mentioned above, environmental releases expected by the use of CO_2 to euthanize birds are negligible. Therefore, environmental emission scenarios of the avicide products will only be based on the alphachloralose and egg-oil uses.

1.2.1.2 Advantages and drawbacks

- *Alphachloralose bait:*

Stupefying baits are more convenient to control birds than toxic baits, as birds can be relocated after stupefaction.

Birds stupefying chemicals present some drawbacks (*ADAS, 2001*):
- It is expensive, when compared to the other techniques, as the pre-baiting phase is long and the applicators must be qualified. There would usually be a period of pre-baiting to ensure that the birds are feeding in the area, to reduce any problems of bait aversion and to preserve non-target organisms.
- It is not always efficient. Baits usually have a specific temperature efficacy threshold of 18°C, below which the chances of recovering from the effects of the drug are considerably lessened. The drug is rather slow in action. With house sparrows, most are probably affected within 15 minutes after consuming the bait, but the delay for immobilisation of feral pigeons may be from 20 to 50 minutes. As a bird is able to retain its power of flight for some time after becoming affected, it is necessary to ensure that birds are completely stupefied before attempting to pick them up. Birds can sometimes move a considerable distance from the bait before being completely immobilised, particularly if disturbed. Adverse weather, particularly strong winds, can also increase dispersal. This can result in a large area where the affected birds have to be recovered.
- It is not very popular among the public. A wide scatter of birds can lead to embarrassment, adverse publicity, and danger to non-target species, e.g. cats eating pigeons.
- It is important to respect recommended concentrations of narcotic for each species of birds. Otherwise, birds can be affected too quickly. If they are stupefied on the bait, they may prevent other birds from feeding and reduce the catch. These concentrations have been derived to give optimum results and increasing them may decrease their efficacy, particularly because of a repellent effect. Any bait, used only to stupefy, can also kill if taken in sufficient quantity. The suffering of birds contradicts the animal welfare Directive (*EC, 1993*).

- *Egg-oil:*

The method has an advantage over nest or egg destruction in that the incubating birds generally continue incubation and do not renest. This method is extremely target specific and is less labour intensive than egg addling (egg shaking).

It is not applicable for all pest bird species (i.e. numerous and small eggs) and chemical use is not popular among public. It is time consuming and costly, it can be done only on land (not in trees). Oil used in a control program should be safe for people to use during application, and environmentally benign.

1.2.1.3 Primary and secondary poisoning

Non-target vertebrates are exposed to avicides primarily through consumption of treated food and secondarily from consumption of poisoned birds. Large treated grains have to be used to preserve small birds.

1.2.2. Methods not using avicides

The following methods are generally used (*University of Florida and the American Mosquito Control Association Public Health Pest Control, 2002*):

Habitat modification

Habitat modification for birds means limiting a bird's food, water, or shelter (*MEDD, 2002*). This is not practical for pigeons, starlings, and house sparrows as these birds will find a number of feeding and watering sites, often far from roosting and loafing areas. Where people are feeding birds in parks or lunch areas, education can help reduce this source of food, but in most cases people will pay little attention to requests to stop. Pigeons, but not sparrows or starlings, may be induced to move by the persistent destruction of nests and eggs. This can be accomplished by high pressure hosing from fire fighting equipment or other water lines. This is the most cost-effective method of nest destruction, effectively destroying the nest, eliminating ectoparasites, cleaning droppings and feathers from the nest site, and harassing the roosting birds. The substitution of eggs of a nest by eggs of another species is applicable for some species (e.g. substitution of gull egg by hen egg (*Leray V., 2000*).
In order to prevent collision with aeroplanes the management of the area is adapted in such way that bird species living in flocks, causing risk to strikes as such, avoid the airport.

Exclusion

Some building designs and conditions lend themselves to bird infestation. Flat ledges, openings in water towers and vents, unscreened windows, and other attributes make a building an attractive location for roosting, nesting, and loafing. Modification or repair can exclude birds. Typical solutions include replacing broken windows and screens, eliminating large crevices, and blocking openings into vents, cooling towers and roof-top equipment with hardware cloth. The following specific measures should be considered because the birds are not killed and the control is comparatively long-lasting.

- Netting: to block bird access to large roosting areas in structures, especially in warehouses and around mechanical equipment areas and cooling towers where aesthetics are of minor consideration.

♦ Covers or ramps: custom-designed for ledges, window air conditioning units, and roof edges to keep birds from infesting these sites. This is costly but valid where limited application will keep birds off selected sites, and where aesthetics are an important consideration.

♦ Spikes: porcupine wire, sharp metal spikes, or any similar "bed of nails" can stop birds from roosting on ledges. Where they can be used, they usually work fairly well. If aesthetics are important, these devices can be limited to areas where they cannot be easily seen. If pigeons are likely to drop nest material and other debris on the newly installed spikes in an attempt to create a new roosting surface, install metal spikes on potential landing sites above the installation.

♦ Sticky repellents**:** tacky gels and liquids are designed to be sticky enough to make a bird uncomfortable, but not so sticky that the birds are trapped. The surface must be appropriately prepared to provide suitable service. After a few attempts, the birds stop trying to land on treated surfaces.

♦ Accoustical means: producing calls of raptors (“Bird-Away”) are sold. Tapes with calls of raptors or with distress and alarm calls of the species to be chased are used, often with limited or temporary success. Ultrasonic sound devices are used but they also do not work always significantly against birds.

♦ Frightening agents:
- Scarecrows.
- Flags, pieces of textile or plastic blowing in the wind.
- Artificial birds (owls, raptors), sometimes kites in the shape of a large raptor.
- Flash light.
- A kind of mill with three faces, two of them fluorescent (orange) coloured, rotated by the wind.
- Electrical frightening: an electrical system is put on ledges. It shocks birds when they are on contact with the system.
- More and more trained raptors are used to scare off birds from landfill and, in particular, airports. The species vary to include eagles, hawks, buzzards, falcons, owls and many others. Peregrine falcons are used frequently but also American such as the red-tailed hawk. A rapidly growing development is the deployment of trained dogs, i.e. Border collies. In the UK they have been used already successfully at Heathrow and Gatwick. At Amsterdam airport the first trials chasing lapwings look promising (*http://www.nihot.nl/ronsroeck.html*). Any situation where there is cover for the quarry such as buildings, hedges, bushes, fences stands of trees and the like, will result in the quarry heading straight for cover, and the raptor usually missing its quarry.

♦ Egg shaking (or egg addling): carried out in some countries. This is usually done for larger species causing damage or nuisance. A permit is required if a species is on the list of protected species. Examples are mute swan and herring gull.

Trapping

Trapping can be an effective supplemental control measure, especially against pigeons. Where a group of birds is roosting or feeding in a confined and isolated area, trapping should be considered the primary control tactic, preferably in the winter when food availability is at a minimum. Traps are set in inconspicuous places where pigeons commonly roost or feed and where traps are not likely to be vandalised (a major risk in trapping programs). Baits of whole corn or sorghum are generally the best but wheat, millet, oat groats, popcorn, sunflower seeds, peas, greens, bread, or peanuts can be very effective. At the beginning of a program, scatter small quantities of bait and some decoys to start the birds feeding and determine the best trapping sites. Since pigeons can fly great distances and find their way home, trap and release is not normally effective. In most cases, trapped birds shall be humanely destroyed. Starlings are not usually good candidates for trapping programs, but effective sparrow traps are available. Trapping sites should be baited for a few days before trapping. Sparrow traps are usually more effective when placed on the ground. Nest box traps attract a sparrow from a potential nest site. Once inside, the bird trips the mechanism, dumping the bird into a collecting bag.

2 Exposure scenarios for the environment

2.1 General issues and background

Environmental exposure is based on the release of avicides from their preparation, application, use and disposal. Exposure scenarios are defined as a set of conditions about use pattern sources, pathways and disposal into soil, water, air and waste.
The direct environmental exposure may take place when avicides are applied outdoors on public or private urban and rural areas around buildings or constructions (farm buildings, food storages, roof tops etc...).
Indoors application may result in environmental exposure via the sewage system (e.g. during cleaning processes after a bird control operation), release of residues or carcasses to dumps.
The exposure of the environmental compartments, soil, water and air is highly dependent on the formulation type, physico-chemical properties of the substance involved and the mode of application, use and disposal.
Emission scenarios relevant for avicides are suggested based on the "realistic worst case" principles and on the identified application and use patterns.
A diffuse release from target animals such as urine, faeces including non-degraded active substance and its transformation and metabolic residues may be anticipated around the controlled area.

In the environmental exposure assessment, emissions/releases from the processes or uses are quantified in amount released per time unit or after a campaign.
The respective emission scenarios are described as a sequence of equations so that emission rates and concentrations in environmental compartments can be estimated. The calculation depends to some degree on default values and estimations. The default values are expert judgements based on experience, measurements or evaluations. If default values are presented in the TGD (*the revised TGD, EC 2003b*), they are used in this report. However, the default values can be superseded by measured values of relevant and reliable data if available.

In UK and France, alphachloralose is usually obtained in the form of a fine powder. Bird baits are then prepared by mixing the powder with food by professional applicators.
Egg-oil products are commercialised as ready-to-use liquids. Coating of eggs with liquid paraffin can be achieved by immersing each egg of a clutch separately in a container or by spraying the liquid on the eggs.
The suggested scenarios, therefore, are based on the bait preparation, application, use and disposal phase. Releases from production of the active substance and its formulation phases are not included.

2.1.1 Further information

Further information should be taken into account on a case by case evaluation. Below is mentioned information that may be included in site specific exposure assessment in order to refine the basic assessment.

2.1.2 Bird control specifications

2.1.2.1 Alphachloralose bait

Bird control management using alphachloralose baits needs to be carried out after a long period of survey. It is based on case-by-case evaluations. Indeed, the number of applications per year and the amount used per application will depend on the number and extent of the infestations. It is quite uncomfortable to set default values for these parameters. Applications should be performed so as to avoid public contact with contaminant, especially when avicide product has to be used in and around buildings.

To solve the problem induced by birds, the first action to carry out is to find which species is involved. Then, applicators have to select which form of the bait is the most appropriate for the considerate species.

In UK, alphachloralose is registered for house sparrows and feral pigeons controls in urban and rural areas, with indoor and outdoor uses, in public hygiene situations.
Alphachloralose is not registered for gull control. However, a few specifically licensed operations have been carried out against roof-nesting and other gulls. For this reason, gulls control operations using alphachloralose are described in an appendix (see Appendix 2).
Studies have shown that alphachloralose is effective as part of a control technique for feral pigeons and house sparrows in urban areas, preferable in places inaccessible to the general public. However, the house sparrows appear to disperse more rapidly after feeding and comatose sparrows are, therefore, harder to find.
Although alphachloralose is effective with feral pigeons and house sparrows in rural areas, the risks to wildlife are considerably higher and it is not recommended for use in agricultural districts.

2.1.2.1.1 Feral pigeon control

Feral pigeon (*Columba livia*) is listed in the Annex II/1 of the Council Directive of 2 April 1979 on the conservation of wild birds (*79/409/EEC*). The species referred to in Annex II/1 may be hunted in the whole EC geographical seas and land areas.
Bait base should be whole wheat, maize or peas. Prebaiting may be employed for 7-8 days depending on the situation.
There may be, however, situations when prebaiting is not necessary or even deleterious to the success of an operation. Extensive prebaiting may result in non-target organisms being attracted to the site.
A concentration of 1-1.5% alphachloralose by weight of bait should be used (1.5% by weight means about 60 g of active ingredient per 4 kg of bait). For the bait preparation, mineral oil is added so that the powder adheres to the surface of grain during mixing.
The grain has to be laid at the rate of about 250-600 $g.m^{-2}$ in strips about 1m wide. The length will depend on the used quantity that is about 50 g per bird (*ACVM, 2002*). Assuming typical pigeon flocks of about 100 individuals (*personal communication, STNA*), a realistic worst case scenario would take into account flocks of 150 individuals. It is assumed in a realistic scenario that one flock has to be controlled for one operation (one treated area is considered for one flock). For maximum clearance, more than one day's narcotic recommended baiting is often necessary, with

an interval of at least 2 days between the successive baitings. A realistic worst case scenario would be then 3 applications run in 5 days to conduct an operation.
For an operation lasting 5 days, assuming no bait removal between each phase of the campaign that should be performed according to label instructions, 22500 g of bait (corresponding to 337.5 g of alphachloralose) may be used and an area of 12.5-30 m^2 contaminated.
To reduce the risks of primary poisoning for non-target species, a specific size of grain can be selected (for example, grains of diameter > 7 mm are recommended to contaminate pigeons in order to avoid smaller birds than pigeons to eat treated grains).

2.1.2.1.2 House sparrow control

As it is stated in the remark of section 1.2.2.1, there is a widely held perception that the house sparrow is in serious decline in some parts of Europe. Therefore, the scenario specifically developed for house sparrow control based on the registration of the alphachloralose product should be put into perspective, as if the decline is confirmed through observation, the use of avicide for controlling house sparrow will be more and more limited.

Prebaiting is not usually carried out, although it can help to ascertain whether the house sparrows (*Passer domesticus)* will feed within a building or accept a particular bait. If there is no readily available source of food for the birds, untreated bread broken into small pieces is used. If the sparrows normally depend on spilled foodstuffs for their food supply, this spillage should be used as prebait.
Suitable bait bases include breadcrumbs, cake crumbs, fine cereals or any foodstuff normally taken by the birds.
A concentration of 2% alphachloralose by weight of bait should be used (2% by weight is about 60 g of active ingredient per 3 kg of bait). For the spillage-type bait preparation, mineral oil is added so that the powder adheres to the surface of grain during mixing. Mineral oil is not required for the baits using bread that must be coarsely crumbed before mixing. Best results are obtained by laying a small quantity of bait at a large number of points. The actual number will depend on the size of the area infested, but there should be at least 20 treated points (*ACVM, 2002*); 30 treated points should be considered for a realistic worst case scenario.
Communal roosts normally contain up to 100 birds but in towns and cities can be much larger e.g. 29,000 in South London (*OBRC, 2002*). Therefore, the quantity to be used for an operation is actually related to the size of area to be treated; about 50 g of bait per point is used for house sparrow control, assuming a point area of 0.1 – 0.2 m^2.
Baiting should continue for 1-2 days. According to label instructions, at the end of the first day, either the treated bait may be left in position or all the bait must be swept up and fresh bait laid on the second day.
Assuming no bait removal at the end of the first day and repeated laying of bait on the second day in a realistic worst case scenario, the amount of chloralose bait used for an operation of 2 days may be 3000 g (corresponding to 60 g of alphachloralose) and an area of 3-6 m^2 contaminated.
It should be noted that it is recommended to renew bread baits every few hours because they become less attractive as they dry. For this specific baiting, the amount of chloralose bait used for an operation should be adjusted to 9000 g (3000 x 3) for an operation lasting 2 days in a realistic worst case scenario, considering 3 renewals a day.

2.1.2.2 Egg-oil

In the UK liquid paraffin oil has been registered for specific species, namely Canada goose (*Branta canadensis*), greylag goose (*Anser anser*), and large gulls (herring gull (*Larus argentatus)*, lesser black-backed gull (*Larus fuscus*) and greater black-backed gull (*Larus marinus*)). Environmental release scenarios using egg-oil products have been only performed for these species. Nevertheless, as some damages could occur in non-agricultural area with other related species, information on the most common related species are presented in Appendix 4; these information should allow estimating the environmental releases when using egg-oil to control the species considered. Egg-oil product can be applied by immersing each egg of a clutch separately in a container or by spraying the liquid on the eggs. Both ways of application are covered in the estimation of the environmental releases.

2.1.2.2.1 Goose control

Canada goose (*Branta canadensis*) is listed in the Annex II/1 of the Council Directive of 2 April 1979 on the conservation of wild birds (*79/409/EEC*). The species referred to in Annex II/1 may be hunted in the whole EC geographical seas and land areas.

Eggs should be treated as early as possible during incubation. This is best achieved by treating eggs immediately after clutch completion, but this requires monitoring of the progress of laying in each clutch; this would be time consuming and is usually not practicable where Canada geese breed colonially. Canada geese begin to lay in the second half of March and most eggs are laid in the first half of April. Good control should therefore be achievable by searching for nests and treating all eggs on 3 occasions (1 application per egg) each year: end of March, mid-April and end of April. Nests in which completed clutches (usually 5-6 eggs) have been treated should be marked so that they are not treated twice. Where Canada geese breed singly, progress should be monitored and the eggs should be treated 3 days after the last egg has been laid (*DEFRA, 2001*).

Greylag goose (*Anser anser*) is also listed on the Annex II/1 of the Council Directive of 2 April 1979 on the conservation of wild birds (79/409/EEC).
Pairs of greylag geese may nest solitarily or in colonies. In England, the treating of eggs of solitarily and colonial of greylag geese should follow the procedures for Canada geese. However, the most appropriate times for the control of colonial greylag geese eggs are mid-April, end of April and mid-May (*DEFRA, 2001*).

Most goose nests are associated with lakes, marshes and slow-moving rivers. Typically, geese build nests on the islands and peninsulas in wetlands. Some can be found in trees (the maximum height for a tree nest is estimated to be about 30 meters). Only a few nests are found on man-made structures in urban area, such as platforms, bridges or buildings. Almost all nests are found to be located within 60 m of water. Nests are usually mounds of grasses, reeds, cattail, sticks, leaves, twigs, mosses, and sedges; most were lined with down and fine grasses (*Campbell W.J. et al., 1995*).

The number of individual geese involved in a damage that should require the use of egg-oil control is difficult to estimate. In the recent years, at Bakersea park, Canada geese numbers could reach 300 (about 150 bird pairs) during the summer months and this was believed to contribute to

water quality problems experienced in the lake (*http://www.wandsworth.gov.uk/londonlakes/lakesns/watfowl.htm*). Considering this case as relevant, it should be assumed that 900 (150 x 6) eggs have to be treated for an operation in a worst case scenario.
Typical Canada goose egg dimensions are 87 x 58 mm (*http://www.museevirtuel.ca/Exhibitions/Birds/Oiseaux/index.html*). In one Study (*Badzinski S. S. et al., 2002*), 46 fresh first-laid Canada goose eggs were collected. The mean egg size was estimated to be 150 cm^3.
According to USDA/APHIS recommendations (*USDA/APHIS, 2001*), goose eggs have to be treated with approximately 7 $ml.egg^{-1}$ of corn oil in spray.
The density of paraffin oil is 790 $kg.m^{-3}$ (dynamic viscosity: 1.9 $kg.m^{-1}.s^{-1}$), therefore for 1 application, the amount of paraffin oil used in a worst case scenario should be estimated to be 790 x 900 x 0.000007 = 5 kg.

2.1.2.2.2 Gull control

Large gulls, namely herring gull (*Larus argentatus)*, lesser black-backed gull (*Larus fuscus*) and greater black-backed gull (*Larus marinus*) are all listed in the Annex II/2 of the Council Directive of 2 April 1979 on the conservation of wild birds (*79/409/EEC*). These species may be hunted only in the Member States where it is allowed.
The large gulls are often colonial and sometimes breed in mixed colonies. They usually lay their eggs between mid-April and late June. Eggs should be treated as soon as possible after incubation begins, which means that a colony must be visited several times during the course of a breeding season in order to treat all eggs. Visits should not be more than 2 weeks apart and ideally, more frequent visits should be made to large colonies at the peak of laying. On each visit, each treated nest should be marked to ensure that eggs are treated only once. The progress of laying should be followed, and the eggs should be treated after the clutch, usually of 3 eggs, has been completed (*DEFRA, 2001*).

Herring gulls use to congregate on beaches along the shores of oceans and other large water bodies. Outside the breeding season, gulls may range inland and can be found beside lakes and rivers, in grassy meadows, or on garbage dumps, golf courses, islands, cliffs, and buildings. Their main habitat requirement is a dependable source of food nearby. In some places where food from human activities is abundant, they have begun to nest on roofs and window ledges of buildings. The nest is circular and lined with moss or grass, which is also used to build up the rim (*Drury, 2002*).

In the city of Les Sables-d'Olonne (France; 15,000 inhabitants), a gull control operation was performed in 2002. Egg-oil was applied only once a year in May. The number of gull nests to be treated has been estimated to be 1,500 (personal communication, *Profil Armor).* So for a 10,000-person city, the number of nests should be estimated to be 1,000, resulted in 3,000 gull eggs to be treated.
Typical herring gull egg dimensions are 70 x 48 mm (*http://www.museevirtuel.ca/Exhibitions/Birds/Oiseaux/index.html*). Spraying 2 ml of white mineral oil or corn oil was found adequate to completely coat a ring-billed gull egg, which average dimensions are 59 x 42 mm (*Pochop & al., 1998*).

The quantity of egg-oil needed at immersion will depend on the egg size. According to USDA/APHIS recommendations (*USDA/APHIS, 2001*), gull eggs have to be treated with approximately 2 ml.egg^{-1} of corn oil in spray. It is assumed that the egg will not be entirely covered when spraying. Therefore, default values of oil needed to cover an egg entirely depending on the species and their egg sizes are presented in table 2.2 (details of calculation are presented in Appendix 4).
The density of paraffin oil is 790 kg.m^{-3}, therefore for 1 application, the amount of paraffin oil used in a campaign treating 3,000 eggs should be estimated to be 790 x 3000 x 0.000002= 4.7 kg.

2.1.3 Campaign characteristics

Default values for bird control campaigns could be drawn from label instructions and personal communications. The following values are to be considered in a realistic worst case scenario:

- *Alphachloralose bait:*

Table 2.1: Pick-list with defaults for parameters used in realistic worst case scenarios.

Bird	**Feral pigeon**	**House sparrow**
Prebaiting	+	+/-
Treated bait	Wheat, maize, peas	Breadcrumbs, cake crumbs, fine cereals
Number of birds in a flock (N_{birds})	150	(More than 100)
Number of flocks (N_{flocks})	1	-
Number of feeding points (N_{sites})	-	30
Amount of product used per bird (Q_{bird})	0.05 kg	-
Amount of product used per feeding point (Q_{site})	-	0.05 kg
Number of applications (N_{app})	3	6
% a.i. in product	1.5	2
Way of application	Strips 1m wide	30 points (each 0.1 – 0.2 m^2)
Q bait (g.m^{-2})	250 - 600	250 -500
Operating conditions	Grains: 3 applications in 5 days (intervals of 2 days)	Bread: 6 applications in 2 days (3 renewals per day) Grains: 2 applications in 2 days
Length of a campaign (d)	5	2

- *Egg-oil:*

Table 2.2: Pick-list with defaults for parameters used in realistic worst case scenarios:

Bird	Goose	Gull
Nest location	Ground	Rooftop
Number of nests to be treated at one site (N_{nests})	150	1000
Number of eggs per nest (N_{eggs})	6	3
Number of applications per egg (N_{app})	1 (3 visits over one month to treat all the eggs, intervals of about 2 weeks)	1 (3 visits over one month to treat all the eggs, intervals of about 2 weeks)
Amount of product needed to cover one egg completely (V_{prod}) in ml	7	Lesser Black-backed Gull 2.6 Herring Gull 2.9 Great Black-backed Gull 3.4

2.1.4 Product recovery

2.1.4.1 Alphachloralose bait

According to label instructions, applicators have to sweep up all bait at the end of the day of application. Then, bait should be eliminated safely, e.g. by burning.
Data concerning the rate of bait removal after application during sparrow and pigeon control operations are lacking. Nevertheless, even though bait could be difficult to find out particularly when adverse weather, it should be assumed in a worst case scenario that at least 10% of the applied material may be removed by applicators at the end of each stage of an operation.

2.1.4.2 Egg-oil

Product recovery after egg-oil control should be considered as negligible and would not be taken into account in the environmental release scenarios.

After any goose egg control, it is essential that the nest be revisited and eggs be removed after a long enough period to preclude the possibility of the goose re-nesting, but soon enough so that no harm comes to the bird from an extended attempt to incubate. The ideal time for this is two weeks (14 days) after incubation has begun and addling has occurred. At this visit, any intact eggs remaining in the nest should be destroyed, taking care to ensure that marked eggs are located. Unmarked eggs that were not in the nest before and are lesser than 14 days can also be destroyed, but any egg for which an uncertain hatch date exists should be floated and returned if greater than 14 days or removed if lesser than 14 days.

In general, the best procedure is to collect eggs and dispose of them off site. Nonviable eggs, however, may have spoiled to a point where they either have already or are about to burst, and appropriate caution should be taken not to expose those collecting the eggs to spoiled material.
Probably the best procedure is to collect eggs from each nest in a trash bag, and remove from the site. In practice, eggs are often disposed of in an area where people will not be exposed to the spoilage; sunk in water; or left to recycle naturally.
It is important that eggs be removed and that incubation be terminated. How this is done will vary from site to site, and depending on what procedure works best at each location (*HSUS, 2001)*.

For gull egg coating, egg removal should not be taken into account. Nests are difficult to be reached by applicators as they are located on rooftops. In most of the cases, it is too much time consuming for the applicators to revisit the nest after having treated them (personal communication, *Profil Armor*).

2.1.5 Bait intake

Basically the estimated daily uptake of a compound (ETE) is given by the following equation (*EC, 2001b*):

$$ETE = (FIR / BW) * C * AV * PT * PD \ (mg.kg^{-1}\ bw/d) \qquad \textbf{(1)}$$

Variable/parameter	Symbol	Unit	Default	S/D/O/P
Input:				
Food intake rate of indicator species (fresh weight)	FIR	$g.d^{-1}$		S/P
Body weight	BW	g		S/P
Concentration of active compound in fresh diet	C	$mg.\ kg^{-1}$		S/P/D
Avoidance factor (1 = no avoidance, 0 = complete avoidance)	AV	-	1	S/D
Fraction of diet obtained in treated area (value between 0 and 1)	PT	-	1	S/D
Fraction of food type in diet (number between 0 and 1; one type or more types)	PD	-	1	S/D
Output:				
Estimated daily uptake of a compound	ETE	$mg.kg.^{-1}d^{-1}$		

The European Plant Protection Organisation suggests that daily food intake may be estimated by using a simple rule of thumb in which the dry weight daily food intake of animals weighing less than 100g is approximately 30% of their bodyweight, and 10% for heavier animals (*EPPO, 1993*).
Then, the food intake rate of house sparrow (average weight: 27 g) would be 7 – 9 $g.day^{-1}$.
The food intake rate of feral pigeon (average weight: 360 g) would be 30 – 50 $g.day^{-1}$.

The bait consumption by birds is difficult to define, as it will mainly depends on the attraction of birds for the bait and the proportion of non-contaminated food available. These parameters may be influenced by the preparation of the bait application. The probability of birds feeding the treated bait may be increased by the suppression of other food resources, the choice of the appropriate bait and the success of the pre-baiting phase.
A laboratory study (*Belant J.L., Seamans T.W., 1999*) was performed with feral pigeons that were orally dosed at 60, 120 or 180 mg active ingredient (a.i.) per kg b.w. in diet (alphachloralose impregnated kernels of corn). No mortality was observed at any of the doses. Mean times for first effects (33 minutes) and mean times for capture (94 minutes) were significantly less for pigeons receiving 180 $mg.kg^{-1}$ than for the others.

The proportion of bait consumption by birds, when compared to the dose applied may depend on the number of birds that would feed on treated bait.
Even though there is a high lack of data concerning the bait consumption during avicide control, default values could be set to 10 and 20%, respectively for the "open rural areas" and for the "in and around building" scenarios. The difference between default values is due to the higher amount of non-contaminated food available in rural area than in urban area.

2.1.6 Travel distance

Studies have shown that 90% of the adult house sparrows will stay within a radius of 2 km during the nesting period. Exceptions occur when the young set up new territories. Flocks of juveniles and non-breeding adults will move 6 to 8 km from nesting sites to seasonal feeding areas (*Fitzwater W. D., 1994*).
Normally the home range of a pigeon flock is about one square km; however, pigeons will travel 10 or more km from their roost sites in search of food. Despite gregarious traits, individuals have been known to live apart from any flock (*Connecticut Department of Environmental Protection, 1997*).

2.2 Exposure scenarios

In the present paper the scenarios are categorised in the following way:

1. Bait preparation

2. Open rural areas

3. In and around buildings

The environmental exposure scenarios are developed on basis of chloralose bait preparation, use, application and disposal that are expected to result in the largest emissions to the environment.
It should be noted that according to the TGD, the local predicted environmental concentration (PEClocal) is the estimated local concentration added to the estimated regional concentration

(Clocal + PECregional). However, for avicides the consumption is estimated to be so low that the regional contribution is negligible. In the present document, Clocal are the initial concentrations based on the emissions and have to be corrected for fate like e.g. degradation to calculate the PEC values used for the risk assessment along the principles of the TGD (*EC, 2003b*). As the degradation rates are unknown, PECs are not calculated in this document.

2.3 Exposure scenario for bait preparation

2.3.1 Introduction

The only registered products for bird control in non-agricultural use are placed on the market as powder. This scenario is not relevant when considering ready-to-use avicide products, like egg-oil products.
Bird baits are prepared by mixing the powder with food by professional applicators and environmental contamination can occur during this phase.
House sparrow and feral pigeon bait preparations are about the same. Alphachloralose powder is mixed with oil and selected food in a recipient. The only changes concern the quantity used of each ingredient.

2.3.2 Release estimation

Environmental release may occur during mixing and cleaning the recipient after the bait preparation, assuming a total environmental release of 5% (*DEPA, 2001*) in a worst case scenario. It should be assumed that the number of emission days is 1 day, considering only 1 phase of preparation keeping the treated bait in a safe manner for further applications. The environmental compartment that may be contaminated at this stage is wastewater.

2.3.3 Model and example of calculation

The release to (sewage) water, $Elocal_{water}$ ($kg.d^{-1}$) may be estimated by the equation 2a for pigeons and 2b for sparrows.

$$Elocal_{water} = \frac{N_{app} \times N_{birds} \times N_{flocks} \times Q_{bird} \times Fc_{product}}{Temission_{prep}} \times F_{released} \quad \textbf{(2a)}$$

$$Elocal_{water} = \frac{N_{app} \times N_{sites} \times Q_{site} \times Fc_{product}}{Temission_{prep}} \times F_{released} \quad \textbf{(2b)}$$

Variable/parameter (unit)	Symbol	Unit	Default	S/D/O/P
Input:				
A) Feral pigeons				
Number of birds in a flock	N_{birds}	-	Table 2.1	D/P
Number of flocks	N_{flocks}	-	Table 2.1	D/P
Amount of product used per bird	Q_{bird}	kg	Table 2.1	D/P
B) House sparrows				
Number of feeding points	N_{sites}	-	Table 2.1	D/P
Amount of product used per point	Q_{site}	kg	Table 2.1	D/P
Fraction of active substance in product	$Fc_{product}$	-		S
Number of applications	N_{app}	-	Table 2.1	D/P
Number of emission days for bait preparation of a campaign	$Temission_{prep}$	d	1	D
Fraction of product released	$F_{released}$		0.05	D
Output:				
Local emission of active substance to wastewater during episode	$Elocal_{water}$	$kg.d^{-1}$		

Remark: In case biocides are intended to be used for controlling other species of birds than feral pigeon and house sparrow, the defaults may be changed and the choice can be made for either the "pigeon" (number of birds, of flocks and amount per bird: equation 2a) or "sparrow" calculation (number of feeding points and amount per point: equation 2b).

Example for the preparation of a feral pigeon campaign (assuming a concentration of 1.5% active ingredient, i.e. $Fc_{product} = 0.015$):
$Elocal_{water} = 3 \times 150 \times 1 \times 0.05 \times 0.015 \times 0.05 / 1 = 0.0169\ kg.d^{-1}$

The concentration in the sewage water can be estimated by dividing the $Elocal_{water}$ by 2,000,000 $l.day^{-1}$, which is the daily amount of sewage water to a local STP ($kg.l^{-1}$) in a city with 10 000 inhabitants. (*EC, 2003b*).

2.3.4 Protection of non-target animals

2.3.4.1 Primary poisoning

Not relevant.

2.3.4.2 Secondary poisoning

Not relevant.

2.4 Exposure scenario in open rural areas

2.4.1 Bait application

2.4.1.1 Introduction

Bait applications can be carried out in rural area mainly to protect food storage in farm buildings. Baits can also be applied outdoor at airport fields in order to prevent bird collisions with aircraft (see Appendix 3 for more detailed information). This scenario covers both applications to protect foodstuffs in rural area and applications at airport fields.

Sparrows and, to a lesser extent, pigeons can be responsible for spoiling and fouling foodstuffs with associated breakdowns of hygiene as well as loss of product. Their presence inside units where human food is handled in bulk and where livestock is housed may pose a serious potential health hazard. Bird faeces are a common contaminant of grain destined for human consumption.
In rural areas, both UK registered products have to be used within 9 meters of food warehouses to fight against house sparrows and pigeons.

2.4.1.2 Release estimation

Treated food is directly applied on soil. The maximum release to the soil compartment should be 100% during the use phase if the substance is not at all consumed by birds and if the material is not recuperated and incinerated by the applicators at the end of the exposure. It can be assumed that at least 10% of the applied toxic material is removed by birds. Taking into account the recycling, elimination or incineration of a part of the applied material (10% should be set as a default value) that is performed by the applicators at the end of each stage of the experiment in most of the cases, the value of the fraction released should be adjusted to 0.8.

Parameters (e.g. treated soil surface, number of applications) to be taken into account for the environmental exposure scenario will depend on the species that will be combated:

Table 2.3: Pick-list with default values for parameters to be taken into account for worst case scenarios:

Bird	Surface ($AREA_{Site-D}$) (m^2)	Number of applications (N_{app})
Pigeons	12.5	3 (treated grain)
Sparrows	0.1	2 (treated grain)
		6 (treated bread)

2.4.1.3 Model and example of calculation

- The equations for the local direct release in the land or airport scenario at a control campaign are given by 3a for pigeons and 3b for sparrows.

$$Elocal_{soil\text{-}campaign} = Q_{bird} \times N_{birds} \times N_{flocks} \times Fc_{prod} \times N_{app} \times F_{release,soil} \quad \textbf{(3a)}$$

$$Elocal_{soil\text{-}campaign} = Q_{site} \times N_{sites} \times Fc_{prod} \times N_{app} \times F_{release,soil} \quad \textbf{(3b)}$$

Variable/parameter (unit)	Symbol	Unit	Default	S/D/O/P
Input:				
A) Feral pigeons				
Number of birds in a flock	N_{birds}	-	Table 2.1	D/P
Number of flocks	N_{flocks}	-	Table 2.1	D/P
Amount of product per bird	Q_{bird}	kg	Table 2.1	D/P
B) House sparrows				
Number of feeding points	N_{sites}	-	Table 2.1	D/P
Amount of product used per point	Q_{site}	kg	Table 2.1	D/P
Fraction of active substance in product	Fc_{prod}	-		S
Number of applications	N_{app}		Table 2.3	D/P
Fraction of product released directly to soil	$F_{release\text{-}D,\ soil}$		0.8	D
Output:				
Local direct emission rate of active substance to soil from a campaign	$Elocal_{soil\text{-}campaign}$	kg		

- The concentration in the soil contaminated after direct release can be estimated by the following equations.

Feral pigeon (considering one treated area per one flock)

$$Clocal_{soil\text{-}D} = \frac{Elocal_{soil\text{-}campaign} \times 10^6}{AREA_{Site\text{-}D} \times N_{flocks} \times DEPTH_{soil} \times RHO_{soil}} \quad \textbf{(4a)}$$

House sparrow

$$Clocal_{soil\text{-}D} = \frac{Elocal_{soil\text{-}campaign} \times 10^6}{AREA_{Site\text{-}D} \times N_{sites} \times DEPTH_{soil} \times RHO_{soil}} \quad \textbf{(4b)}$$

Variable/parameter (unit)	Symbol	Unit	Default	S/D/O/P
Input:				
Local emission to soil from a campaign	$Elocal_{soil\text{-}campaign}$	kg		O
Site area directly exposed to avicide	$AREA_{Site\text{-}D}$	m^2	Table 2.3	D/P
A) Feral pigeons			Table 2.1	D/P
Number of flocks	N_{flocks}	-		
B) House sparrows			Table 2.1	D/P
Number of feeding points	N_{sites}	-		
Depth of exposed soil	$DEPTH_{soil}$	m	0.1	D [1)]
Density of wet exposed soil	RHO_{soil}	$kg.m^{-3}$	1700	D
Output:				
Local concentration in soil due to direct release after a campaign	$Clocal_{soil\text{-}D}$	$mg.kg^{-1}$		

1) The leaching distance was estimated to be 10 cm (*OECD, 2002a*).

To estimate the soil contamination accurately, the contribution from disperse release of avicide via urine and faeces should be added (indirect release). It is assumed that 90% of the ingested avicide (10% of the applied material) is released via urine and faeces as undegraded substance.

The aim of alphachloralose use is to catch treated birds to relocate them or to humanely euthanise them. If the operation is well conducted, only very few treated birds will move from the treated area. Nevertheless, as the effects induced by alphachloralose intake are not immediate, some birds can move away from the treated area after having absorbed the toxic material. The average period between first feeding and first symptoms of narcosis is 28 minutes (the range is 10-120 minutes). The period of narcosis usually lasts some 10-20 hours (range 2-72 hours) (*ACVM, 2002*). As mentioned above (see section 2.1.5 Travel distances), the home and travel ranges of the species considered are very large.

Therefore, considering the little number of treated birds that will remain in the nature and the high size of the soil area that could be contaminated by faeces and urine, the contamination of soil by indirect release of stupefying bait should be neglected. So, it may be assumed that:

$$Clocal_{soil} = Clocal_{soil\text{-}D}$$

Remark: Emissions to soil may subsequently reach the ground water. Specific scenario should then be considered (*EC, 2003b*).

Examples:

- Assuming 2% a.i. in treated bread for house sparrow control, the released amount of an avicide to the soil for six applications:
$Elocal_{soil}$ = 0.05 x 0.02 x 30 x 6 x 0.8 = 0.144 kg a.i.
After one campaign (6 applications): $C_{soil\text{-}campaign}$ = 0.144 x 10^6 / (0.1 x 30 x 0.1 x 1700) = 282 $mg_{a.i.}.kg^{-1}$ soil.

- Assuming 1.5% a.i. in treated grains for pigeon control, the released amount of an avicide to the soil for three applications is:
$Elocal_{soil}$ = 0.05 x 150 x 1 x 0.015 x 3 x 0.8 = 0.27 kg a.i.
After one campaign (3 applications): $C_{soil\text{-}campaign}$ = 0.27 x 10^6 / (12.5 x 1 x 0.1 x 1700) = 127 $mg_{a.i}.kg^{-1}$ soil.

2.4.1.4 Protection of non-target animals

2.4.1.4.1 Primary poisoning

Control with contaminated food on open area may be performed after a pre-baiting with untreated material. The pre-baiting aims to select the appropriate zone where the non-target species (e.g. other bird species, campagnols, rabbits) will not be susceptible to eat. Even if the experience is well prepared, the primary poisoning of non-target species can not be totally excluded as contaminated food is directly applied on soil and the area not protected. The degree of risk for non-target species to eat contaminated food will depend on the efficiency of the pre-baiting phase.

2.4.1.4.2 Secondary poisoning

The secondary poisoning of non-target organisms will depend on the metabolism of the substance used for the target birds. The slower the effect occurs the greater distance the bird can fly. If birds are able to migrate after control, they will be difficult to find and to be eliminated. Then scavengers (e.g. birds of prey, foxes) could be contaminated by feeding on dead or dying animals. It should be reminded that the house sparrows appear to disperse more rapidly after feeding and comatose sparrows are, therefore, harder to find.

2.4.2 Egg-oil coating

2.4.2.1 Introduction

This scenario covers only egg-oil treatment performed to control goose, as the presence of gulls in non-urban area doesn't induce sufficient damage or nuisance to involve avicide use.

Geese can cause damage by fouling of grassland in amenity areas, denuding areas around lakes and ponds of grass and wetland plant species by overgrazing and trampling. As they are large, dominant and often aggressive birds, it is thought their presence at a site might put pressure on existing wildfowl populations. When numerous, they can cause considerable erosion problems around pond/lake edges (*ADAS, 2001*).

2.4.2.2 Release estimation

In most of the cases, goose nests are found on the ground. Only ground nests are treated by egg-oil. Egg-oil product can be applied by immersing each egg of a clutch separately in a container or by spraying the liquid on the eggs.

Releases of product can occur during the service life of the product and during product application by spraying. Releases into the environment by immersing eggs with protective gloves are not taken into account in this document, as they give rise to very short exposure on a local scale. It should be assumed that the soil area or nest area that could be contaminated by product loss should be estimated to be the 10 cm depth of soil located under the nest and the soil area around the nest (estimated to be 10 cm around).

The fraction of product that can be lost during application by spraying, resulting in droplets that fail to reach the target, e.g. egg, is assumed to be comprised in the nest area, as described above, as applicators are such close to eggs that droplets can not migrate too far from the nest. The application of the product by spraying also involves releases into the air because of spray drift. Releases into the air are not taken into account in this document, as they give rise to very short exposure on a local scale.
According to USDA/APHIS recommendations (*USDA/APHIS, 2001*), the most effective application equipment is a pressurised back-pack or hand-held sprayer that holds from 4 to 8 litres of egg-oil. Sprayers should be pressurised to between 1.034 bar and 2.76 bar and should be calibrated to deliver between 3 to 6 $ml.sec^{-1}$. The spray wand should contain a tip that produces a fan or circular pattern.

The Table 2.4 shows a typical distribution of droplet sizes for flat –fan nozzle when spraying water at 2 different pressures (*North Dakota State University, 1997*).

Table 2.4: Droplet size range for flat-fan nozzle at 1.38 bars et 2.76 bars (*North Dakota State University, 1997*)

Size range (microns)	**Percent of total volume**	
	1.38 bar	**2.76 bar**
0-21	0.1	0.4
21-63	3	10.4
63-105	10.7	20.1
105-147	16.2	25.4
147-210	36.7	35.3
210-294	27.5	7.7
over 294	5.8	0.7

The higher the delivery rate is, the larger the droplets are. Droplets less than 50 microns have insufficient momentum for impaction as they remain suspended in the air indefinitely or until they evaporate (*Landers, in press*). Using these data and considering the used pressure is usually below or up to 3 bars, as a worst case, in a very first approach, a figure of 10% is proposed as a default value (Fdrift = 0.1) for the present scenario.

After application, emissions to soil from the treated structure may occur due to frequent wetting by rainfall and subsequent leaching from the treated substrate.
The estimation of emissions from treated products during their service life should be based on standardised leaching tests. These tests should allow determining the quantity of an active ingredient, leached out of the product due to rainfall, per surface and time. The leaching tests should be performed with similar philosophy as for wood preservatives (*OECD, 2002a*). The calculations proposed here do not take into account removal processes of the substance from the soil compartment due for example to degradation, volatilisation, leaching to ground water.

Remark: It should be assumed that the receiving compartment is the soil, even if the first compartment to be reached by product loss by leaching should be the nest bottom. The substance would first reach the latter compartment and subsequently the soil.

Typical nests of Canada geese are large and circular, approximately 45 cm diameter (*French & Parkhurst J., 2001*), resulting in a nest surface of 0.16 m^2. When adding the around nest area (10 cm around), the total volume of the area that could be contaminated is: $(0.45 + 0.2)^2$ x 3.14 x 0.1 / 4 = 0.033 m^3.

2.4.2.3 Model and example of calculation

1. Release estimation during application:

- The equation for the local direct release of product to the soil due to losses at application is presented below.

$$Elocal_{soil,app} = N_{nests} \times N_{eggs} \times V_{prod,egg} \times 10^{-6} \times RHO_{prod} \times Fc_{prod} \times N_{app} \times F_{lost} \quad \textbf{(5)}$$

Variable/parameter (unit)	Symbol	Unit	Default	S/D/O/P
Input:				
Number of nests to be treated at one site	N_{nests}	-	Table 2.2	D/P
Number of eggs per nest	N_{eggs}	-	Table 2.2	D/P
Amount of product needed to cover one egg completely	$V_{prod,egg}$	ml	Table 2.2	D/P
Density of product	RHO_{prod}	$kg.m^{-3}$		S
Fraction of active substance in product	Fc_{prod}			S
Number of applications	N_{app}	-	1	D
Fraction of product lost during application:	F_{lost}	-		
- spraying			0.1	D
- immersion			0	D
Output:				
Local emission rate of active substance to soil at application from a campaign	$Elocal_{soil,app}$	kg		

- The concentration in the contaminated soil due to releases at application can be estimated by the following equation.

$$Clocal_{soil,app} = \frac{Elocal_{soil,app} \times 10^6}{AREA_{Soil} \times N_{app} \times DEPTH_{soil} \times RHO_{soil}} \qquad \textbf{(6)}$$

Variable/parameter (unit)	Symbol	Unit	Default	S/D/O/P
Input:				
Local emission to soil from a campaign	$Elocal_{soil\text{-}campaign}$	kg		O
Exposed area under a treated nest (nest + surrounding surface)	$AREA_{soil}$	m^2	Table 2.2	D/P
Number of applications	N_{app}		1	D
Depth of exposed soil	$DEPTH_{soil}$	m	0.1	D
Density of wet exposed soil	RHO_{soil}	$kg.m^{-3}$	1700	D
Output:				
Local concentration in soil due to release at application for a campaign	$Clocal_{soil,app}$	$mg.kg^{-1}$		

Example:

- Assuming 100% a.i. (pure product) in egg-oil for goose control, the released amount of an avicide to the soil during an operation, which consists in 1 application in 1 month (c.f.equation 5) is:
$Elocal_{soil,app}$ = (volume applied per egg x liquid density x number of eggs per nest x number of nests) x fraction of active ingredient in the product x number of applications x fraction released
$Elocal_{soil,app}$ = (150 x 6 x 0.000007 x 790 x 1 x 1 x 0.1 = 0.5 kg a.i. per operation.
The volume of the exposed soil, assuming a surface of individual receiving compartment of 0.033 m^2, is: 0.033 x 150 x 0.1 = 5 m^3.
At density of wet soil of 1700 $kg.m^{-3}$ the weight of the contaminated soil is 5 x 1700 = 8500 kg.
$C_{soil,loss}$ = $0.5.10^6$ / 8500 = 59 $mg_{a.i.}.kg^{-1}$ soil after spraying for 1 treatment.

2. Releases during product lifetime:

No data are available concerning specific leaching test of an egg-oil. It is assumed in a worst case scenario that 10% of the oil present on an egg leaches to the soil during one rain event. This figure seems to be reasonable, as the oil is very low water soluble and deeply bound to the egg. In the course of a time window of 30 days since the application day, 11 rain events may occur (*EC, 2003b*).

- The equations for intermediate calculations, and the local indirect release of product to the soil during service life after either spray application or egg immersion are presented below.

Remark: The substance amount that has been lost during the application has to be taken account when estimating the quantity leachable.

$$Q_{ai,leachable} = V_{prod,egg} \times 10^{-6} \times RHO_{prod} \times Fc_{prod} \times N_{egss} \times N_{app} \text{ x } (1-F_{lost}) \quad \textbf{(7)}$$

$$Elocal_{soil,leached} = Q_{ai,leachable} \times \sum_{i=1}^{N_{rain}} F_{leached,soil} \times (1-F_{leached,soil})^{N_{rain}-1} \quad \textbf{(8)}$$

$$Clocal_{soil,total} = \frac{Elocal_{soil,leached} \times 10^{6}}{AREA_{soil} \times N_{app} \times DEPTH_{soil} \times RHO_{soil}} + Clocal_{soil,app} \quad \textbf{(9)}$$

Variable/parameter (unit)	Symbol	Unit	Default	S/D/O/P
Input:				
Quantity of oil needed to cover one egg completely	$V_{prod,egg}$	ml	Table 2.2	D/P
Density of product (egg oil)	RHO_{prod}	$kg.m^{-3}$		S
Fraction of the a.i. in the product	Fc_{prod}	-		S
Number of eggs per nest	N_{eggs}	-	6	D
Number of applications	N_{app}	-	1	D
Fraction of product released by leaching	$F_{leached,soil}$	-	0.1	D
Exposed area under a treated nest (nest + surrounding surface)	$AREA_{soil}$	m^2	Table 2.3	D/P
Depth of contaminated soil	$DEPTH_{soil}$	m	0.1	D
Density of wet exposed soil	RHO_{soil}	$kg.m^{-3}$	1700	D
Fraction of product lost during application:	F_{lost}	-		
- spraying			0.1	D
- immersion			0	D
Local concentration in soil due to release at application	$Clocal_{soil,app}$	$mg.kg^{-1}$		O
Intermediate calculation:				
Quantity of active ingredient on the egg at the day of application	$Q_{ai,leachable}$	kg		
Output:				
Total release of a.i. to soil due to leaching for a 30-d period	$Elocal_{soil,leached}$	kg		
Local concentration in soil at the end of the period	$Clocal_{soil,total}$	$mg.kg^{-1}$		

Examples:

Releases during product lifetime
- Egg immersion:
The quantity of leachable active ingredient (paraffin oil with RHO_{prod} = 790 $kg.m^{-3}$ and Fc_{prod} = 1) at egg-oiling of goose eggs for one nest is:
$Q_{ai,leachable} = 7 \times 10^{-6} \times 790 \times 1 \times 6 \times 1 \times 1 = 0.033$ kg
The emission to soil after 11 rain events is:

$$Elocal_{soil,leached} = 0.033 \times \sum_{i=1}^{11} 0.1 \times (1-0.1)^{i-1} = 0.023 \text{ kg}$$

The local concentration in soil at the end of the period is:
$Clocal_{soil,leached} = 0.023 \times 10^{6} / (0.33 \times 1 \times 0.1 \times 1700) = 406$ $mg.kg^{-1}$.
$Clocal_{soil,loss} = 0$ as $F_{lost} = 0$. Therefore, $Clocal_{soil,total} = 406 + 0 = 406$ $mg.kg^{-1}$.

- Egg spraying:

The $C_{soil,loss}$ must be added to the $Clocal_{soil,leached}$, which will be lower than for the egg immersion as the amount of leachable substance is lower.

2.4.2.4 Protection of non-target animals

2.4.2.4.1 Primary poisoning

The losses to the soil surface during spraying or immersing are very small and animal food would be poorly contaminated by egg-oil. Few animals are eating bird eggs (*Jackson & Green, 2000*). Egg-oils containing pure paraffin are of very low toxicity and only impurities may affect egg-eating animals. Therefore, primary poisoning is not relevant for this type of bird control.
The aim of applying egg-oils is to control the egg development, but not to be toxic for the parents. A particular attention should be focussed on the product toxicity when parents sit on their eggs. The toxicity of the product during brooding should be assessed by performing the skin sensitisation test, which is required in the notification dossier of a biocide substance.
The quantity of product linked to the bird parent feathers, and that might be removed elsewhere is considered too low to reach concern.

2.4.2.4.2 Secondary poisoning

Not relevant.

2.5 Exposure scenario in and around buildings

2.5.1 Bait application

2.5.1.1 Introduction

This scenario covers bait applications in and around buildings in urban areas, mainly to avoid building erosion induced by bird faeces droppings but also to protect food storage. This scenario also covers bait applications performed inside buildings in rural areas, as environmental releases are similar as indoor applications in urban areas.

Much of the damage caused by the feral pigeons arises from their infestation in buildings. Fouling of buildings and monuments frequently occurs at places where pigeons nest or roost. This is not only unsightly but may also have a destructive effect as the acidic droppings can erode the surface of stonework. Gutters and drainpipes may become blocked, leading to flooding and associated problems. Pavements, ladders and fire escape may be made unsafe because of the potential for slipping on droppings.
Feral pigeons must also be regarded as potential transmitters of disease, although there is a lack of hard evidence regarding the transmission of disease to humans. It is known that a high portion of feral pigeons is infected with ornithosis (a mild form of psittacosis). Some have been shown to carry salmonellosis and, although the incidence is low, the public hazard cannot be ignored.

The growing urbanization of wintering sparrow flocks seeking warmth and shelter for roosting may have serious consequences. Large roosts that occur in buildings or industrial structures are a problem in urban sites because of health concerns, filth, noise, and odour. In addition, slippery accumulations of droppings pose safety hazards at industrial structures, and the acidity of droppings is corrosive.

European starlings are often cited as bird pests involved in building degradation (*ADAS, 2001*). Nevertheless, as no avicide product is currently registered in EC Member States for these bird species, no specific scenario related to this species is considered in this paper.

2.5.1.2 Release estimation

The only source of contamination induced by indoor applications may be due to residues from use of impregnated grain and bread that may reach the environment from disposal by sewerage system or cleaning. Estimation may be performed according to section 2.3.3 of the present report. However, the pathway may be generally considered as negligible (*EUBEES, 2002*).

In most of the cases, outdoor applications in urban area consist in placing baits on rooftops and ledges. Soil applications are very rare as it could result in poisoning non-target species (e.g. dogs, cats and even humans).

Therefore, the only environmental compartment that may be contaminated is the wastewater through product runoff by rain water flow. In a realistic worst case scenario, it should be assumed that all the product applied will enter the wastewater compartment, except the product part that will be absorbed by birds and the part that will be removed by applicators. These parts are assumed to represent 30 % of the product (e.g. 20 + 10%) and so 70% should be set as the default value for the fraction of product released to wastewater in pigeon and sparrow control operations.

2.5.1.3 Model and example of calculation

The release to (sewage) water is estimated by equation (9). The quantity of active ingredient may be calculated in two ways, i.e., for pigeons (quantity per bird) and for sparrows (quantity per feeding point). The equations are presented below.

Pigeons:

$$Q_{ai,campaign} = Q_{bird} \times N_{birds} \times N_{flocks} \times Fc_{prod} \quad \textbf{(10a)}$$

Sparrows:

$$Q_{ai,campaign} = Q_{site} \times N_{sites} \times Fc_{prod} \quad \textbf{(10b)}$$

$$Elocal_{water} = \frac{Q_{ai,campaign} \times N_{app} \times F_{released}}{Temission_{campaign}} \quad \textbf{(11)}$$

Variable/parameter (unit)	Symbol	Unit	Default	S/D/O/P
Input:				
A) Feral pigeons				
Amount of product used in one phase of the campaign at one site	Q_{bird}	kg	Table 2.1	D/P
Number of birds in a flock	N_{birds}	-	Table 2.1	D/P
Number of flocks	N_{flocks}	-	Table 2.1	D/P
B) House sparrows				
Amount of product used in one application at one site	Q_{site}	kg	Table 2.1	D/P
Number of application sites	N_{sites}	-	Table 2.1	D/P
Fraction of active substance in product	$Fc_{product}$			S
Number of applications during campaign	N_{app}	-	Table 2.1	D/P
Number of emission days for a campaign	$Temission_{campaign}$	d	Table 2.1	D/P
Fraction of product released	$F_{released}$		0.7	D

Variable/parameter (unit)	Symbol	Unit	Default	S/D/O/P
Intermediate calculation:				
Quantity of active ingredient per campaign	$Q_{ai,campaign}$	kg		
Output:				
Local emission of active substance to wastewater during episode	$Elocal_{water}$	$g.d^{-1}$		

It is assumed that a higher proportion of the bait will be removed by bird consumption in urban area than in rural area, respectively 20 and 10%, resulting in a higher proportion of treated birds. Nevertheless, indirect environmental contamination by faeces and urine should not be considered as relevant as most of the treated birds will be picked up by applicators and euthanised. It should be reminded that a wide scatter of birds could lead to embarrassment, adverse publicity.

Examples:

- The released amount of an avicide to the wastewater is calculated, assuming 2% a.i. in the avicidal product used in treated bread for house sparrows control, and an operation lasting 2 days. The quantity of active ingredient used in a campaign is:

$Q_{ai,campaign}$ = 0.05 x 0.02 x 30 = 0.03 kg a.i.

The emission to water is then:

$Elocal_{water}$ = 0.03 x 6 x 0.7 / 2 = 0.063 $kg_{a.i.}.d^{-1}$.

- The released amount of an avicide to the wastewater is calculated, assuming 1.5% a.i. in the product used in treated grain for pigeons control, and an operation lasting 5 days. The quantity of active ingredient used in a campaign is:

$Q_{ai,campaign}$ = 0.05 x 150 x 0.015 = 0.113 kg a.i.

$Elocal_{water}$ = 0.113 x 3 x 0.7 / 5 = 0.047 $kg_{a.i.}.d^{-1}$.

Remark: To this part of product released to the wastewater from the use of avicide in and around buildings should be added the part of product that is released to the same environmental compartment during bait preparation. This latter part has been set to be 5% in a realistic worst case scenario (cf. section 2.3.2).

PEC refining:

In the scenario developed above, it is assumed that all the material applied for the operation would reach the wastewater compartment during the application period, regularly (the same amount of material released each day). A more relevant and realistic scenario should take into account the leaching rate of the substance according to the rainfall rate and the bond of the substance to the substrate. A means of taking into account these parameters should be to perform leaching tests.

2.5.1.4 Protection of non-target animals

2.5.1.4.1 Primary poisoning

Usually, risks of primary poisoning will be lower for in and around buildings applications than for open area applications, considering the baits should be placed at out of reach locations, which cannot be the case in open areas. Nevertheless, risks cannot be totally suppressed as some animals (e.g. cats, other non-target bird species) could have access to the treated area. The degree of risk for non-target species to eat contaminated food will depend on the efficiency of the pre-baiting phase.

2.5.1.4.2 Secondary poisoning

Even if the travel distances of treated birds can be large, it should be assumed that they would stay in the urban environment and would be easier to find than in an open area. Non caught birds, after death, may be eaten by urban scavengers (e.g. cats, and to a lesser extent dogs).

2.5.2 Egg-oil coating

2.5.2.1 Introduction

This scenario is related to environmental releases induced by gull egg treatment in urban area (e.g. buildings). In France, this method is specifically used to avoid the growing up of the seagull populations in the cities of the Atlantic coast (e.g. Brest, Les Sables d'Olonne; personal communication, *Profil Armor*). The typically used product is paraffin oil, in which formalin is added at 1-2%. The latter is being used to increase the lifetime of the product.

The main problems with gulls, particularly in towns, are associated with the roof nesting herring and lesser black-backed gulls. There are also occasional instances of greater black-backed gulls, common gulls, kittiwakes and fulmurs nesting on roofs (the latter three species are not on the UK government's general license, and are therefore protected in this country). The fabric of building can be damaged by the gulls pecking at the roofs. Sometimes gutters and drains are blocked by nest debris and droppings.

Gulls droppings can also be a problem when they land on people and cars, and in gardens. In addition to their nuisance value, the acidic nature of the droppings can cause damage through their chemical action.

As gulls are establishing and maintaining a breeding territory they can be very noisy, often early in the morning. Although the noise isn't confined to the breeding season, it is often during this period of intense activity that most complaints will be received. Gulls, especially if they have dependant young, can also attack or threaten people. If gull's chicks fall off the nest site, the adults can become aggressive towards people in areas where they have previously been passive.

Gull's habit of feeding at refuse tips and roosting on and subsequent pollution of reservoirs also causes concerns. They have been implicated in the transmission of botulism and Salmonella spp (*ADAS, 2001*).

2.5.2.2 Release estimation

In urban areas, gull's nests are found on rooftop of buildings. Egg-oil product can be applied by immersing each egg of a clutch separately in a container or by spraying the liquid on the eggs.

Releases of product can occur during the service life of the product and during product application by spraying. The receiving compartment is wastewater through product runoff by rain water flow. Releases into the environment by immersing eggs with protective gloves are not taken into account in this document, as they give rise to very short exposure on a local scale.
The fraction of product that can be lost during application by spraying, resulting in droplets that fail to reach the target, e.g. egg, is assumed to be 10% (see section 2.4.2.2).
The fraction of active substance in product (Fc_{prod}) depends on whether or not a stabiliser (for example, formalin) is added, and its percent contained in egg-oil product.

It should be assumed that all the product applied and not lost by drifting will enter the wastewater compartment during its lifetime.
The wastewater is not a compartment where substance can bioaccumalate. Therefore, it should be assumed that the maximum release of product would occur at the first rain event. In a realistic worst case scenario, it is assumed that all the nests are treated in 2 days (1 day to treated all nests seems to be not realistic) and that the first rain event occurs after the second day, when all the material has been applied. The default value of the oil applied on egg leached to the wastewater during one rain event has been set to 10% (cf. section 2.4.2.3). If data concerning result of leaching tests are present in the notification dossier, they have to be used instead of the default value.
This means that the total emission at the first rain event equals (1/Temission) x loss at application of total quantity applied + the release of the leached active ingredient from the total quantity egg-oil applied.

Table 2.5: Number of emission days of release to wastewater depending on the way of application and the life cycle stage of the substance:

	$Temission_{app}$	$Temission_{leach}$
Spray	2	1
Immersion	2	1

2.5.2.3 Model and example of calculation

The release to (sewage) water may be estimated by the equation:

$$Elocal_{water} = \left(\frac{F_{lost}}{Temission_{app}} + \frac{F_{leached}}{Temission_{leach}} \right) \times V_{prod} \times 10^{6} \times RHO_{prod} \times Fc_{prod} \times N_{sites} \times N_{nests} \times N_{eggs} \times N_{app} \qquad \textbf{(12)}$$

Variable/parameter (unit)	Symbol	Unit	Default	S/D/O/P
Input:				
Amount of product needed to cover one egg completely	V_{prod}	ml	Table 2.2	D/P
Density of product	RHO_{prod}	$kg.m^{-3}$		S
Fraction of active substance in product	Fc_{prod}			S
Number of application sites	N_{sites}	-	1	D
Number of nests to be treated at one site	N_{nests}	-	1000	D
Number of eggs per nest	N_{eggs}	-	3	D
Number of applications	N_{app}		1	D
Number of emission days of release to wastewater for stage of application	$Temission_{app}$	d	Table 2.5	D
Number of emission days of release to wastewater for stage of lifetime	$Temission_{leach}$	d	Table 2.5	D
Fraction of product released at application	F_{lost}	-	0.1	D
Fraction of product released at leaching	$F_{leached}$	-	0.1	D
Output:				
Local emission of active substance to wastewater during episode	$Elocal_{water}$	$kg.d^{-1}$		O

Examples:
- Spraying:

The released amount of an avicide to the wastewater, assuming 98% a.i. in egg-oil product (formalin present at 2%) for herring gull control for an operation lasting 2 days and a first rain event after all the product has been applied, is:

$Elocal_{water} = (0.1 / 2 + 0.1 / 1) \times 2.9 \times 10^{-6} \times 790 \times 0.98 \times 1 \times 1000 \times 3 \times 1 = 1\ kg.d^{-1}$

- Immersion:

The released amount of an avicide to the wastewater during its lifetime after egg immersing, assuming 98% a.i. in egg-oil product for herring gull control and a first rain event after all the product has been applied, is:

$Elocal_{water}$ = (0 / 2 + 0.1 / 1) x 2.9 x 10^{-6} x 790 x 0.98 x 1 x 1000 x 3 x 1 = 0.67 $kg.d^{-1}$.

2.5.2.4 Protection of non-target animals

2.5.2.4.1 Primary poisoning

The concentrations in the rainwater flow after spraying or immersing are very small and animal food would be poorly contaminated by egg-oil. Gull eggs are difficult to be reached and few animals are eating birds (*Jackson & Green, 2000*). Egg-oils containing pure paraffin are of very low toxicity and only impurities may affect egg-eating animals. Therefore, primary poisoning is not relevant for this type of bird control.

2.4.2.4.2 Secondary poisoning

Not relevant.

3 Exposure scenarios for primary and secondary poisoning

3.1 Introduction

Primary exposure scenarios correspond to the ingestion of bait by a non-target animal. Secondary exposure scenarios are developed for non-target organisms eating treated target organisms.

In general, non-target animals do not consume bird eggs. When they do – e.g., mammals as American mink (*Mustela vison*), hedgehog (*Erinaceus europaeus*), brown rat (*Rattus norvegicus*), wood mouse (*Apodemus sylvaticus*), feral cat (*Felis catus*), otter (*Lutra lutra*), feral ferret (*Mustela furo*), red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*) and birds as various gull's species, arctic skua (*Stercorarius parasiticus*), hooded crow (*Corvus corone cornix*), carrion crow (*Corvus corone*), raven (*C. corax*), hen harrier (*Circus cyaneus*), magpie (*Pica pica*) (*Jackson & Green, 2000; Nordström, 2003*), they break the shells and eat the internal part of the eggs, which is not contaminated by egg-oil, as the shells are physical barriers. Therefore no scenarios are developed for egg-oil control.

In the following scenarios, only stupefying baits are considered as chloralose was the only active substance identified in avicide products that might be significantly released in the environment (CO_2 releases are considered negligible). Non-target animals are mammals and birds other than those selected to be tackled.

Susceptibility or tolerance to avicides exposure, and the resulting risks of poisoning vary among mammals and birds due to differences in their normal diets, feeding habits, ecological or other factors.

Examples of primary and secondary poisoning incidents induced by abuse of plant protection products containing alphachloralose have been reported (*Barnett et al., 2002*).
In 2000, alphachloralose abuse was involved in 6 incidents with buzzards, 1 with red kite and 2 with magpies. Three swans were poisoned following the abuse of alphachloralose. Golden eagles died as a result of pesticide poisoning from the abuse of alphachloralose (1 incident). Several hundred pheasants and partridges were found to be affected by alphachloralose; a partridge and three pheasants died. In most of these cases, the source of the bait was unknown.
Two tethered pigeon carcasses found at a peregrine falcon nesting site were probably targeting peregrines found dead.
Even if one incident involving both strychnine and alphachloralose was reported for dogs, specific scenarios for chemical interactions are not developed in the scenarios.

Use methods for plant protection product applications are similar to those for avicide applications presented in this report (e.g. outdoor bait applications), especially for open area scenarios.

Therefore, scenarios should be developed to describe mechanisms that may lead to poisoning of non-target organisms.

Considering alphachloralose-based baits, if application of stupefying baits is performed according to instruction labels, the risks of primary poisoning should be minimal, as concentrations of stupefying agents in the treated bait should be set to induce only narcotic effects and not the death of the animals.
Scenarios based on alphachloralose control would be applicable to new active ingredients placed on the market and holding narcotic effects for the birds' species to be controlled. They would also be useful where new active substances with other effects (e.g. toxic baits, chemosterilisants) contained in contaminated food would be notified.

Remark: Feral pigeon and house sparrow have to be considered for secondary poisoning when the species considered is not the species that is to be tackled.

3.2 Exposure scenarios for primary poisoning

When avicides are applied according to label instructions, they are used after a prebaiting phase. This phase is performed to avoid non-target primary poisoning and increase control efficacy. The primary poisoning of non-target animals occurs accidentally or because of carelessness. Worst case scenarios must be considered depending on the controlled species.
Concentration of active substance in the avicides products and dose applied vary with the controlled species. The appropriate concentrations of the active substance should be checked from its notification dossier and the calculations conducted accordingly. Default values used in these scenarios are those set for alphachloralose.

- House sparrow control:

The maximum bait quantity applied daily should be 4500 g using 3 bread bait renewals. In fact, this dose is not actually consumed by non-target animals because the bait would not be renewed if non-target animals have been intoxicated by the bait. Therefore, a daily dose of 1500 g should be taken into account in a worst case scenario.

- Feral pigeon control:

The bait quantity applied daily of 7500 g should be taken into account in a worst case scenario.

3.2.1 Non-target organisms

Rodents are the main animal group at risks to be accidentally poisoned because the baits are potentially attractive for them and they are able to feed in all the areas where baits are laid.
It is a common experience that dogs are more omnivorous than cats and that may explain why dogs are more often victims of primary poisoning (*EUBEES, 2002*). Pigs are considered the most susceptible species among domestic animals.
It seems reasonable to include in a worst-case scenario birds eating cereal and weed seeds like sparrows, pigeons and pheasants. The domestic hen may be comparable with the pheasant.

Basically the estimated daily uptake of a compound (ETE) is given by the following equation (*EC, 2001b*):

$ETE = (FIR / BW) * C * AV * PT * PD$ ($mg.kg^{-1}$ bw/d) **(1)**

Variable/parameter	Symbol	Unit	Default	S/D/O/P
Input:				
Food intake rate of indicator species (fresh weight)	FIR	$g.d^{-1}$		S/P
Body weight	BW	g		S/P
Concentration of active compound in fresh diet	C	$mg. kg^{-1}$		S/P/D
Avoidance factor (1 = no avoidance, 0 = complete avoidance)	AV	-	1	S/D
Fraction of diet obtained in treated area (value between 0 and 1)	PT	-	1	S/D
Fraction of food type in diet (number between 0 and 1; one type or more types)	PD	-	1	S/D
Output:				
Estimated daily uptake of a compound	ETE	$mg.kg.^{-1}d^{-1}$		

In a worst case scenario, AV should be set to 1 as default value both for non-target mammals and birds.

Food intake can be very variable, depending on the metabolic rates of species, the nature of their food, weather conditions, time of year, etc. If no information is available on the daily food mean intake, the following regression equations (*EPPO, 1993*) can be used to predict dry-weight intake for an animal of a particular body weight:

for all birds: $\log FIR = 0.651 \log BW - 0.188$ **(13)**

for songbirds: $\log FIR = 0.85 \log BW - 0.4$ **(14)**

for other birds: $\log FIR = 0.751 \log BW - 0.521$ **(15)**

for mammals: $\log FIR = 0.822 \log BW - 0.629$ **(16)**

To estimate more accurately the food intake for a species of a given weight, equations presented in Crocker and Hart (*2002*) could be used. Knowing the energy value and moisture content of its typical foods, and the efficiency with which it digests them, the average amount of food it is likely to eat in a day may be calculated using the following equation:

$DFI = DEE / (EF * (1 – moisture) * AE)$ **(17)**

With:

DFI = Daily Food Intake (wet g)

DEE = Daily Energy Expenditure (kj)

EF = Energy in Food (kj/g)

AE = Assimilation Efficiency

Where moisture and assimilation efficiency are proportions between 0 and 1.

3.2.1.1 Mammals

PT should be set to 1 in a realistic worst case scenario, considering mammals may only feed in the treated area. PD will vary among animals.

According to *DEPA (2001)*, rodents may feed about 50-60% of rodenticides, when applied in treated bait around rat hole. In a realistic worst case scenario, when avicides products are applied in and around buildings, the bait consumption by rodents should be about 40% (10% in normal situations).

Pigs and dogs are potentially exposed to avicides when applied around farm buildings. Treated grain is not a common feeding for them and an accidental feeding of treated bait should not account for more than 1-2% of the total daily food consumption. Treated bread would be more attractive for them. Considering the specific baiting using bread, 10% should be set as default value for the proportion of bait consumption in the total daily food consumption.

The higher proportion of alphachloralose in treated bait is 2% used for house sparrow control. This value is used in the following Table to obtain the daily worst case consumption of active substance.

Table 3.1: Expected content of the active substance of an avicide in non-target mammals after bait consumption (concentration of active substance in avicide bait 2%)

Species	**Body weight**	**Daily mean food intake**	**Bait consumption in the total daily food consumption Normal situations**	**Worst case bait consumption in the total daily food consumption**	**Worst case daily bait consumption**	**Worst case daily active substance consumption**	**Swallowed dose of a.i. per animal b.w. (worst case)**
	(g)	(g)	(%)	(%)	(g)	(g)	($mg.kg_{b.w.}$)
Mouse*)	20	3	10	40	1.2	0.024	1200
Rat*)	400	20	10	40	8	0.16	400
Dog*)	10000	750	1-2	10	75	1.5	150
Pig*)	60000	2400	1-2	10	240	4.8	80

*) Values for body weight and daily mean food intake from *OECD (2002b)*

3.2.1.2 Birds

A grain and seed eating bird is not expected to eat just the treated bait and nothing else. But, in a worst case scenario, PD should be set to 1 as it should be assumed that birds may consume only the food type selected for the bait.

Considering the high home range of birds and their feeding habits, default value for PT factor should be set to 0.2. However, if reliable data are included in the notification dossier, they should be used to estimate a more accurate PT value.

A study (*Central Science Laboratory, 2001*) recorded single feeding bouts for different species and seeds. About one kilogram of various seeds was disposed at different times and locations and bird visiting was recorded. The maximum seed intakes per bird depending on the seed type were estimated. These results presented in the Table 3.2 are relevant for risk assessment where avicide concentrations on food items are relatively high (e.g. high enough for a single feeding bout to produce a near-lethal dose) and the PT and PD values are set with high degrees of uncertainty.

Table 3.2: Expected content of the active substance of an avicide in non-target birds after bait consumption (concentration of active substance in avicide bait 2%)

Species		**Body weight** (g)	**Daily mean food intake** (g)	**Seed type**	**Maximum seed intake per visit** (g)	**Theoretical active substance consumption** (g)	**Swallowed dose of a.i. per animal b.w.** ($mg.kg_{b.w.}$)
Tree sparrow *)	*Passer montanus*	22	7.6	Wheat	2.6	0.052	2364
		22	7.6	Maize	3.3	0.066	3000
House sparrow *)	*Passer domesticus*	27	9	Wheat	0.9	0.018	667
		27	9	Peas	0.6	0.012	444
Chaffinch*)	*Fringilla coelebs*	20.9	7.5	Wheat	3.6	0.072	3445
		20.9	7.5	Peas	3	0.060	2871
Woodpigeon *)	*Columba palumbus*	490	53.1	Peas	35	0.7	1429
Feral pigeon *)	*Columba livia*	360	41.4	Maize	11.4	0.228	633
		360	41.4	Peas	36.9	0.738	2050
Pheasant *)	*Phasianus colchicus*	953	102.7	Wheat	19.6	0.392	411
		953	102.7	Maize	79.8	1.596	1675
		953	102.7	Peas	0.9	0.018	18.9

*) Values for body weight, daily mean food intake and maximum seed intake per visit from *Central Science Laboratory (2001)*

The bait consumption of any of the non-target animals should not be limited by the available bait quantity because their daily mean food intake is much smaller.

3.2.2 Bio-elimination

The values presented in the above Tables do not take into account the bio-elimination.
Experimentally, alphachloralose absorption is rapid by oral route; it is eliminated from the body by urine through hepatic conjugation. The half lifetime was not determined but seemed to be relatively short (*Abdelaziz H., 1981*). Therefore, a reasonable default value for elimination fraction should be 0.8. However, the appropriate elimination rate for an active substance should be checked from its notification dossier and the calculations conducted accordingly.

The expected concentration of active substance in the animal after metabolism and other elimination processes is calculated as follows:

*EC = ETE * (1 - El)* **(18)**

Variable/parameter	Symbol	Unit	Default	S/D/O/P
Input:				
Estimated daily uptake of a compound	ETE	$mg.kg.^{-1}d^{-1}$	Eq. 1	O
Fraction of daily uptake eliminated (number between 0 and 1)	El	-		S
Output:				
Expected concentration of active substance in the animal	EC	$mg.kg^{-1}$		

3.2.3 Model and example of calculation

The doses in the relevant non-target mammals and birds should be calculated for each active substance to be assessed. These predicted doses for primary poisoning will then be compared with the LD_{50} of the species to be protected.

Remark: Use of grains with diameter > 7 mm for pigeon control is a way to reduce risks of primary poisoning of little birds.

3.3 Exposure scenarios for secondary poisoning

The general rules for assessment of secondary poisoning are presented in section 3.8 of the TGD (*EC, 2003b*). However, avicide specific issues to be taken into account in an exposure scenario document are presented in this section.

When an operation is well conducted using stupefying baits, all the treated birds should be caught in order to kill them afterwards by gazing or to relocate them but this is not always the case as it is stated in section 1.2.2.2. Risks of secondary poisoning for non-target organisms consist in feeding birds that would escape or be relocated.

According to use instructions, the release of alphachloralose-treated birds after recovery is authorised. Therefore, risks of secondary poisoning are considered as low.

Worst case secondary scenarios are nevertheless developed as an help to the preparation of the evaluation of the notification dossier of new active substances, and are based on the alphachloralose-baiting experience.

3.3.1 Amount of active substance consumed by target birds

Equation 1 (cf. primary poisoning) can still be used for calculating the amount of active substance being consumed by the target bird.

Bait consumption should account for 10% in open area and 20% in and around buildings of the total daily consumption in normal situations.
In order to elucidate a full-scale scenario, a situation with PT = 1 (i.e. 100% of contaminated food items on treated area) has to be considered as the realistic worst case. In normal use, it seems very unlikely that an animal should not take the non-treated available food within its home range, as the occurrence of its preferred food has been one of the factors determining its presence. Therefore, PT values 0.2, 0.5 and 1 are included in the following calculation examples.

Using stupefying bait, birds should be narcotised after bait intake and relocated or euthanised. Therefore, in a realistic scenario for stupefying baits, a repeated bait intake should not be considered. Nevertheless, in the case of new substances (chemosterilisant, toxic) notification, this parameter should be taken into account in the scenario.

The dose of active substance present after a 2-day or a 5-day control operation in the target birds has been included in the calculations. It is assumed that the target bird will eat continuously during the whole period and that the bio-elimination of active substance is 80% per day during the whole period.

The content of active substance in the target birds available to raptors and scavengers is presented in the Table 3.3. Calculations are based on the following:
The percentage of bait consumption is equal to factor PT expressed as a number between 0 and 1; the food intake rate divided with body weight is as default set to 30% for house sparrow and 10% for pigeons i.e. FIR/BW = 0.3 and 0.1, respectively. The concentration of a.i. in the bait will depend on the target species. For pigeons, C = 15 $g.kg^{-1}$; for house sparrows, C = 20 $g.kg^{-1}$ (these values should be checked from the notification dossier of the substance).

Equation 1 is used for calculation of avicide in target animal on Day 1 immediately after first meal.
Examples for 20% of total daily consumption:
ETE = 0.1 * 15 * 1 * 1 * 0.2 = 0.3 $g.kg^{-1}$ for pigeon
ETE = 0.3 * 20 * 1 * 1 * 0.2 = 1.2 $g.kg^{-1}$ for house sparrow

EC_2 (estimated residue concentration for Day 2 before new meal) with the default value for bio-elimination 0.8:
EC_2 = 0.3 * (1 - 0.8) = 0.06 $g.kg^{-1}$ for pigeon
EC_2 = 1.2 * (1 - 0.8) = 0.24 $g.kg^{-1}$ for house sparrow

The principle is that pigeon eats each of the 5 days the same daily amount and eliminates 30% of its content of residues. For house sparrow operation should not be continued after 2 days. It is assumed they will stop feeding treated bait thereafter.

EC_3 is the concentration of residues in the animal before new meal on Day 3 and so forth. For pigeon:
EC_3 = (EC_2 + ETE) * (1 - 0.8) = (0.06 + 0.3) * 0.2 = 0.072 $g.kg^{-1}$
EC_4 = (EC_3 + ETE) * (1 - 0.8) = (0.072 + 0.3) * 0.2 = 0.074 $g.kg^{-1}$
EC_5 = (EC_4 + ETE) * (1 - 0.8) = (0.074 + 0.3) * 0.2 = 0.075 $g.kg^{-1}$
EC_6 = (EC_5 + ETE) * (1 - 0.8) = (0.074 + 0.3) * 0.2 = 0. 075 $g.kg^{-1}$

Table 3.3: Residues of active substance in target birds in $g_{a.i.}.kg_{b.w.}^{-1}$ at different times during a control operation (concentration of active substance in avicide bait: 2 or 1.5% for house sparrow and feral pigeon respectively)

	Residues ($g.kg^{-1}$) of avicide in target animal with bait percentage consumption in % of daily consumption *					
	House sparrow			**Feral pigeon**		
	20%	**50%**	**100%**	**20%**	**50%**	**100%**
Day 1 after the first meal	1.2	3	6	0.3	0.75	1.5
Day 2 before new meal	0.24	0.6	1.2	0.06	0.15	0.3
Day 3 before new meal	0.29	0.72	1.44	0.07	0.18	0.36
Day 6	0.002	0.006	0.01	0.07	0.19	0.37

*) Bait consumption percentage of total daily consumption is equal to factor PT in equation 1.

3.3.2 Amount of active substance in non-target animals

According to TGD on secondary poisoning, it is assumed that target-birds fed entirely treated baits (i.e.100%) and that the non-target animals consume 50% of their daily intake from treated birds. In the Table 3.4. below, the concentration in non-target animals at day 6, assuming target-birds surviving this long is estimated.

Pets such as dogs and cats that live in close contact with human beings could be at risks of being secondary poisoned with avicides, particularly if they prey on treated birds around buildings where avicides are being used.
Other mammals such as foxes, polecats, stone martens, stoats, raccoon dogs and weasels may be at risks because they often search for prey around farms, gardens, parks or other areas where birds may be controlled.
Northern goshawk, sparrowhawk, peregrine falcon, hobby, tawny owl, barn owl and eagle owl are bird species that eat live birds. They often hunt not far away from human settlements or in areas where birds are controlled due to their pest status. Their risks of becoming victims of secondary poisoning through treated prey animals has to be evaluated.
Also scavenger birds such as *Corvidae* (crows and allies), *Laridae* (gulls), and kites may be at risks for secondary poisoning. These species, however, usually obtain a small fraction of their food from birds compared to the others, which catch alive prey.

For the daily consumption of sparrows and pigeons we have to consider the likelihood that 100% might occur. The likelihood of the 20, 50, and 100 % per bird of prey species is presented in the Table below (++ very likely, + likely, 0 possible, - unlikely, -- very unlikely):

Table 3.4: likelihood of daily consumption of sparrows and pigeons according to the prey species and its gender (personal communication, *Van der Poel*)

Species (gender)	Prey	20%	50%	100%
Sparrowhawk (?)	Sparrows	++	++	+
	Feral pigeons	+	0	--
Sparrowhawk (?)	Sparrows	+	+	-
	Feral pigeons	++	+	0
Peregrine Falcon (?)	Sparrows	0	-	--
	Feral pigeons	++	+	0
Peregrine Falcon (?)	Sparrows	-	--	--
	Feral pigeons	++	++	+

A selection of the hunting birds species has been made according to the Table 3.4; it is presented in Table 3. 5. In a worst case scenario, only the sparrowhawk and peregrine falcon have been chosen as they feed almost exclusively on birds. Therefore, a default value of 100% for the daily consumption of treated birds by non-target birds has been selected despite the TGD rules. For mammals, only the most relevant non-target species, e.g. fox, and a default value of 50% has been selected.

Table 3.5: Expected contents of active substance in non-target animals due to secondary poisoning. Birds fed 100% on treated baits and non-target carnivores fed 100% on treated birds (NA = not applicable)

Species (gender)		Body weight *) (g)	Daily mean food intake *) (g)	Sparrow caught on **day 3** (**a.i. content: 1.44 g.kg^{-1}**)		Pigeon caught on **day 6** (**a.i. content: 0.37 g.kg^{-1}**)	
				Amount a.i. consumed in birds (mg)	Swallowed dose by non-target animal (mg.kg^{-1})	Amount a.i. consumed in birds (mg)	Swallowed dose by non-target animal (mg.kg^{-1})
Sparrowhawk (?)	*Accipiter nisus*	144	45	64.8	450	NA	NA
Sparrowhawk (?)	*Accipiter nisus*	256	60	NA	NA	22.2	86.8
Peregrine Falcon (?)	*Falco peregrinus*	625	110	NA	NA	41	65.8
Fox [1)]	*Vulpes vulpes*	5700	520.2	374.5	65.7	96.2	16.9

*) All values for birds of prey derived from Cramp et al. (1980) and Glutz von Blotzheim (1971), and for mammals from EC (2001b).

1) Default value of 50% for the daily consumption of treated birds.

These expected contents of active substance in non-target animals due to secondary poisoning will then be compared with the LD_{50} of the species to be protected.
These contents have been obtained using worst case scenario of TGD and default values from alphachloralose; they are not realistic. By its mechanism of action, alphachloralose bait can not be consumed by birds on a whole day, as it has a narcotic effect making birds stop feeding after one intake. For non stupefying substances, the risks of secondary poisoning should be conducted accordingly as the concentration of active ingredient in the food, in the cases of a toxic substance or a chemosterilisant, would be considerably lower than 2%.

APPENDIX N°1: Results of the surveys performed in Europe

French survey:

In order to collect information on avicide uses in France, a questionnaire was sent on August and September 2002 to organisms and persons that were susceptible to be involved in the tackle of birds in France (egg-oil products were not covered by the questionnaire).

Table I.1: Statistics of the French survey

	Send	Answer	%
Bird control organism	9	6	67
Producer of active substance (alphachloralose)	2	0	0
Bird expert	5	2	40
Total	16	8	50

French survey results showed that:

- Alphachloralose was the only active substance allowed to be used in avicide products in France in 2002.
- Contaminated food was the only form used to apply alphachloralose.
- Bird control firms claimed no-use of chemical methods to fight against birds.
- The only site where avicides may be found to be used is at airport fields, but the avicide use is extremely rare because physical control methods are easier to apply and results obtained are often better.

European survey:

On October 2002, a questionnaire was sent to the authorities of Member States in relation to Directive 98/8/EC. Questions were related to the avicide uses and legislation products in their country. The survey was also sent to bird control organisms in Europe and to the Royal Society for the Protection of Birds (egg-oil products were not covered by the questionnaire).

Table I/2: Statistics of the European survey

	Send	Answer	%
Competent authorities	14	8	57
Bird control organism	14	5	36
Association for the protection of birds	1	0	0
Alphachloralose dealer	1	0	0
Total	30	13	43

European survey results showed that:

- In Germany, Denmark, Finland and Austria, the national laws do not allow the use of any biocidal product to control birds.
- In Sweden and Italy, use of avicide is allowed but such a product is not currently used is these countries.
- In UK, 2 alphachloralose-based products are registered for house sparrow and feral pigeon control for public hygiene purposes.
- Avicide products are not used to control birds at Italian and UK airports.

List of the contacted persons

French survey:

- Bird Control professionals:

Amboiles Services
Compagnie Générale des Insecticides
GIL FRANCE
Pigeon Propre
Profil Armor
SACPA
SMAP Desinfection
Société Artois Chimie
Société Caussade

- Bird specialists:

Mr Briot (STNA, Service Technique de la Navigation Aérienne)
Mr Clergeau (INRA)
Mr Grolleau (INRA)
Mr Taouis (INRA)
Museum National d'Histoire Naturelle

- Producers of alphachloralose:

ENPV Raticide 50
Société Salomez

European survey:

- Bird Control professionals:

ADAS (UK)
Austrian Pest Control Association (Austria)

Belgian Pest Control Association (Belgium)
British Pest Control Association (UK)
Dutch Pest Control Association (Netherlands)
Farming and Wildlife Advisory Group (UK)
German Pest Control Association (Germany)
National Pest Technicians Association (UK)
Portuguese Pest Control Association (Portugal)
Spanish Pest Control Association (Spain)
Mr Barber (Safeskys, UK)
Mr Battistoni (Bird Strike Committee, Italy)
Mrs Thompson (Crop Protection Association, UK)
Mr Windebank (Safeskys, UK)

- Competent authorities:

Mr Bell (UK)
Mr Bergmann (Denmark)
Mr Braunschweiler (Finland)
Mrs Brazier (UK)
Mrs Fitzpatrick (Sweden)
Mrs Fresno (Spain)
Mrs Gaertner (Germany)
Mr Meijs (Netherlands)
Mr Huysman (Belgium)
Mrs Karanikolou (Greece)
Mrs Morrison (Scotland, UK)
Mrs Moura (Portugal)
Mr Plattner (Austria)
Mr Zaghi (Italy)

- Association for the protection of birds:

Royal Society for the Protection of Birds (RSPB, UK)

- Alphachloralose dealer:

Rentokil Inc. (UK)

APPENDIX N°2: Gull control operations

In UK and France, no product containing alphachloralose is registered for gulls control. Nevertheless a few specialised licensed operations can be authorised, especially for herring gulls. This is the reason why gull control operations are not included in the environmental exposure scenarios. There is a high lack of data concerning this specific type of use.
Herring gull (*Larus argentatus)* is listed on the Annex II/2 of the Council Directive of 2 April 1979 on the conservation of wild birds (79/409/EEC). These species may be hunted only in the Member States where it is allowed.

Herring gull biology:

The food intake rate of herring gull (average weight: 1150 g) would be 100 -150 g/day.
In winter, herring gulls are most likely to congregate on beaches along the shores of oceans and other large water bodies. In other seasons, gulls may range inland and can be found beside lakes and rivers, in grassy meadows, or on garbage dumps, golf courses, islands, cliffs, and buildings. Their main habitat requirement is a dependable source of food nearby. Even 40 km is not an unreasonable daily round, if there is nothing nearer and the rewards are attractive enough (*Drury, 2002*).

Avicide use:

The technique is quite different from those used against feral pigeons and house sparrows, the narcotic is contained within soaked bread and placed in the nest of the breeding bird. Considering the gull body weight and food consumption, it is assumed that the bait quantity used to fight against gulls is 2 times higher the one used for pigeons control, e.g. 100 g/bird. The proportion of active substance in the bait is 1-1.5%.
In a field trial (*Seamans, T. W., J. L. Belant, 1999*), alphachloralose baits with a 30 mg/kg b.w. dosage were shown to result in 50% herring gull capture success and no mortality. Baits at 58 mg/kg resulted in 89% capture success and 41% mortality of captured birds. Baits at 95 mg/kg resulted in 65% capture success and 82% mortality of captured birds. The dose estimated to induce 50% mortality in the gull population was 43.1 mg/kg b.w.
As gull damages mostly occur in urban area, gull control operations are only considered in urban areas.
In the city of Les Sables-d'Olonne (France, 15,000 inhabitants), the number of gull nests was estimated to be 1,500 (personal communication, *Profil Armor)*. So for a 10,000-person city, the number of nests should be estimated to be 1,000. Chemical control should be applied to both parents, and then the applied amount should be 100 x 2 x 1000 = 200 kg of stupefying baits for a 10,000- person city.
Bait renewal and removal should not be taken into account, as nests are difficult to be reached by applicators.

Characteristics of gull control operation are presented in the Table below:

Table II.1: Parameters for a gull control operation in a 10000-inhabitants city:

Bird	**Gull**
Treated bait	Soaked bread
Bird flocks to be treated (individuals number)	2000 (2 birds/nest)
Q bait used/application	100 g/bird
% a.i.	1.5
Way of application	Bait placed in the nest of the bird
Operating conditions	Bread: 1 application in 1 day
Total used bait (kg)	200

Release calculations:

To estimate environmental releases, it should be assumed that all the product applied will enter the wastewater compartment, except the product part that will be absorbed by birds (20%). The fraction of product released to the wastewater should be 80%.

The released amount of an avicide to the wastewater, using equation 9 and assuming 1.5% a.i. in treated bread for gull control and an operation lasting 1 day, should be:
$Elocal_{water}$ = 200 x 0.015 x 1000 x 1 x 0.85 / 1 = 2550 g a.i.d^{-1}

Remark: It may be assumed that:

- The preparation of 1000 treated baits may last at least 1 working day. Therefore, in that case, the release during bait preparation (5%) should not be added to the release after application (80%).
- The release after application should not be 100% the first day. The actual figure for the calculations may be 10%.

APPENDIX N°3: Bird-related incidents at airports

Presence of birds at airports induces the hazards of collisions with aircraft and ingestion by jet engines. In Europe, for the period of 1998-2000, the rate of bird-related registered incidents was about 5 for 10,000 flights. It was about 1.4 in France for the same period. Incidents can be benign or serious when they induce the aircraft to be repaired (*STNA, 2002*).

To avoid the presence of birds in the airport areas, several techniques can be used:

- The ecological struggle consists in modifying the airport area by reducing or suppressing the drinking zones, the attractive cultures, the waste dumps in the neighbourhood…
- The frightening devices that are used in airports can be either acoustic or visual.
- The bird control using chemicals is not frequently used, as it is not sufficiently effective for the time being. However, it is still used at airports when the other techniques failed to be effective.

Birds of prey, *laridae*, swifts and swallows, *colombidae*, passerines, *corvidae* were respectively responsible of 42, 17, 13, 10, 5 and 3% of the bird-related incidents in France for the 1998-2000 period. Herring gull and feral pigeon are the most frequent species that can be combated through chemical use.

APPENDIX N°4: Complementary information for egg-oil treatment:

In UK liquid paraffin oil has been registered for specific species, namely Canada goose (*Branta canadensis*), greylag goose (*Anser anser*), and large gulls (herring gulls (*Larus argentatus)*, lesser black-backed gull (*Larus fuscus*) and greater black-backed gull (*Larus marinus*)). Environmental release scenarios using egg-oil products have been only performed for these species. Nevertheless, as some damages could occur in non-agricultural area with other related species, information on the most common related species are presented.

These species are common gulls (*Larus canus)*, black-headed gulls (*Larus ridibundus)*, kittiwakes (*Rissa tridactyla)* and fulmars (*Fulmarus glacialis*). No product has been found to be registered for these species as they are not on the UK government's general license, and are therefore protected in this country. They are considered as regularly occurring migratory species according to the article 2 of the bird directive (*EC, 1979*), but they might be tackled in some countries of the EC. They can induce nuisances by nesting on roofs.

To estimate the amount of egg-oil product needed to cover one egg completely, the surfaces of "spheres" with the largest" and "smallest" diameters for each species are added. These sums are compared to the sum for the ring-billed gull, for which 2 $ml.egg^{-1}$ is needed.

Table IV.1: Egg sizes and estimated related amounts of egg-oil needed to cover entirely the eggs (*Van der Poel, personal communication*):

Species	Egg size (mm)	Diameter (cm) largest	Diameter (cm) smallest	Surface "sphere"(cm^2) largest	Surface "sphere"(cm^2) smallest	ml/egg
Black-headed Gull	52 x 37 [1)]	5.2	3.7	85	43	1.6
Kittiwake	57 x 51 [1)]	5.7	5.1	102	82	2.2
Common Gull	58 x 41 [1)]	5.8	4.1	106	53	1.9
Lesser Black-backed Gull	67 x 47 [1)] 68 x 47 [2)]	6.75	4.7	143	69	2.6
Herring Gull	70 x 48 [2)] 72 x 49 [3)] 72 x 51 [4)]	7.2	4.9	163	75	2.9
Great Black-backed Gull	77 x 54 [2)] 78 x 52 [1)]	7.75	5.3	189	88	3.4
Fulmar	74 x 51	7.4	5.1	172	82	3.1
Ring-billed Gull	59 x 42	5.9	4.2	109	55	**2**

Information from nominate Sweden [1)], UK [2)], NL [3)], Norway & Sweden[4)], (Cramp et al., 1977; 1983; Glutz von Blotzheim, 1982)

In this paper, it has been assumed that problems induced by gulls occur only in urban areas, where gulls nest on roofs. In case biocides are notified for control of gulls in non-urban areas, the following information should be helpful for gull nests found on ground.

Gulls nests vary to rather great extent. It should be noted that no data has been found in the literature concerning neither the fulmar nor the kittiwake nest size. The surface soil area that should be used for calculation (including 10 cm around the nest) were derived from the outer and inner diameters. They are presented in the following table.

Table IV.2: Nest sizes and estimated related soil area that may be contaminated (*Van der Poel, personal communication*)*[)]:

	Outside				**Inside**				**Calculation**	
	diameter (m)			**Surface (m^2)**	**diameter (m)**			**Surface (m^2)**	**diameter (m)**	**Surface (m^2)**
Species	largest	smallest	mean	mean diameter	largest	smallest	mean	mean diameter		
Black-headed Gull	0,5	0,2	0,35	0,096			0,15	0,018	*0,55*	0,24
Common Gull	0,2	0,3	0,25 [1)]	0,049	0,12	0,2	0,16	0,020	*0,45*	0,16
Lesser Black-backed Gull			0,35 [2)]	0,096			0,25 [1)]	0,049	*0,55*	0,24
Herring Gull			0,35 [2)]	0,096			0,25 [1)]	0,049	*0,55*	0,24
Great Black-backed Gull	0,3	0,6	0,42	0,139	0,23	0,3	0,27	0,057	*0,62*	0,30
Greylag Goose			0,86	0,581			0,25 [1)]	0,049	*0,65*	0,33
Canada Goose			0,45	0,16						**0,33**

*[)] All the values for diameter size were obtained from Glutz von Blotzheim (1982), except other footnotes.
[1)] interpolated data
[2)] estimated data

Remark: Special attention should be focussed on the black-headed gulls, as they usually have a fixed and dry nest, which is surrounded by water. This means a possibility of direct emission to surface water; nests on ground are rare (*Glutz von Blotzheim, 1982*).

ANNEX: REFERENCES

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