Cefas

Radiological Habits Survey: Dungeness, 2005

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SUMMARY

This report presents the results of a survey conducted in 2005 into the habits and consumption patterns of people living, working and pursuing recreational activities in the vicinity of Dungeness A and Dungeness B nuclear power stations. Dungeness A is powered by twin Magnox reactors. It is owned by the Nuclear Decommissioning Authority. Magnox Electric Ltd. is responsible for the day-to-day operations of the site. Dungeness B is powered by two advanced gas-cooled reactors. It is owned and operated by British Energy Generation Ltd. Dungeness A is licensed to Magnox Electric Ltd. and Dungeness B is licensed to British Energy Generation Ltd. for the purposes of installing and operating certain activities prescribed under the Nuclear Installations Act, 1965 (as amended). Under the Radioactive Substances Act, 1993, the two companies are authorised to discharge gaseous radioactive wastes via stacks to the atmosphere and liquid radioactive wastes via an outfall into the English Channel. The Dungeness site also contains sources of direct radiation.

Potential exposure pathways related to the site are:

- consumption of locally sourced aquatic and terrestrial foods
- occupancy of intertidal areas
- handling fishing gear and sediment
- occupancy on or in water
- consumption and/or use of seaweed
- consumption and use of groundwater and surface water
- off-site transfer of contamination by wildlife
- occupancy of buildings and the surrounding areas

The survey investigated all of these pathways. Individuals from the local population were interviewed and the data obtained are presented and discussed. Data for 872 individuals were collected. Gamma dose rate measurements were taken to supplement those made in routine surveillance programmes.

In the marine environment, the local foods consumed were fish, crustaceans, molluscs and sea kale. Activities potentially leading to external exposure included commercial fishing, charter fishing, angling, bait digging, repairing coastal defences, hobby fishing, dog walking, beach combing, beach cleaning, RNLI work, nature warden duties, bird watching, playing, sunbathing and walking. One houseboat dweller was identified. Observations for individuals handling fishing gear and sediment were made. Water sports and beach sports such as kitesurfing, kitebuggying, windsurfing, jet ski-ing, yachting, rowing and diving were very popular in the survey area. No evidence of seaweed being used as a fertiliser or compost was found. Sheep were seen grazing on the tide-washed bank of the River Rother.

In the terrestrial environment, up to 5 km from the site, food production was limited due to the predominantly shingle substrate covering the majority of the area. Seven farms were noted in the area and there was an allotment site located on the border of the 5 km area. High consumption rates were found for adults in the green vegetables, other vegetables, root vegetables and eggs food groups and for children in the sheep meat food group. For the purposes of this summary, high rates have been defined as when the observed 97.5 percentile rate exceeds the generic 97.5 percentile rate. If there is no observed 97.5 percentile rate because there is only one consumer in the age group, the observed critical group mean consumption rate is compared with the generic 97.5 percentile rate. Other local foods consumed were potato, domestic fruit, poultry, wild/free foods, rabbits/hares, honey and wild fungi. No consumption of milk, cattle meat, pig meat, venison, freshwater fish or local cereals was identified. Well water was the primary water source for the allotments at Lydd as they do not have a mains water supply. No households, farms or livestock were found to be using or drinking groundwater or surface water. A water sports club was based on a freshwater lake in the terrestrial survey area.

Transfer of radioactive contamination from the site into the surrounding area by wildlife was investigated. Rabbits and pigeons were the only species that the site considered as having high populations on power station land. These species both have the potential to leave the site. Rabbits from the Lydd military range were consumed but no pigeon from the survey area was consumed.

External exposure to direct radiation may occur to those living or spending time near the site. Occupancy habits within 1 km of the site perimeter included those related to residential, work and recreational activities. The highest occupancies were associated with residences.

Site-specific issues highlighted by the customers as needing careful attention included the state of the inshore fisheries and shrimping, the presence or absence of sea kale cutting, the decrease in cockling at Greatstone-on-Sea and Littlestone-on-Sea, the increase in consumption of scallops and the numbers of bird watchers on the shingle bank to the south of the power stations. These issues were investigated and have been written about in the relevant sections of the report.

The data from the survey are presented in full for each individual in order to assist in assessments of the additive effects of exposures from multiple pathways. Additionally, the information recorded during interviews was processed in two different ways to identify high rates appropriate to the various aquatic and terrestrial pathways. One method estimated a representative figure for each pathway by selecting a group at the upper end of the distribution of observations. The other chose the 97.5 percentile rate from the distribution.

Comparisons are made with the results from previous aquatic, terrestrial and direct radiation surveys.

Suggestions are made for changes to environmental monitoring programmes on the basis of the information collected during the survey.

1 INTRODUCTION

The public may be exposed to radiation as a result of the operations of the Dungeness site either from discharges of liquid or gaseous radioactive wastes into the local environment, or from radiation emanating directly from the site. This report provides information about activities carried out by members of the public, which may influence their radiation exposure. The study has been funded by the Environment Agency, the Food Standards Agency and the Health and Safety Executive in order to support their respective roles in protecting the public from the effects of radiation.

1.1 Regulatory framework

The Environment Agency regulates discharges of waste under the Radioactive Substances Act 1993 (RSA 93) (UK Parliament, 1993) as amended by: the Environment Act 1995 (EA 95) (UK Parliament, 1995a); by legislation implementing the European Union (EU) Basic Safety Standards (BSS) Directive 96/29/Euratom (CEC, 1996); and by the Energy Act 2004 (EA 04) (UK Parliament, 2004). This Directive takes account of Recommendations of the International Commission on Radiological Protection (ICRP), particularly ICRP 60 (ICRP, 1991). Authorisations under RSA 93 are issued by the Environment Agency after wide-ranging consultation, including the Food Standards Agency. As well as being a Statutory Consultee, the Food Standards Agency has responsibilities for ensuring that any radioactivity present in food does not compromise food safety and that authorised discharges of radioactivity do not result in unacceptable doses to consumers via the food chain. The Food Standards Agency also ensures that public radiation exposure via the food chain is within EU accepted limits. Consultation papers on Statutory Guidance to the Environment Agency on the regulation of radioactive waste discharges were issued by the Department of the Environment, Transport and the Regions (DETR) (now part of Department for Environment, Food and Rural Affairs (Defra)) in 2000 (DETR, 2000a) and the Welsh Assembly in 2002 (The Welsh Assembly Government, 2002). These draft Guidance documents include, *inter alia*, affirmation that protection of the

critical groups of the public is the appropriate radiological protection methodology to use. This report provides information to support assessments of critical groups.

Installation and operation of certain prescribed activities can only take place on sites if they are licensed under the Nuclear Installations Act 1965 (as amended) (NIA 65) (UK Parliament, 1965). The Nuclear Installations Inspectorate of the Health and Safety Executive implements this legislation and is also responsible for regulating, under the Ionising Radiations Regulations (IRR 99) (UK Parliament, 1999), the restriction of exposure of the public to direct radiation from operations occurring on these sites.

1.2 Radiological protection framework

UK policy on the control of radiation exposure has long been based on the Recommendations of ICRP, which embody the principles of justification of practices, optimisation of protection and dose limitation. Radiological protection of the public is based on the concept of a critical group of individuals. This group is defined as those people who, because of where they live and their habits, receive the highest radiation dose due to the operations of a site. It follows that, if the dose to this group is acceptable when compared to relevant dose limits and constraints, other members of the public will receive lower doses, and overall protection is provided for.

Dose standards for the public are embodied in national policy (UK Parliament, 1995b), in guidance from the International Atomic Energy Agency (IAEA) in the Basic Safety Standards for Radiation Protection (IAEA, 1996) and in European Community legislation in the EU BSS Directive 96/29/Euratom. The public dose standards were incorporated into UK law in IRR 99. In order to implement the Directive in England and Wales, the Environment Agency was issued with a direction by the DETR in 2000 (DETR, 2000b). This includes the requirements that the Environment Agency ensure, wherever applicable,

- all public radiation exposures from radioactive waste disposal are kept As Low As Reasonably Achievable (ALARA);
- the sum of such exposures does not exceed the dose limit of 1 mSv a year;

The Environment Agency shall have regard for maximum doses to individuals for use at the planning stage:-

- 0.3 mSv a year from any source;
- 0.5 mSv a year from the discharges from any single site.

The Environment Agency is also required to ensure that the dose estimates made are as realistic as possible for the population as a whole and for reference groups of the population. It is also required to take all necessary steps to identify the reference groups of the population taking into account the effective pathways of transmission of radioactive substances. Guidance on the principles underlying prospective assessments (i.e. assessments of potential future doses) has been provided by a group of UK public bodies (EA, SEPA, DoENI, NRPB and FSA, 2002). Where relevant, this guidance may also be applied to retrospective assessments (i.e. assessments of doses already received). A discussion paper (Camplin *et al.,* 2002) has considered different ways in which data collected from habits surveys similar to this study may be used to carry out integrated (i.e. combined pathway) dose assessments.

2 THE SURVEY

2.1 Site activity

There are two nuclear power stations next to each other at Dungeness; Dungeness A and Dungeness B. For the purposes of this survey they are considered as a single site. Dungeness A is owned by the Nuclear Decommissioning Authority (NDA). Magnox Electric Ltd. (itself a wholly owned subsidiary of British Nuclear Group (BNG)) is the site licensee company and is responsible for the day-to-day operations of the station. BNG is the site management company who provide employees at management level and where appropriate other levels to Magnox Electric Ltd. All other staff are employed by Magnox Electric Ltd. The station generates electricity from twin Magnox reactors. Dungeness B is owned and operated by British Energy Generation Ltd and is powered by two advanced gas-cooled reactors. The site is located on the south east coast of Kent approximately 5 km south east of the town of Lydd (see Figures 1 and 2).

Under NIA 65, the holder of the site licence for Dungeness A is Magnox Electric Ltd. and for Dungeness B is British Energy Generation Ltd., allowing the installation and operation of certain activities. These companies are responsible for the day-to-day running of the sites. Under RSA 93, the companies are authorised to discharge gaseous radioactive wastes via stacks to the atmosphere and liquid radioactive wastes via an outfall into the English Channel. Details of the amounts of radioactive waste discharged in 2004 have been published (EA, EHS, FSA and SEPA, 2005). The site also contains sources of direct radiation. It should be noted that during the 10 day survey period two of the four reactors were not operating at full capacity. Dungeness A had one reactor offline for all of the survey except for the last day when it came back on at very low power and Dungeness B had one reactor offline for the duration of the survey. The other two reactors were operating at nominal full power for the entire survey duration.

2.2 Survey objectives

The Centre for Environment, Fisheries & Aquaculture Science (Cefas) undertook the survey in 2005 on behalf of the Environment Agency, the Food Standards Agency, and the Health and Safety Executive. The aim of the survey was to obtain integrated habits data related to public radiation exposure from Dungeness via aquatic, terrestrial and direct radiation pathways in order to permit realistic assessments of critical group doses.

The last aquatic habits survey conducted by Cefas in the Dungeness area was in 1999 (Caldwell and McMeekan, 2000). Data from this survey are used in dose assessments for the Dungeness area (e.g. EA, EHS, FSA and SEPA, 2005). The last terrestrial habits survey was also in 1999 (Reeve and Taylor, 1999) and the last direct radiation survey was in 1993.

Fieldwork was undertaken in order to obtain site specific habits survey data. These data were used to establish exposure pathways for the local population and the characteristics of those most exposed. General habits survey information, such as the number and types of farms or number of angling clubs in the area was also obtained.

Investigations were carried out to ascertain the following:

- The consumption rates of aquatic and terrestrial foods from within the survey areas
- The production, use and destination of local produce
- External exposure activities over intertidal substrates
- Occupancy in and on water in the survey areas affected by liquid and gaseous discharges
- The consumption and use of groundwater and surface water in the terrestrial survey area
- The extent of occupancy within 1 km of the site perimeter fence
- Site specific issues requested by the customers

- The extent of any unusual practices, which may be relevant, such as the use of seaweed as a fertiliser or livestock feed and the transfer of contamination off-site by wildlife

2.3 Survey areas

Three survey areas were defined to encompass the dominant activities expected for aquatic, terrestrial and direct radiation pathways.

The aquatic survey area, shown in Figure 1, covered the coastline from Fairlight in the west to Folkestone in the east. Any activities inshore of the shipping channel were included in the survey area. The same area was used in the 1998 survey and it was based on hydrographic survey information. The area is relevant to the effect of liquid discharges from Dungeness.

The terrestrial survey area, shown in Figure 2, was defined as the circle to a radius of 5 km from the site centre (NGR TR 083 168) to encompass the main areas of potential deposition from gaseous discharges. The same area was used in the 1999 survey.

For direct radiation, the survey area is also shown in Figure 2. The Dungeness site comprises two licensed sites containing Dungeness A and Dungeness B. There are separate perimeter fences around the two licensed sites, though in part they are shared. The direct radiation survey area was defined as the area within 1 km of the overall external perimeter fence of the two licensed sites, which thus excluded the shared boundary. The 1993 direct radiation survey covered an area extending approximately 0.4 km from the Dungeness site perimeter on the basis that this is where members of the critical group were most likely to be. The area in 1993 excluded the western half of the 2005 survey area.

2.4 Conduct of the survey

The fieldwork component of the survey was carried out between 20th June and 2nd July 2005 by a survey team of three people, according to techniques described by Leonard *et al.* (1982).

A programme of work was sent to the Environment Agency, the Food Standards Agency, and the Health and Safety Executive before the survey for comment. Prior to the start of the fieldwork, discussions were held between the Cefas survey team, representatives from Dungeness A and B, the Environment Agency, the Food Standards Agency and the Health and Safety Executive. These discussions provided an outline of the main aims of the survey and highlighted areas or items that required special attention or effort by the team. On 21st June, meetings were held between the survey team and representatives from Dungeness B and separately, with representatives from Dungeness A. The meetings served to provide details about site operations, including waste disposal, and information about potential pathways and activities in the area. Further information was sought about wildlife studies and pest control measures on the site. Animals could be carriers for transporting radioactive materials off-site and are also potential food items for some individuals.

People with a local knowledge of the survey area were contacted for information on any aspects relevant to the various exposure pathways. These included local councils, Defra bee inspectors, the local beekeeping association, the State Veterinary Service, the Romney Marsh Countryside Project, the National Federation of Sea Anglers, local angling clubs, commercial fishermen, local Defra fisheries officers and The British Association for Shooting and Conservation.

During the survey, individuals who were identified as having the potential to be exposed to radioactivity from the site were contacted and interviewed. Interviews were used to establish individuals' consumption rates of locally grown terrestrial foods and locally caught seafood, their handling rates of intertidal sediments and commercial fishing gear, their occupancy rates relevant to external exposure and occupancy rates in and on water. Any general information of

possible use to the survey was also obtained. Using the information gained in the interviews, a list of occupations and activities was built up to produce a picture of potential exposure pathways. This then enabled emphasis to be placed on those individuals who were likely to be the most exposed, and included commercial fishermen, bait diggers, anglers, shellfish collectors, farmers, beekeepers, allotment holders and people living and/or working close to the site.

The survey did not involve the whole population in the vicinity of Dungeness, but targeted subsets or groups, chosen in order to identify those individuals potentially most exposed. However, it is possible that even within a subset or group there may be people we did not interview at the time of the survey. Therefore, to aid interpretation, the number of people for whom data were obtained in each group as a percentage of what we estimate to be complete coverage for that group has been calculated. The results are summarised in Table 1. The 'groups' are described and quantified, and the numbers of people for whom data were obtained are given as percentages of the totals. It should be noted that for certain groups, such as anglers, it can be virtually impossible to calculate the total number of people who undertake the activity in the survey area as many people visit from outside or only visit occasionally during the year. In other cases, it may be necessary to estimate the number of individuals from the number of clubs, for example. These cases are explained in Table 1. Overall, although the number of potential interviewees in the terrestrial survey area was estimated to be 2000, and several thousand people would use the aquatic survey area, information was obtained for a significantly smaller number than this. In particular, it should be noted that the survey did not include site employees or contractors for either company while working on site. Dose standards applicable to them whilst at work are different to those for members of the public.

For each of the three survey areas, the survey targeted pathways primarily relevant to that survey area. For example, people in the terrestrial survey were initially questioned because it was known that they grew significant quantities of terrestrial foodstuffs. However, where possible, every interviewee was asked about pathways in each of the three areas. During interviews with representatives from clubs such as diving clubs, it was not possible to collect

data for all pathways (such as consumption of local foods) for each member. In these cases, data were limited to those relating to the primary reason for the interview (e.g. in the case of ocupancy rates in and on water for diving club members, the club secretary could provide data for club members for that pathway only). In Annex 1 and 2, such individuals only have data for the pathways of primary interest.

Thirty-three person-days were spent investigating the survey areas and interviewing individuals who were relevant to the survey. Observations for 872 individuals were recorded. During the survey, gamma dose rate measurements were taken to aid assessment of external exposure pathways.

3 METHODS FOR DATA ANALYSIS

3.1 Data recording

Data collected during the fieldwork were recorded in logbooks. On return to the laboratory, the data were examined and any notably high rates were double-checked, where possible, by way of a follow-up phone call. In rare cases where follow up phone calls were not possible (e.g. interviewees who wished to remain anonymous), the data were accepted at face value. The raw data were entered into a habits survey database where each individual for whom information was obtained was given a unique identifier (the observation number) to assist in maintaining data quality.

During the interviews, people could not always provide consumption rates in kilograms per year for food or litres per year for milk. In these cases, interviewees were asked to provide the information in a different format. For example, some estimated the size and number of items, e.g. eggs consumed per year, whereas others gave the number of plants in a crop or the length and number of rows in which the crop was grown per year. The database converted these data into consumption rates (kg/y for food and l/y for milk) using a variety of conversion factors. These included produce weights (Hessayon, 1990 and 1997 and Good Housekeeping, 1994), edible fraction data researched by Cefas and information supplied by the Meat and Livestock Commission. For the purpose of data analysis, foodstuffs were aggregated into food groups as identified in Table 2. Specific food types relevant to this survey are presented in the subsequent tables.

All consumption and occupancy data in the text of this report are rounded to two significant figures to reflect the authors' judgement on the accuracy of the methods used. In the tables and annexes, the consumption rate data are usually presented to one decimal place. Occasionally this rounding process causes the row totals to appear slightly erroneous ($\pm$ 0.1). Consumption rates less than 0.05 kg/y are presented to two decimal places in order to avoid them appearing as 0.0 kg/y. External exposure data are quoted as integers.

To ensure the quality of the data collected during the survey fieldwork and presented in the report, the following procedures have been employed:

- Experienced scientific staff were used for fieldwork and data assessment. They had been trained in the techniques of interviewing and obtaining data for all pathways that were relevant to the survey being conducted. Where individuals offered information during interview that was unusual, they were questioned further in order to double-check the validity of their claims.
- Where possible, interviewees were contacted again to confirm the results of the initial interview if, when final consumption or occupancy rates were calculated, observations were found to be high in relation to our experience of other surveys, taking into account local factors.
- Data were manipulated in a database using a consistent set of conversion factors.
- Data were stored in a database in order to minimise transcription and other errors.
- Draft reports and data tables were formally reviewed by an experienced consultant in radiological protection.
- Final reports were only issued when the Environment Agency, the Food Standards Agency and the Health and Safety Executive were entirely satisfied with the format and content of the draft.

The habits data are structured into groups of activities with similar attributes. For example, when considering terrestrial food consumption, all types of root vegetables are grouped together in a food group called ‘root vegetables’. Similarly, for aquatic food consumption, all crustacean species are grouped as ‘crustaceans’. For external exposure over intertidal sediments, occupancy over a common substrate (for example, sand) is chosen. The choice of a group of activities is made when it is reasonable to assume that consistent concentrations or dose rates would apply within the group. In addition to grouping of activities, ingestion data are structured into age groups because different dose coefficients (i.e. the factors which convert intakes of radioactivity into dose) can apply to different ages. These age groups are from 0 to 1.0 y of age (called 3 month old); more than 1.0 y to 2.0 y (called 1 year old); more than 2.0 y to 7.0 y (called

5 year old); more than 7.0 y to 12.0 y (called 10 year old); more than 12.0 y to 17.0 y (called 15 year old). Individuals over 17 years old are treated as adults. These age groupings are consistent with those used in ICRP 72 (1996). For direct radiation pathways, the data are grouped into distance zones from the site perimeter as a coarse indication of the potential dose rate distribution due to this source of exposure. The bands used were: 0 – 0.25 km, 0.25 – 0.5 km and 0.5 – 1 km. These distance bands are also useful when assessing exposure to gaseous discharges.

3.2 Data analysis

The main output of the study is the statement of individuals' consumption, handling and occupancy rates given in Annexes 1 and 2. Annex 3 contains qualitative or estimated data to supplement Annexes 1 and 2. These can be used by those undertaking radiological assessments on the effects of the operation of the Dungeness site – taking into account the concentration and/or dose rate distributions in space and time relevant to the assessment. It is only with the outcome of such an assessment that the critical group can strictly be defined as those most exposed.

In addition to providing these data in the annexes, we have also analysed them to provide estimates of rates of occupancy, handling and consumption which can be regarded as typical of those most exposed prior to a formal assessment being undertaken. Two approaches are used.

Firstly, the 97.5 percentile rate was calculated for each group using the Excel mathematical function for calculating percentiles. This method accords with precedents used in risk assessment of the safety of food consumption. Mean and 97.5 percentile rates based on national statistics have been derived by the Ministry of Agriculture, Fisheries and Food (MAFF) (now part of Defra) and the Food Standards Agency (Byrom *et al.,* 1995 and FSA, 2002), and these are referred to as generic rates in this report. Secondly, the 'cut-off' method described by Hunt *et al.* (1982) was used. With the 'cut-off' method, the appropriate high rate was calculated by taking the arithmetic mean of the maximum observed rate and all rates observed within a

factor of three of the maximum value (termed the lower threshold value). It accords with the principle expressed by ICRP (ICRP, 1984) that the critical group should be small enough to be reasonably homogeneous with respect to age, diet and those aspects of behaviour that affect the doses received. In this report, the term critical group rate is used to represent the data derived by the 'cut-off' method for ease of presentation. A separate critical group rate was calculated for each food group or activity identified in the survey.

In exceptional cases the 'cut-off' method can result in only one member of the high rate group. In this case, judgement is used as to whether to include other individuals within the group.

In previous aquatic surveys (those undertaken prior to 2002) a factor of 1.5, instead of 3, was used to define the cut-off value for intertidal occupancy and handling. However, it is now considered appropriate that the same factor of 3 as for consumption is used. The factor reflects variations in the doses likely to be received due to natural variations in the interactions of radiations with tissues caused by, for example, differences in anatomy.

For ingestion pathways, high rates for children have been calculated from the survey data. However, because few child consumers were identified, the rates should be viewed with caution. For assessment purposes, an alternative, theoretical approach may be taken which involves scaling the critical group rates for adults by ratios. These ratios are given in Annex 4 and have been calculated using generic 97.5 percentile consumption rates.

Selection of 97.5 percentile and critical group rates for occupancy is not made for the direct radiation pathway. Such an analysis is of limited value without a detailed knowledge of the spatial extent of dose rates due to direct radiation.

For the purposes of assessing total dose integrated across all pathways, the data from the survey can be further analysed to take into account the degree of overlap of each pathway. This is discussed further in Section 7 and data to undertake a total dose assessment are provided in Annex 5. Data from Annex 3 are not included in Annex 5.

4 AQUATIC RADIATION PATHWAYS

4.1 Aquatic survey area

The aquatic survey covered all coastline and intertidal areas between Fairlight and Folkestone (Figure 1) and all waters inshore of the shipping channel.

Fairlight, Pett Level and Winchelsea

Fairlight marked the western extent of the aquatic survey area. The shore was a muddy, shingle substrate with a few rocky outcrops further out to sea. Access to the shoreline from the village of Fairlight was difficult as there were 50 m high cliffs bordering the shore.

Pett Level and Winchelsea Beach combined to form a 4 km stretch of coastline. Pett Level was easily accessible for people travelling by car because there was a road running parallel with, and very close to, the beach. Parking in lay-bys was free and unlimited. At high tide, the beach consisted of a steep, shingle bank but at low tide a flat beach of sand with some mud was exposed. Beach sports such as kite boarding, popular elsewhere in the survey area, were not possible at Pett Level or Winchelsea due to the groynes, pools of water, and rocky outcrops on the beach. Dog walking, walking, keddle and set netting, beach angling and commercial bait digging were, however, noted on these beaches. A small boat angling club with approximately 30 members was located at Pett Level. Their angling boats were kept on the shingle above the high water mark. The club secretary said that members would probably fish up to 20 boat sessions annually in addition to fishing from the beach in this area.

Rye Harbour and Rye

The Rye Harbour Nature Reserve is located between Winchelsea Beach and the west bank of the River Rother. The boundary of the nature reserve in a seaward direction is the high tide

line. Wildfowling was allowed on parts of the reserve but as no wildfowling clubs owned the right to shoot there, it was only used by individual wildfowlers who were not affiliated to a club.

Rye Harbour is a small village situated on the west bank of the River Rother approximately 1.5 km inland from the coast. Four commercial and several pleasure angler's boats were moored at Rye Harbour. Due to the large tidal range here, the boats were afloat at high tide and aground on soft mud at low tide. There was a small amount of tide-washed salt marsh on both banks of the river at Rye Harbour and upstream towards Rye. No wildfowling activity was noted in the area. Rye RNLI station, Rye Sailing Club and a public slipway were all situated on the west bank of the River Rother at Rye Harbour. The Harbour Master's Office and patrol boat were situated on the east bank opposite the village. In addition, the Lydd Military Range patrol vessels were moored here.

The town of Rye was very popular with tourists. It is situated approximately 3.5 km from the coast up the River Rother at the confluence with the River Brede. The majority of the Rye fishing fleet and two fish wholesalers were located at the Fish Quay here. The fishing boats, approximately 20 in number, were a mixture of small set/trammel netters and larger scallop dredgers and trawlers. The River Brede at Rye contained moorings and two boat yards, one of which contained a boat that was used as a dwelling. As with Rye Harbour, boats moored at Rye were grounded on soft mud at low tide due to the large tidal range.

Camber Sands and Broomhill Sands

To the east of the River Rother is Camber Sands – a vast sandy beach. Camber Sands was very popular with tourists because the village of Camber offered a lot of holiday accommodation, especially for families. Access by car was good as there was a large car park separated from the beach by sand dunes. The large tidal range meant that there could be up to a kilometre of beach between the sand dunes and the water's edge. The beach was very convenient for families with children playing on the beach.

To the east, Camber Sands merges into Broomhill Sands, another sandy beach with good vehicular access. It was very popular for people engaged in sports such as kitesurfing and kite-buggying because these activities were not permitted at Camber Sands where they were considered a hazard to other beach users. When the wind conditions were favourable, reportedly there were up to 100 kites per weekend day in total at this location and at Jury's Gap further east.

Jury's Gap, Lydd Military Range, Galloways and Denge Marsh

At Jury's Gap, the sand began to get stonier and the beach was more popular with anglers. Just to the east of Jury's Gap is the Lydd Military Range, which coveres a 7 km long stretch of shoreline. There was a footpath running through the range alongside the shore all the way from Jury's Gap in the east to Denge Marsh in the west. The eastern quarter of this path was not an official public right of way, but the western three quarters was, so the Ministry of Defence allowed public access along the entire length of the path. The most common users of the path were walkers from the holiday accommodation at Camber and anglers. During firing times, access to the path was prohibited. The military firing range and exclusion zone for vessels extended approximately 4 km out to sea but during times of no firing, boats were able to enter range waters.

A road, which led to a lookout tower, bisected the Lydd Military Range with a main section in the west and a smaller section in the east. The beach at the end of the road was known locally as Galloways and was popular with anglers.

Denge Marsh is the name of the beach immediately east of Lydd Military Range at the end of Dengemarsh Road. The last part of this road was unmade and was very bumpy but the beach was still very popular with anglers. Cars could be parked on the shingle. On one occasion during the survey, about 35 anglers were observed, all within about 500 metres of the car park. The beach was part of a large shingle bank, which continued in front of the power stations.

Dungeness

The shoreline in front of the Dungeness power stations and around the tip of the peninsula to Dungeness Point was a shingle bank, which began at Denge Marsh. The shingle bank dropped off steeply towards the sea and the water depth increased quickly, which meant that it was popular with anglers but that very few other activities took place there. Parking for members of the Dungeness angling club was available via a track onto the shingle at Dungeness Point but many non-members also used this area to park. A fishing tackle shop selling locally dug bait and offering boat angling trips was located in Dungeness village so was conveniently located for anglers.

The Dungeness commercial fishing fleet, which consists of about eight active boats, all under 10 m in length, land their boats directly on the beach at Dungeness Point with boats winched out of the water well above the high tide line. The Dungeness boats fish mainly for Dover sole in the summer and cod and whiting in the winter using trawls and trammel nets. As well as the active boats, there were also several disused boats at Dungeness Point.

Four charter boats operated from Dungeness. They took angling parties out for rod and line fishing trips and generally caught a wide mixture of fish including cod, whiting and mackerel.

Dungeness Beach (located round the peninsula to the north of Dungeness Point) was a shingle beach at high tide and a sandy beach at low tide. The Dungeness RNLI station was located on the shingle. The station had one life boat, two full-time employees and 22 volunteers aged between 18 and 55. The training consisted of exercises every fortnight where one third of the volunteers went out on the boat and the other two thirds stayed on the beach. The station dealt with approximately 15 call-outs per year.

Lydd-on-Sea, Lade, Greatstone-on-Sea and Littlestone-on-Sea

The beaches at Lydd-on-Sea, Lade, Greatstone-on-Sea and Littlestone-on-Sea form one continuous beach. In the south, the top of the beach was shingle but vast areas of sand were exposed at low tide. At Greatstone-on-Sea and Littlestone-on-Sea, the shingle ceased so the beach was just sand with gradually more mud in the sand towards the north. Access to the beaches was easy because there was a coast road running alongside the shoreline and car parks at Lade, Greatstone-on-Sea and Littlestone-on-Sea. The whole stretch was popular with anglers, commercial and private bait diggers and walkers.

At Lydd-on-Sea there was a combined fish merchant and wet-fish shop. The merchant bought fish and shellfish from six commercial fishermen at Dungeness and one at Rye and bought in fish from further afield when it was not available locally. The shop also sold locally dug bait.

Kite sports and other water and beach sports were as popular along this stretch of coastline as at Broomhill Sands. As these sports are heavily dependent on the direction of the wind, people tended to go to either one or the other area. Conditions would only be conducive for kite sports at one of the beaches at a time because one faces south and one faces east. Instructors from two kite sports clubs in Kent, who brought groups of students to this stretch of beach for tuition, were interviewed here but they also use the Broomhill Sands stretch of beach depending on the weather conditions.

At Lade, a commercial fyke netter set two lines of nets for eels by wading out into the water from the beach. He only worked on a part-time basis and he was the only eel fisherman in the whole survey area. A few small, non-commercial boats were landed on the shingle at Lade but these were seldom used. A wooden boardwalk had been created leading from the car park at Lade out to the beach in order to protect the shingle ecosystem.

Greatstone-on-Sea beach was very popular with tourists and holidaymakers as there was no shingle as with the beaches further south or mud as with Littlestone-on-Sea to the north. There was a fishing tackle shop in Greatstone-on Sea.

Varne boat club and an RNLI station were located in Littlestone-on-Sea. Each had their own slipway so all boats were kept on land when not in use. The Varne boat club had about 70 boats in its boat angling section, 40 in the jet-skiing section and a few power boats and sailing boats. The RNLI had one fast response life boat at Littlestone.

St. Mary's Bay and Dymchurch

There was little activity on the beach between Littlestone-on-Sea and St. Mary's Bay as there was no vehicular access. There were many groynes on the beach making it unsuitable for kite sports.

St. Mary's Bay was a quiet beach despite good access from the road. The substrate was sand and mud with many groynes protecting the beach.

Dymchurch was more touristy and built-up. It was a sandy beach at low tide with a promenade along its length. At high tide however, there was no real beach as the water came right up to the promenade and sea wall. A public slipway at Dymchurch was used by jet-skiers and a few boat anglers at high tides. Swimmers were observed at Dymchurch at high tide and at low tide people were seen paddling.

A stall selling seafood was noted but the produce being sold was from outside the survey area.

To the north of Dymchurch was a 1.5 km stretch of coastline where the sea defence system was being repaired. This work involved approximately 50 workers spending time on the intertidal area, some of whom were also handling sediment as part of their work. The sea defence repair

work was scheduled to last for about 6 months in 2005 but may have overrun into 2006. Times for these people may not be relevant in future years.

Hythe and Sandgate

The Hythe Military Range coveres 2.8 km of the shoreline between Dymchurch and Hythe. No military personnel spent time on the intertidal areas. There was a public right of way along the shoreline in the range and this was popular with anglers and dog walkers. As with the Lydd Military range, this path was closed during firing times. The danger area around the range extended out to sea but the Ministry of Defence had an arrangement with four fishermen who were allowed to fish within the range area during times when the military were not firing. During the survey, the footpath through the range was only accessible from the eastern side because the sea defence repair work was blocking access to the path from the west.

On the east side of Hythe Ranges, the Martello Towers mark the start of Hythe Beach. Four fishing boats were observed near the towers that were winched onto the shingle beach above high water mark, two of which were commercial fishing boats.

Between Hythe and Sandgate, the beach was shingle at high tide and sand and shingle at low tide. There was good access as a road ran parallel to the beach and there was good parking. Locals and tourists were often observed along the whole stretch of the beach. The area was extremely popular with anglers and dog walkers, and when the weather was good, people were observed sunbathing, paddling and swimming.

This was an active area for water sports. A diving club was based in Hythe whose members were regularly diving in the survey area. The members of a dinghy sailing and windsurfing club, also based in Hythe, regularly used the area between March and October. The dinghies and windsurf boards were kept on land, in a compound at the clubhouse which backed onto the shingle beach. People were observed kitesurfing, jet-skiing and canoeing near the Hythe

Imperial Hotel. There was also a rowing club based in Sandgate whose members regularly row between Sandgate and Hythe.

Folkestone

The shingle and sand beach was continuous between Sandgate and Folkestone Pier. This stretch of beach also had good access and was popular with anglers, dog walkers, sunbathers and swimmers. Anglers were regularly observed fishing from several rocky breakwaters off Folkestone Beach. The main angling location in the area was Folkestone pier, which was used regularly by locals and people from outside the area.

Folkestone Harbour was split into an inner and outer harbour by a railway bridge; small boats could pass underneath the bridge. The harbour was tidal and at low tide mud was exposed in both the inner and outer harbours. In the outer harbour, approximately 10 commercial fishing boats all under 10 metres were moored. There was a public slipway where people were observed launching jet skis and jet skiing outside the harbour. A bait digger was interviewed in the outer harbour at low tide, digging for lugworm and rag worm non-commercially. In the inner harbour, small sailing boats, pleasure boats, small fishing boats, dive boats and sea angling charter boats were moored. There was also a public slipway in the inner harbour. A combined fish wholesaler and wet fish shop located in the harbour bought fish from the local boats; some of their catch was from the survey area. Several kiosks in the harbour also sold shellfish from the survey area. East of Folkestone Harbour was a sandy beach which was observed to be popular on many occasions with people playing, sunbathing, swimming.

4.2 Commercial fisheries

The commercial fishing industry in the survey area was active in comparison with much of the UK and it encompassed a wide range of fishing methods. It was estimated that there were approximately 50 commercial boats operating from the survey area. The majority of the commercial boats were moored in harbours at Rye Harbour, Rye Fish Quay or Folkestone but at Dungeness and Hythe boats were landed on the beaches above the high tide line. Interviews

were conducted with skippers of 30 commercial fishing boats, of which 15 were based in Rye, eight were based in Folkestone, six were based at Dungeness and one was based in Hythe.

The most common commercial fishing methods used in the area were dredging, trawling, gill netting and trammel netting and smaller amounts of potting. A lot of fishermen used more than one fishing method during the course of the year. Dredging was undertaken for king scallops (*Pecten maximus*). Netting, such as trawling, gill netting and trammel netting, was for mixed fish – predominantly flatfish such as plaice (*Pleuronectes platessa*), soles and dab (*Limanda limanda*) in summer and cod (*Gadus morhua*) in winter. Two commercial fishermen who fished part time used drift nets for herring (*Clupea harengus*), mackerel (*Scomber scombrus*) and sprat (*Sprattus sprattus*). Two fishermen went potting for whelk (*Buccinum undatum*), crab (*Cancer pagurus*) and lobster (*Hommarus gammarus*) in the summer.

In addition to commercial fishing from a boat, six people with licenses to use keddle nets around the River Rother area were interviewed. Four of these were actively using their licenses during the summer to catch herring and mackerel. One part time commercial fisherman with permission to use fyke nets to catch European eel (*Anguilla anguilla*) at Lade was interviewed. Fyke nets and keddle nets are both set up at right angles to the shoreline and operated on foot from the beach.

Although not a commercial fishery, several commercial bait diggers operated in the area. Numbers were difficult to ascertain because the bait diggers worked over all the beaches between Winchelsea and Dymchurch at low tide when sand or sand and mud was exposed. Some were full-time and others were part-time but there was a core of approximately 15 people involved. The majority used suction pumps, primarily to collect black lugworm but also some blow lugworm. One or two still dug for worms with garden forks.

4.3 Angling and hobby fishing

Shore angling was very popular in the survey area. The most popular angling locations were Folkestone Pier, beaches at Sandgate and Hythe and Dungeness Point, and the survey team regularly saw at least 15 people at a time fishing in these places. Several people also fished on the beaches at St. Mary's Bay, Greatstone-on-Sea, Littlestone-on-Sea, Lade and Denge Marsh. A few people also fished on beaches towards the west of the survey area such as Galloways, Jury's Gap, Winchelsea Beach, Rye and Pett Level. Although there is no requirement to belong to an angling association in order to go fishing from the beach, the Dungeness Angling Association had about 600 members – some local and some who travel to the area to fish.

Angling from boats was also very popular. There were at least three boat angling clubs in the survey area representing about 120 members in total, of which about 30 were keen, regular anglers. There were also other clubs to the east and west of the survey area whose members came into the survey area to fish. Many people from the boat angling clubs had their own boats and for those who did not, there were club boats or charter boats, which could be used.

The survey team identified eight charter angling boats operating from the coastline in the survey area. There were four at Dungeness, three at Rye and one at Folkestone. In addition, there was one based in Dover who regularly took groups fishing within the survey area. These charter fishermen had a customer base of several hundred anglers between them.

The most abundant fish species caught by anglers were mackerel, bass (*Dicentrarchus labrax*), whiting (*Merlangius merlangus*), cod, Dover sole (*Solea solea*), dab and plaice. Other fish species caught to a much lesser extent were lesser spotted dogfish (*Scyliorhinus canicula*), pouting (*Trisopterus luscus*), pollack (*Pollachius pollachius*), European eel, black bream (*Spondyliosoma cantharus*), flounder (*Platichthys flesus*), wrasse (*Labrus bergylta*), lemon sole (*Microstomas kitt*) and herring.

Two individuals went hobby fishing; they both used commercial boats, which had not yet been de-licensed, but they did not sell their catch. It was shared with family and friends. One of the fishermen used drift nets to catch herring and mackerel and kept his boat on Dungeness Beach. The other fisherman trawled for plaice in summer and used gill nets for cod in winter and kept his boat on Littlestone-on-Sea Beach.

At least twelve men were identified who went push netting for brown shrimps (*Crangon crangon*) and of these people, nine were interviewed. Dungeness Beach and Lydd-on-Sea Beach were the most common locations for this hobby but one person also used Littlestone-on-Sea Beach and one used the Camber Sands/Jury's Gap area. Two of the nine push netters interviewed sold the excess of their catch from the door to local customers. All the push netters gave excess shrimps away to friends and family.

No individuals were noted to be collecting molluscs from the survey area (other than the commercial collection of whelks and king scallops mentioned earlier). In particular, as specifically requested by the customer, the collection and consumption of cockles from Greatstone-on Sea and Littlestone-on-Sea beaches was investigated but none was found.

4.4 Wholesalers and retailers

The majority of the fish and shellfish from the survey area was being sold to one of three wholesalers; two in Rye, and one in Folkestone. In the main, the wholesalers in Rye bought from the Rye and Dungeness boats and the wholesaler in Folkestone bought from the Folkestone boats. Two of the wholesalers sold some of their produce to the public through wet fish shops they had at their premises. The majority of the fish and shellfish was either sold by the wholesalers nationally or exported to France and Belgium. They also sold smaller amounts of fish and shellfish to fishmongers or hotels in Kent and East Sussex

Two fishmongers selling locally caught produce operated in the area – one had a shop in Lydd-on-Sea and one had a shop in Hythe and a mobile fish van. Both fishmongers had licensed

fishing boats so they sold their own catch and one also bought from several other fishermen in the area.

One fisherman had a stall selling his catch at Folkestone Harbour and the only the excess was sold to the wholesaler in Folkestone. There were four other stalls selling shellfish directly to the public near the harbour in Folkestone. Some of the whelks they were selling were from the survey area but the crab and lobster were not.

The commercial fyke netter jellied some of the eels he caught and sold them to several seafood stalls outside the survey area in Kent. Some were smoked and sold at a smokehouse at Dungeness.

4.5 Wildfowl

The shoreline along the aquatic survey area was predominantly sand or shingle. The only areas of salt marsh identified were small patches on the banks of the River Rother downstream from Rye but the survey team found no evidence of wildfowling there. No wildfowling clubs had rights to shoot within the survey area but individual wildfowlers were reported to shoot at the Rye Harbour Nature Reserve. The reserve manager reported that there were a maximum of 6 male individuals involved. The wildfowlers do not have any occupancy over intertidal areas themselves but do shoot birds from these areas. Wildfowling at the reserve is unregulated so there are no bag limits. As these individuals were not part of a wildfowling club they proved difficult to contact but since there are no bag limits is it likely that they consume some wildfowl.

4.6 Other Pathways

The use of seaweed from the survey area was investigated. Seaweed trapped on the cooling water intake screens was macerated and put back out to sea but in general, there was very little seaweed washed up along the aquatic survey area. No evidence of it being used as a fertilizer

or as livestock feed was found. Two consumers of sea kale were identified. Further details are given in Section 4.7.

Sheep were seen grazing on the tide-washed area on the eastern bank of the River Rother but no occupancy rates or details were ascertained from the farmer.

4.7 Internal exposure

Consumption data for locally caught aquatic foodstuffs are presented in Tables 3 to 6 for adults and in Tables 7 to 9 for children. The tables include the mean consumption rates of the critical groups together with the observed 97.5 percentile rates calculated as described in Section 3.2. No consumption of wildfowl was noted and no child consumers of marine plants and algae were found. For purposes of comparison, the data are summarised in Table 10 for adults and Tables 11 to 13 for children (15 year olds, 10 year olds and 5 year olds respectively). No children in the 1 year old and 3 month old age groups were noted to be consuming any locally caught seafood. The summary tables also include mean rates and 97.5 percentile rates based on national data (referred to as 'generic' data in this report) but no generic data are available for the 5 year old age group.

Adult consumption rates

The people consuming the greatest quantities of food from the aquatic survey area were commercial fishermen, charter boat skippers, hobby fishermen and anglers and friends and families of these people.

The predominant species of fish consumed by adults were cod, mackerel, Dover sole, plaice, herring, bass, dab and whiting together with smaller quantities of thornback ray (*Raja clavata*), lesser spotted dogfish, lemon sole, European eel, spurdog (*Squalus acanthius*), sprat, grey gurnard (*Eutrigla gurnardus*), flounder, huss (*Scyliorhinus stellaris*), pouting, grey mullet (*Chelon labrosus*), brill (*Scophthalmus rhombus*), bream, turbot (*Scophthalmus maximus*), pollack, red

mullet (*Mullus surmuletus*) and John Dory (*Zeus faber*). A critical group of 25 individuals was identified with a maximum consumption rate of 120 kg/y and a mean of 51 kg/y. The observed 97.5 percentile rate based on 235 observations was also 51 kg/y. This compares with the adult generic mean and 97.5 percentile consumption rates for fish of 15 kg/y and 40 kg/y respectively. The percentage breakdown of species eaten by the critical group was 15% herring, 15% cod, 15% Dover sole, 10% plaice, 5% mackerel, 5% dab, 5% bass and 30% other species as named in Table 3. These percentages, rounded to the nearest 5%, are based on the total amount of fish consumed by this group and exclude observations for 'mixed fish'.

The only species of crustaceans consumed by adults were crabs, brown shrimps and lobsters. A critical group of 18 individuals was identified with a maximum consumption rate of 16 kg/y and a mean of 9.3 kg/y. The observed 97.5 percentile rate based on 83 observations was 14 kg/y. This compares with the adult generic mean and 97.5 percentile consumption rates for crustaceans of 3.5 kg/y and 10 kg/y respectively. The percentage breakdown of species eaten by the critical group, rounded to the nearest 5%, was 50% brown shrimps, 40% crabs and 10% lobsters.

The only species of molluscs consumed by adults were king scallops and whelks. A critical group of eight individuals was identified with a maximum consumption rate of 34 kg/y and a mean of 17 kg/y. The observed 97.5 percentile rate based on 65 observations was 20 kg/y. This compares with the adult generic mean and 97.5 percentile consumption rates for molluscs of 3.5 kg/y and 10 kg/y respectively. The only species eaten by the critical group was king scallops.

Two people were found to be consuming small quantities of sea kale from the shingle near the power station. Picking sea kale is not permitted as it is a protected species, therefore it is possible that more people were consuming sea kale but did not disclose it during the survey. A critical group of two individuals was identified with a maximum consumption rate of 0.45 kg/y and a mean of 0.33 kg/y. The observed 97.5 percentile rate based on two observations was 0.45 kg/y. There are no generic consumption rates with which to compare these results.

Children's consumption rates

15 year old age group

For fish, a critical group of three individuals was identified with a maximum consumption rate of 35 kg/y and a mean of 29 kg/y. The observed 97.5 percentile rate based on 15 observations was 32 kg/y. This compares with the generic mean and 97.5 percentile consumption rates for fish of 6.5 kg/y and 20 kg/y respectively.

For crustaceans, a critical group of three individuals was identified with maximum and mean consumption rates of 4.5 kg/y. The observed 97.5 percentile rate based on five observations was also 4.5 kg/y. This compares with the generic mean and 97.5 percentile consumption rates for crustaceans of 2.5 kg/y and 6.0 kg/y respectively.

For molluscs, a critical group of three individuals was identified with maximum and mean consumption rates of 20 kg/y. The observed 97.5 percentile rate based on five observations was also 20 kg/y. This compares with the generic mean and 97.5 percentile consumption rates for crustaceans of 2.5 kg/y and 6.0 kg/y respectively.

10 year old age group

For fish, a critical group of five individuals was identified with a maximum consumption rate of 35 kg/y and a mean consumption rate of 24 kg/y. The observed 97.5 percentile rate based on 20 observations was 32 kg/y. This compares with the generic mean and 97.5 percentile consumption rates for fish of 6.0 kg/y and 20 kg/y respectively.

For crustaceans, a critical group of five individuals was identified with a maximum consumption rate of 4.6 kg/y and a mean consumption rate of 3.5 kg/y. The observed 97.5 percentile rate based on 10 observations was 4.6 kg/y. This compares with the generic mean and 97.5 percentile consumption rates for crustaceans of 2.5 kg/y and 7.0 kg/y respectively.

For molluscs, a critical group of two individuals was identified with a maximum consumption rate of 20 kg/y and a mean consumption rate of 14 kg/y. The observed 97.5 percentile rate based on five observations was 18 kg/y. This compares with the generic mean and 97.5 percentile consumption rates for molluscs of 2.5 kg/y and 7.0 kg/y respectively.

5 year old age group

For fish, a critical group of two individuals was identified with a maximum consumption rate of 8.0 kg/y and a mean consumption rate of 6.9 kg/y. The observed 97.5 percentile rate based on five observations was 7.8 kg/y. No generic consumption rates have been derived for this age group.

For crustaceans, a critical group of two individuals was identified with maximum and mean consumption rates of 0.40 kg/y. The observed 97.5 percentile based on two observations was also 0.40 kg/y. No generic consumption rates have been derived for this age group.

For molluscs, a critical group of one individual was identified with a consumption rate of 3.7 kg/y. The observed 97.5 percentile is not applicable for one observation. No generic consumption rates have been derived for this age group.

4.8 External exposure

Intertidal occupancy

Table 14 shows the intertidal occupancy data recorded during the survey. The four types of intertidal substrate in the survey area where public occupancy was identified were salt marsh, sand, sand and mud, and sand and stones. In addition, the table contains data for houseboat dwelling occupancy rates, the values being when the boats were in contact with the substrate at

low tide. It should be noted that dependent on the material with which the hull is constructed and the thickness, its shielding effect will differ from boat to boat.

The only occupancy rate recorded over salt marsh was 150 h/y for an angler. This rate represents the critical group intertidal occupancy rate over salt marsh.

The maximum occupancy rate recorded over sand was 2000 h/y for nine men working on the shore repairing sea defences. This work is scheduled to last for 18 months so is not a permanent intertidal activity. Fifty-three other people (45 men working on the sea defence project, five bait diggers, one angler, one shore worker and one dog walker) had occupancy rates within a factor of three of this giving a mean occupancy rate for this group of 1600 h/y.

The maximum occupancy rate recorded over sand and mud was 2000 h/y for someone who does bait digging and angling. Four other bait diggers had occupancy rates within a factor of three of this giving a mean occupancy rate for this group of 1500 h/y.

The maximum occupancy rate recorded over sand and stone was 1000 h/y for an angler. Eighteen other individuals (13 anglers, two walkers, one shore worker, one angler/beach cleaner and one angler/shore worker/ beach comber) had occupancy rates within a factor of three of this. This gives a mean occupancy rate for this group of 590 h/y.

The one occupancy rate recorded for houseboat dwelling, when the boat was on mud as opposed to floating, was 3900 h/y. This rate represents the critical group occupancy rate for housebout dwelling on mud.

Handling

Handling sediment, while bait digging or mollusc collecting, or handling commercial fishing gear, which has become entrained with fine sediment particles, can give rise to skin exposure from beta radiation. This needs consideration even though the annual dose limit for skin is a factor of

50 times higher than that for effective dose. There is also a contribution to effective dose due to skin exposure (ICRP, 1991).

Handling of angling equipment was not considered to be a significant pathway. Therefore, as in previous surveys, data for this pathway were not collected.

Fishing gear can also be a source of whole body gamma exposure due to occupancy in the vicinity of the gear. However this pathway is minor compared with the same exposure received during occupancy over intertidal areas and it has therefore been omitted from the report.

Table 15 shows the times spent handling fishing gear and intertidal sediment recorded during the survey.

The maximum fishing gear handling rate recorded was 1800 h/y for two commercial fishermen. Thirty-two other commercial fishermen had gear handling rates that came within a factor of three of this. This gives a mean handling rate for this group of 1100 h/y.

The maximum sediment handling rate recorded was 2000 h/y for a bait digger. Nine other bait diggers had sediment handling rates within a factor of three of this. This gives a mean handling rate for this group of 1200 h/y.

Gamma dose rate measurements

Representative gamma dose rate measurements at 1 m above the substrate were taken over mud, sand, sand and mud, sand and stones and salt marsh. These measurements (shown in Table 16) ranged from 0.042 μGy/h over sand and stone to 0.066 μGy/h over mud. Natural levels of around 0.05 and 0.07 μGy/h are expected over sand and mud respectively. A value of 0.06 μGy/h is expected for all other substrate types.

4.9 Water based activities

Activities taking place in or on the water can lead to ingestion of water and/or inhalation of spray. These pathways are generally considered to be minor in comparison with other exposure pathways such as the ingestion of foods produced in the vicinity of a nuclear site. However, in order to allow for their assessment, relevant data have been collected.

Occupancy rates for activities taking place in or on seawater or freshwater around Dungeness are shown in Table 17.

Freshwater within 5 km of the site centre can only be affected by washout of gaseous discharges. However in order to keep all observations for time spent in and on water together, they are presented in Table 17 and discussed here in the aquatic section. The text highlights the fact that these observations relate to freshwater and therefore to the terrestrial survey area and in the table the terrestrial observations are shown in italics.

Table 17 includes eight children. No further manipulation of the data (for example, calculating critical group rates) has been carried out. It should be noted that a lot of the data was gained through interviews with representatives from the RNLI, diving clubs, water sports clubs, etc. providing generic figures for their members.

Activities in the water

Activities taking place in seawater around Dungeness included push netting for shrimps, fyke netting for eels, kitesurfing, windsurfing, diving, swimming and paddling. One hundred and seventy-eight observations were recorded. The people with the highest occupancy rates were a group of 10 kitesurfers with 520 h/y.

The only activities observed taking place in freshwater around Dungeness were for users of the Lydd Water Sports Centre situated on Dengemarsh Road. Water sports instruction was given in

water-skiing, wake boarding and jet ski-ing. Two adult instructors had the highest occupancy rates with 130 h/y. In addition to the 72 keen adult members listed in Table 17 with occupancy rates of 39 h/y there were also about 8 keen members between the ages of 6 and 17 with the same occupancy rates. They have not been entered in the table or Annex 2 because insufficient data was available as to their exact ages. There were also a further 170 members at the Lydd Water Sports Centre with lower occupancy rates in water who have not been entered in Table 17 or Annex 1.

Activities on the water

Activities taking place on seawater around Dungeness included commercial fishing, charter boat skippering, sea angling, boating to and from dive sites, RNLI duties, working on a military range safety boat, living on a houseboat, jet-skiing, yachting, rowing and canoeing. Three hundred and fifty-two observations were recorded. The highest occupancy rate was 3000 h/y for a commercial fisherman.

Activities taking place on freshwater around Dungeness were again restricted to instructors and members of Lydd Water Sports Centre. The highest occupancy rates were 1200 h/y for two adult instructors. The keen adult members had occupancy rates on freshwater of 39 h/y. As with occupancy in freshwater, there were about eight children with occupancy rates of 39 h/y and many other members with lower occupancy rates on water who have not been entered into Table 17 or Annex 2.

5 TERRESTRIAL RADIATION PATHWAYS

5.1 Terrestrial survey area

The terrestrial survey area covered all land and watercourses within 5 km of the site centre (NGR TR 083 168) as shown in Figure 2. The Dungeness site is located to the west of Dungeness village, which is surrounded to the south and east by the English Channel. Land to the north and west of the power stations is dominated by vast areas of shingle. Denge Marsh, to the west, is part of the Lydd Ranges – a military training area. Land to the north of Dungeness is used for farming and to the north-west the survey area contains many small bodies of freshwater formed when shingle was extracted for use elsewhere. Many of these pits are now managed by the RSPB. Most of the area is a designated National Nature Reserve (NNR).

The closest town is Lydd, which is located just outside the survey area to the north-west. Two roads (Dungeness Road and Dengemarsh Road) and a train line traverse the survey area from Lydd towards Dungeness. The only other roads are a minor road leading south from Lydd, along the edge of the Lydd Ranges and then on through the ranges to a beach called Galloways, and a main road running from north to south along the east coast.

Habitation in the terrestrial survey area is sparse and is mainly constrained to a narrow strip of land up to 500 metres from the east coast. Four villages are situated along this coast: Greatstone-on-Sea in the north through to Lade and Lydd-on-Sea and finally to Dungeness at the tip of the peninsula near the power stations. In addition, there are a few outlying houses located along Dungeness Road and Dengemarsh Road.

Five farmers had farms or farmland within 5 km of Dungeness. Of these:

- Two had sheep and arable crops
- One had sheep and chickens and ducks for eggs
- One had sheep only

- One had arable crops only

There were also two smallholdings:

- One kept small amounts of beef cattle, chickens for meat and eggs, ducks and geese for eggs, and hay.
- One kept small amounts of beef cattle, potatoes and hay

One private residence kept chickens and ducks for the eggs and sold the eggs to local customers.

All of the cattle and most of the lambs were sold to Ashford livestock market but a few lambs were sold to an abattoir in Tunbridge Wells. The chicken, chicken eggs and duck eggs were sold directly to local customers from the door. No geese eggs were sold. The arable crops included wheat, beans, oil seed rape, potatoes, peas and linseed although not all of these were grown in the survey area in any one year. With the exception of some of the potatoes sold at the smallholdings, and some of the hay sold locally, all the arable crops were sold to national merchants or used as winter feed.

One sheep farmer and his extended family consumed lamb from the farm. No local beef was consumed by anyone interviewed in the survey area. Chicken meat was consumed by three people at the smallholding where poultry was kept. At the 3 locations mentioned above where poultry was kept, eggs from chickens and geese were consumed. One other household also kept chickens solely for their own consumption of eggs, and a further four households consumed eggs bought from the private residence that was selling eggs.

The Lydd allotment site, where there were approximately 35 tenants, was located on the edge of the terrestrial survey area. The allotments were the main place where fruit and vegetables were grown within 5 km of Dungeness because elsewhere the shingle substrate meant that people had little or poor soil in their gardens. However, certain people had imported soil, used

grow bags or pots, or built up compost over the years, in which to grow fruit and vegetables at their residences.

Four beekeepers were identified in the survey area. The number of hives per beekeeper ranged from one to 35 with the total number of hives between them being 44. One beekeeper kept bees in their garden and the other three kept them on farmland. Locally produced honey was sold at three retail outlets in the survey area – the Smokery in Dungeness, the fishmongers in Lydd-on-Sea and a smallholding on Dungeness Road. It was also sold at outlets outside the survey area and to local customers. The beekeepers and their families consumed honey from the hives and excess was given to other family members and friends.

Consumption of wild foods included blackberries, pears, sloes and mushrooms. Mushrooms were collected either from farmland or from the shingle around Dungeness. Blackberries grew wild around the allotments as well as on the shingle around Dungeness. Three consumers said they ate wild pears from a tree in Dungeness and sloes were eaten by one resident in the direct radiation survey area. Game was only consumed by two households. One was a farmer who consumed a few partridge from a commercial shoot on his land. The other was an allotment tenant who shot one partridge a year from the allotment and about 10 rabbits a year from the military shooting range.

Incidences of freshwater angling were not identified by the survey team. This was probably because angling was not allowed in the NNR pits and because there was so much scope for sea angling in the vicinity. As a result, no consumption of freshwater fish was identified.

To the south of Lydd, but just inside the terrestrial survey area, is Lydd Water Sports Centre. The lakes used for water sports instruction are freshwater lakes so any occupancy rates in or on water will be relevant to gaseous discharges from the site. However, the rates are discussed in section 4.7 of the aquatic survey section.

The Lydd allotments were not supplied with mains water and so the primary water supply was well water. This was the only use of groundwater identified in the survey. No livestock were reported to be drinking ground water from wells boreholes or springs.

The transfer of contamination from Dungeness by wildlife was investigated. At site meetings mentioned in Section 2.4, staff were asked if they were aware of wildlife that could act as carriers for the transfer of radioactivity off site. Rabbit populations around the site had increased as a result of foxes in the area being culled. The site did have a “rabbit-proof fence” but this was not completely effective. Due to the sensitivity of the neighbouring NNR and RSPB reserve, the site was limited as to how it could cull the rabbits. Only one person ate rabbit, which was caught on the Lydd Military Range. Pigeons were culled by shooting, using nets and by a hawker. The dead pigeons were incinerated. No consumption of pigeon was noted.

5.2 Wholesalers and retailers

No terrestrial food wholesalers and only three food retailers were located within the survey area (other than the farms, small-holdings and private residences discussed above). The fishmongers in Lydd-on-Sea and The Smokery in Dungeness both sold local honey. The third retail outlet was in Dungeness; it sold eggs and vegetables, which were produced outside the 5 km survey area.

5.3 Internal exposure

Consumption data for locally produced foodstuffs potentially affected by gaseous discharges are presented in Tables 18 to 29 for adults and Tables 30 to 38 for children. These tables include the mean consumption rates of the critical groups together with the observed 97.5 percentile rates calculated as described in Section 3.2. For purposes of comparison, the data are summarised in Table 10 for adults and in Tables 11 to 13 for children (15 year olds, 10 year olds, 5 year olds respectively). No children in the 1 year old or 3 month old age groups were noted to be consuming locally produced foods potentially affected by gaseous discharges.

In order to provide information relevant to surveillance and assessments studies, the consumption rate data collected during the survey were analysed to indicate which food types most commonly contributed to each food group. The data are summarised in Table 39. Those food types shown in bold and labelled with an asterisk were sampled as part of the 2004 Food Standards Agency monitoring programme (EA, EHS, FSA and SEPA, 2005).

Adult consumption rates

Consumption of locally produced foods was identified in the following 12 food groups: green vegetables, other vegetables, root vegetables, potato, domestic fruit, sheep meat, poultry, eggs, wild/free foods, rabbits/hares, honey and wild fungi. No consumption of milk, cattle meat, pig meat, venison, freshwater fish or local cereals was identified.

When compared with the generic 97.5 percentile consumption rates, the critical group mean consumption rate was greater only for other vegetables. A further seven critical group mean consumption rates exceeded the generic mean consumption rates. These were for green vegetables, root vegetables, potato, sheep meat, eggs, wild/free foods and honey. Four observed 97.5 percentile consumption rates exceeded the generic 97.5 percentile consumption rates. These were for green vegetables, other vegetables, root vegetables and eggs.

Children's consumption rates

15 year old age group

Five children in this age group were identified to be eating locally produced food. Consumption was identified in the following six food groups: domestic fruit, sheep meat, poultry, wild/free foods, honey and wild fungi. No consumption was identified for the following food groups: green vegetables, other vegetables, root vegetables, potato, milk, cattle meat, pig meat, eggs, rabbits/hares, venison, freshwater fish and local cereals.

The critical group mean consumption rate exceeded the generic 97.5 percentile and mean consumption rates only for sheep meat. No observed 97.5 percentile consumption rates exceeded the generic 97.5 percentile consumption rates. However, it should be noted that for food groups with only one consumed in this age group, observed 97.5 percentile consumption rates could not be calculated.

10 year old age group

Three children in this age group were identified as eating locally produced food. Consumption was identified in the following five food groups: root vegetables, potato, domestic fruit, wild/free foods and wild fungi. No consumption was identified for the following food groups: green vegetables, other vegetables, milk, cattle meat, pig meat, sheep meat, poultry, eggs, rabbits/hares, honey, venison, freshwater fish and local cereals. No critical group mean consumption rates exceeded the generic 97.5 percentile or generic mean consumption rates. No observed 97.5 percentile consumption rates exceeded the generic 97.5 percentile consumption rates. However, it should be noted that for food groups with only one consumed in this age group, observed 97.5 percentile consumption rates could not be calculated.

5 year old age group

Four children in this age group were identified as eating locally produced food. Consumption was identified in the following five food groups: other vegetables, root vegetables, potato, domestic fruit and honey. No consumption was identified for the following food groups: green vegetables, milk, cattle meat, pig meat, sheep meat, poultry, eggs, wild/free foods, rabbits/hares, wild fungi, venison, freshwater fish and local cereals. No generic 97.5 percentile or generic mean consumption rates have been determined for this age group so no comparisons with the corresponding observed rates are possible.

6 DIRECT RADIATION PATHWAYS

6.1 Direct radiation survey area

The direct radiation survey area is shown in Figure 2. It covered all land within 1 km of the Dungeness site perimeter fence, which delineates the external boundary of the Dungeness A and B licensed sites.

The site was bordered to the south by the English Channel. There was a distance of about 100 metres between the sea and the site fence, which was taken up by a large shingle bank. The public had access to the shore in front of the site by way of a public footpath. Anglers and bird watchers were the main users of this path although most anglers tended to fish towards the periphery of the survey area, either at Denge Marsh in the west or at Dungeness Point in the east, because it was closer to vehicular access points.

To the west, north and east, the site was surrounded by a vast expanse of shingle, some of which had NNR status and some of which had Site of Special Scientific Interest status. There was also an RSPB reserve to the north, which fell partly within the survey area. To the west, the land nearest to the site perimeter is owned by British Energy and is the location of an electricity sub-station. Land to the north is bisected by the access road to the power stations, two public footpaths and a dismantled railway.

To the east of the site is the village of Dungeness, which is served by a tarmac road. As well as houses, the village contains holiday homes and weekend homes as well as a number of other buildings. These included a pub, a light railway station and associated shop and restaurant, a working lighthouse, an old, non-working lighthouse, an art gallery and the Dungeness Bird Observatory.

6.2 Residential activities

All the places of residence in the direct radiation survey area were in the village of Dungeness to the east and north-east of the site. The survey identified 63 houses in the survey area, of which only 43 were occupied as a primary place of residence. Of the 20 others, eight were used as holiday homes, five were used at weekends, two were being renovated and five were empty or derelict. There were 24 houses in the 0 – 0.25 km zone, 13 in the 0.25 – 0.5 km zone and 26 in the 0.5 – 1.0 km zone. Interviews were conducted at 33 of the permanently occupied houses and 2 of the other houses. Children lived at five of these 35 houses.

The closest houses to the site were two houses near the eastern side of the Dungeness site boundary. One was occupied; the other was unoccupied at the time of the survey but had been bought by Dungeness A and was used to provide accommodation for their contractors.

6.3 Leisure activities

The Dungeness peninsula received about 500,000 visitors annually. Visitors were attracted by the unique shingle landscape and associated wildlife.

Bird watching was a popular activity - the Dungeness Bird Observatory attracted several hundreds of day visitors each day on a busy weekend and provided overnight accommodation for about 300 birdwatchers a year. Visitors also went to the RSPB reserve. As specifically requested by the customers changes in numbers of bird watchers near the site was investigated. A gradual increase in the numbers of birdwatchers visiting the Dungeness peninsula over the past five years was reported. The increase related to the area as a whole rather than specifically to the shingle bank to the south of the power stations.

Shore angling was very popular, especially from Denge Marsh at the west of the survey area and from Dungeness Point in the east. At Dungeness Point there was an access road and space to park on the shingle for members of Dungeness Angling Association but non-members

tended to use it too. The beach was also used by people accompanying anglers for walking and sunbathing in good weather. At low tide, some anglers used Dungeness Beach to dig their own bait. Hobby fishermen who went push netting for shrimps also used Dungeness Beach.

The Romney, Hythe & Dymchurch Railway (RH&DR), a narrow gauge railway, ran regularly from Hythe to Dungeness for six months of the year and ran a reduced service for the other six months. This attraction was very popular with tourists. At the Dungeness station there was a small ticket office/shop and a café.

The old lighthouse was a tourist attraction, which was open to the public during peak holiday times. Locals and visitors could also visit the Britannia Pub for food and drinks all year round. Dungeness was known for its art and there is a small art gallery open all year round within the direct radiation survey area.

6.4 Commercial activities

Workplaces within 1 km of the site included the electricity sub-station, the Britannia Pub, the RH&DR train line, shop and café, the old and new lighthouses, a tackle shop and the Dungeness Bird Observatory and the art gallery.

The electricity sub-station was usually unmanned but was serviced and maintained by National Grid staff who were there for short periods of time. The pub employed 15 full-time staff and varying numbers of part-time staff during the year. The RH&DR had four full-time drivers, 11 volunteer drivers and several guards. As the train line extended all the way to Hythe, only a small percentage of these people's work was in the direct radiation survey area. Ten percent has been assumed here. RH&DR employed two full-time and eight part-time staff in the café and two part-time staff in the shop. The working lighthouse was operated by a resident who lived in the direct radiation survey area. The tackle shop was run by two residents of the direct radiation survey area. The Dungeness Bird Observatory had two wardens who lived at the observatory; one lived there all year; the other for nine months of the year.

Other people came into the direct radiation survey area to work but were not based there permanently. This included commercial bait diggers who used a variety of beaches including Dungeness. Commercial fishermen, RNLI staff and volunteers from the Dungeness branch, and safety boats for Lydd Military range would work on the waters within 1 km of the station for part of their work. English Nature had two wardens who spent small amounts of hours in the survey area. Employees and contractors of the Dungeness site were not included in the survey.

6.5 Occupancy rates

Table 40 presents indoor, outdoor and total occupancy data for adults and children and includes distances from the site perimeter fence where these occupancies took place. An analysis of the data by distance zones and occupancy rates is shown in Table 41.

0 - 0.25 km from the site perimeter fence

Occupancy data were collected for 50 individuals in the 0.0 to 0.25 km zone. The observations were mainly for residents or staff at the RH&DR but there were also a few visitors and birdwatchers and a dog walker. A resident had the highest occupancy rate of 8100 h/y.

0.25 – 0.5 km from the site perimeter fence

Occupancy data were collected for 25 people in the 0.25 to 0.5 km zone. The observations were for residents, two people renovating properties and workers at the Britannia Pub. A resident who lived and worked in the survey area had the highest total occupancy rate of 8400 h/y. It should be noted that this individual worked at the RH&DR café so about 5% of the total occupancy rate was spent indoors in the 0 – 0.25 km zone.

0.5 – 1.0 km from the site perimeter fence

Occupancy data were collected for 48 people in the 0.5 to 1.0 km zone. The majority of observations were for residents and anglers but there were also sunbathers, visitors to the area and two English Nature wardens. A resident had the highest total occupancy rate of 8700 h/y.

6.6 Gamma dose rate measurements

Table 42 presents gamma dose rate measurements for the Dungeness direct radiation survey. Representative gamma dose rate measurements were taken both inside and outside a selection of residences and at outdoor background locations outside the area. It should be noted that the measurements have not been adjusted for natural background dose rates.

In the survey area, outdoor measurements were taken at a height of 1 metre over sand and stone, grass, or grass, sand and stone approximately 5 to 10 metres from the nearest buildings, and ranged from 0.045 to 0.081 µGy/h. Background readings from outside the direct radiation survey area taken over grass for comparison were 0.061 and 0.076 µGy/h (average 0.069 µGy/h). Indoor measurements ranged from 0.047 to 0.120 µGy/h and were, in most cases fairly similar to the outdoor measurements at the same residences. At three locations, the indoor measurements were noticeably higher but this is more likely to be due to natural radioactivity in the building materials than to any artificial sources. It should be noted that due to two of the four reactors being off-line for the duration of the survey, these gamma dose rates may be lower than usual.

Comprehensive studies of background radiation have been carried out on a national scale by the National Radiological Protection Board (since 1st April 2005 the Radiation Protection Division of the Health Protection Agency), the most recent of these being a review conducted during 1999 (Hughes, 1999). The results from these could be used for comparison.

7 COMBINED PATHWAYS

In determining habits data for the purposes of assessing radiological doses to the public, it may be necessary to consider a combination of pathways. Data are provided in Annexes 1 and 2 so that the full effect of combining pathways can be assessed for individual observations, given the concentrations and dose rates for a particular assessment. In some circumstances it will be possible to make simplifying assumptions, and define the consumption and external exposure rates appropriate to a series of potential critical groups. Such assumptions will depend on the assessment in question but some initial observations are provided here as a starting point for those undertaking assessments.

The most extensive combinations of pathways for adult dose assessment are shown in Table 43. Each of the 33 combinations shown in Table 43 represents an actual individual (or individuals) from Annex 1 who has positive data (irrespective of the magnitude), for each pathway marked with an asterisk. It should be noted that combination numbers in Table 43 do not correlate directly with observation numbers in Annex 1. Other individuals from Annex 1 have combinations that are not listed in Table 43 because they have fewer pathways and a dose assessment for them would be adequately covered by one of the 33 listed combinations.

Combinations of pathways at critical group rates may be achieved by considering the data in Annexes 1 and 2. Although critical group rates are not given in the annexes, the rates for individuals making up the groups are shown emboldened. Possible combinations of pathways and their associated critical group rates are therefore apparent.

The Environment Agencies and the Food Standards Agency have considered ways of using habits data to calculate total dose retrospectively. The adopted approach is to use the adult consumption and occupancy data collected in each habits survey to create a matrix with a series of habits profiles for each site. The relevant matrix for the Dungeness adults' profiled habits data is shown in Annex 5. The National Dose Assessment Working Group (NDAWG) has considered this approach to assessing retrospective total doses (Camplin *et al*, 2005) and

has agreed that using habits profiles is an appropriate approach. Retrospective total doses around Dungeness will in future be made using these profiles and reported in the Radioactivity in Food and the Environment Reports (See Appendix 7. EA, EHS, FSA and SEPA, 2005).

8 CONCLUSIONS AND SUGGESTIONS

8.1 Survey findings

The survey investigated the three potential sources of public radiation exposure from the Dungeness site, which were:

- Discharges of liquid radioactive waste to the English Channel
- Discharges of gaseous radioactive waste to the atmosphere
- Emitters of direct radiation

Data were collected for 872 individuals including commercial fishermen, shore anglers, boat anglers, shellfish collectors, people pursuing water sports and beach sports, farmers, beekeepers, allotment holders and people spending time within 1 km of the site. These people were targeted because their habits and where they live may cause them to be exposed to radioactivity from the site. However, it should be noted that the most exposed people can only be defined with the outcome of a dose assessment.

All consumption rates recorded in this report include only locally produced or caught foods.

The adult critical group rates (as defined in Section 3.2) for the separate local aquatic consumption pathways were:

- 51 kg/y for fish
- 9.3 kg/y for crustaceans
- 17 kg/y for molluscs
- 0.33 kg/y for marine plants and algae

The predominant aquatic species consumed by the respective critical groups were herring, cod, Dover sole and plaice; crabs, brown shrimps and lobsters; king scallops; and sea kale.

No wildfowling or consumption of wildfowl was noted in the survey area although small amounts of tide-washed pasture were noted along the banks of the River Rother. Sheep were seen to be grazing on the east bank of the River Rother during the survey.

The critical group occupancy rates over the separate intertidal substrates were:

- 150 h/y for salt marsh
- 1600 h/y for sand
- 1500 h/y for sand and mud
- 590 h/y for sand and stone

The critical group occupancy rate for time spent in a houseboat whilst it was grounded on mud was 3900 h/y.

The critical group rate for handling fishing gear was 1100 h/y and for handling sediment was 1200 h/y.

The maximum occupancy rate in marine water was 520 h/y and the maximum occupancy rate for time spent on marine water was 3000 h/y. The maximum occupancy rate in fresh water was 130 h/y and the maximum occupancy rate for time spent on fresh water was 1200 h/y.

The adult critical group rates for the separate local consumption pathways for foods affected by gaseous discharges were:

- 35 kg/y for green vegetables
- 66 kg/y for other vegetables
- 36 kg/y for root vegetables
- 64 kg/y for potato
- 7.5 kg/y for domestic fruit
- 19 kg/y for sheep meat
- 2.9 kg/y for poultry
- 20 kg/y for eggs

- 11 kg/y for wild/free foods
- 2.3 kg/y for rabbits/hares
- 4.7 kg/y for honey
- 0.50 kg/y for wild fungi

No consumption of milk, cattle meat, pig meat, venison, freshwater fish or local cereals was identified. Consumption of foodstuffs by children was also recorded. Combinations of food groups (both aquatic and terrestrial) consumed at critical group rates, together with external pathway exposures, may be derived from the data for individuals in Annexes 1 and 2. Rates for individuals making up the critical groups are presented in bold type.

The only water being used, other than mains water, was at Lydd allotments, where the allotment holders used well water to irrigate their crops. Ground water was not used as a source of drinking water at any of the properties visited.

Rabbits and pigeons were the only species considered by the site as having high populations on power station land and some culling took place. This wildlife had the potential to transfer radioactive contamination from the site into the surrounding area. However, no consumption of pigeon from the survey area was noted and only one person was found to be consuming rabbits from the Lydd Military Range.

For occupancy by members of the public within 1 km of the Dungeness site perimeter fence, the highest rates (indoors plus outdoors) were:

- 8100 h/y for the 0 to 0.25 km zone
- 8400 h/y for the 0.25 to 0.5 km zone
- 8700 h/y for the 0.5 to 1.0 km zone

In all three zones, the highest occupancy rates were for residents.

8.2 Comparisons with previous surveys

The results from this survey can be compared with results from the last aquatic and terrestrial habits surveys undertaken at Dungeness in 1999, where the same survey areas were used as in this survey. Comparisons can be made with the last direct radiation habits survey from 1993, although it should be noted that the 2005 survey considered a larger area.

In 1999, the critical group mean consumption rate for fish was 59 kg/y for a group of 44 people, and the maximum consumption rate was 120 kg/y. The main species of fish consumed by the critical group were cod, sole, plaice, dab, mackerel and herring. In 2005, the critical group consumption rate decreased slightly to 51 kg/y, the maximum consumption rate stayed the same at 120 kg/y, but the number in the critical group decreased to 25. The main species consumed by the critical group were herring, cod, Dover sole and plaice.

In 1999, the critical group mean consumption rate for crustaceans was 17 kg/y, the maximum consumption rate was 31 kg/y and the number of people in the critical group was 25. In 2005, the critical group consumption rate decreased to 9.3 kg/y, the maximum consumption rate also decreased to 16 kg/y and the number in the critical group was 18. In 1999 and 2005, the main species of crustaceans consumed by the critical group were brown shrimp, crab and lobster.

In 1999, the critical group mean consumption rate for molluscs was 15 kg/y, the maximum consumption rate was 25 kg/y and the number of people in the critical group was 14. In 2005, the critical group consumption rate was similar at 17 kg/y, though the maximum consumption rate increased to 34 kg/y and the number in the critical group decreased to eight. In 1999, the main species consumed was whelks, and to a lesser extent scallops, and in 2005 it was king scallops.

The consumption of wildfowl was not investigated in 1999 and was not identified in 2005.

In 1999, the consumption of marine plants such as sea kale was suspected although no consumption rates could be confirmed. In 2005, two consumers made up the critical group with a mean consumption rate of sea kale of 0.33 kg/y and a maximum rate of 0.45 kg/y.

For occupancy of intertidal substrates recorded in 1999 and 2005, there are three that can be compared: sand, sand and mud (or muddy sand) and sand and stones (or shingle).

For external pathways, it should be noted that the methodology for determining the critical group has changed since the 1999 survey (see Section 3.2) so care is needed when comparing results. In the following paragraphs, the critical group rates from the 1999 survey have been recalculated using the current method and the rates in brackets were calculated using the original method.

The 1999 critical group mean intertidal occupancy rate over sand using the 2005 methodology was 1300 h/y for two bait diggers (1300 h/y for two bait diggers) and the maximum rate was also 1300 h/y. The 2005 critical group mean intertidal occupancy rate over sand was 1600 h/y for 62 people – most of whom were working on shore repairing sea defences. The others were bait digging, angling, walking or working on the shore in connection with the fishing industry. The maximum rate was 2000 h/y.

The 1999 critical group mean intertidal occupancy rate over sand and mud (called muddy sand) using the 2005 methodology was 1700 h/y for two bait diggers (1700 h/y for two bait diggers), with a maximum rate of 1800 h/y. The 2005 critical group mean intertidal occupancy rate over sand and mud was 1500 h/y for five bait diggers, the maximum rate being 2000 h/y.

The 1999 critical group mean intertidal occupancy rate over sand and stone (called shingle) using the 2005 methodology was 650 h/y for eight anglers (970 h/y for three anglers), with a maximum rate of 1200 h/y. The 2005 critical group mean intertidal occupancy rate over sand and stone was 590 h/y for 19 people. They were mainly anglers but some people were also

working on the shore, walking, beach combing or beach cleaning. The maximum rate was 1000 h/y.

Occupancy rates for time spent in a houseboat over intertidal mud cannot be compared since this pathway was not recorded in 1999.

In 1999, the critical group mean handling rate for commercial fishing gear using the 2005 methodology was 1200 h/y for five fishermen (1400 h/y for three fishermen), with a maximum handling rate of 1600 h/y. The 2005 critical group mean handling rate for commercial fishing gear was 1100 h/y for 34 fishermen, the maximum rate being 1800 h/y.

In 1999 the critical group mean handling rate for sediment was 1500 h/y for four bait diggers (1500 h/y for four bait diggers) with a maximum handling rate of 1800 h/y. The 2005 critical group mean handling rate for sediment was 1200 h/y for 10 bait diggers. The maximum handling rate was 2000 h/y.

A comparison of occupancy rates in and on water cannot be made because this pathway was not investigated in the 1999 survey.

For terrestrial food groups, the critical group mean consumption rates (kg/y and l/y) in the 2005 survey are tabulated below, together with those of the 1999 survey for ease of comparison:

	1999	2005
• Green vegetables	31	35
• Other vegetables	61	66
• Root vegetables	28	36
• Potato	51	64
• Domestic fruit	39	7.5
• Milk	0	0
• Cattle meat	18	0
• Pig meat	0	0

• Sheep meat	23	19
• Poultry	3.9	2.9
• Eggs	30	20
• Wild/free foods	4.1	11
• Rabbits/hares	6.0	2.3
• Honey	8.9	4.7
• Wild fungi	2.7	0.50
• Venison	0	0
• Freshwater fish	0	0

Consumption rates had increased in 2005 in the following food groups: green vegetables, other vegetables, root vegetables, potato and wild/free foods, though apart from wild/free foods the increases were small. Consumption rates had decreased in 2005 in the following food groups: domestic fruit, cattle meat, sheep meat, poultry, eggs, rabbits/hares, honey and wild fungi. Most significant were the reductions in cattle meat from 18 kg/y to 0 kg/y, domestic fruit from 39 kg/y to 7.5 kg/y and in eggs from 30 kg/y to 20 kg/y. The other reductions were small. Milk, pig meat, venison and freshwater fish were not consumed in either 1999 or 2005.

As noted in Section 2.3 the 1993 direct radiation survey area was smaller than in 2005. However, a comparison of the data shows that in 1993 the highest recorded occupancy rate was 8400 h/y for someone who lived in the 0.0 – 0.25 km zone. In the 2005 survey, the highest occupancy rate was 8700 h/y for a person living in the 0.5 – 1.0 km zone. In the 0.0 – 0.25 km zone in 2005, the highest occupancy rate was 8100 h/y for a resident.

Commercial activities noted in 1993 and still being carried out in 2005 were the RH&DR and the old lighthouse. The RH&DR café employed similar numbers of staff in 2005 as in 1993 but number of hours worked for station/shop staff had reduced in 2005. Number of hours worked by staff at the old lighthouse had also reduced in 2005. In 2005, the other commercial activities identified were the Dungeness Bird Observatory and the art gallery. As in 1993 the two main leisure activities identified were bird watching and angling.

Indoor gamma dose rate measurements for four residences in 2005 can be compared with gamma dose rate measurements taken inside the same houses in 1993. In 1993, they ranged from 0.053 to 0.11 μGy/h and in 2005 they ranged from 0.047 to 0.12 μGy/h. Outdoor gamma dose rate measurements for three residences in 2005 could be compared with gamma dose rate measurements taken outside the same houses in 1993. In 1993, they ranged from 0.054 to 0.087 μGy/h and in 2005 they ranged from 0.047 to 0.081 μGy/h.

In all cases the comparable results were very similar. Six of the seven comparable rates were slightly lower in 2005 than in 1993 although it should be noted that in 2005 only two of the four reactors were online, whereas in 1993 all four reactors were online.

8.3 Suggestions for environmental monitoring

The 2004 monitoring programmes operated by the Environment Agency and the Food Standards Agency included the following samples and measurements (EA, EHS, FSA and SEPA, 2005):

Aquatic surveillance

- Bass from the pipeline area
- Cod from the pipeline area
- Plaice from the pipeline area
- Shrimps from the pipeline area
- Whelks from the pipeline area
- Crabs from Hastings
- Cuttlefish from Hastings
- Bladderwrack *(Fucus vesiculosus)* from Copt Point
- Seaweed from Copt Point
- Mud and sand from Rye Harbour
- Sediment from Rye Harbour, Camber Sands and Pilot Sands

- Seawater from the pipeline area and Dungeness South

Gamma dose rate measurements

- Pebbles and sand and pebbles and shingle at Littlestone-on-Sea
- Sand at Greatstone-on-Sea
- Pebbles and shingle at Dungeness East
- Pebbles and pebbles and shingle at Dungeness South
- Pebbles and sand at Jury's Gap
- Sand at Rye Bay
- Mud and sand at Rye Harbour

Beta dose rate measurements

- Mud and sand at Rye Harbour

Terrestrial surveillance

- Milk
- Blackberries
- Honey
- Peas
- Potato
- Sea kale
- Wheat
- Grass
- Freshwater

The following lists are suggestions for changes to the current environmental monitoring programmes. It should be noted that the suggestions are based on the findings of this survey and information about samples taken as environmental indicators. They are not the outcome of any form of assessment. It is suggested that samples currently monitored, which are not listed below, remain unchanged in the monitoring programme.

(1) Environment Agency monitoring

- Gamma dose rate measurements taken over pebbles, pebbles and sand, shingle and pebbles and shingle at Littlestone-on-Sea and Dungeness could be changed to sand and mud since this is more radiologically significant and both substrates had high occupancy rates.
- Gamma dose rate measurements at Jury's Gap and Rye Bay could be removed since no high occupancy rates were recorded there.

(2) Food Standards Agency monitoring

- Plaice from the pipeline area could be replaced by Dover sole from the pipeline area, since Dover sole was eaten in greater quantities.
- Crabs from Hastings could be replaced by crabs from Folkestone since this is where crabs in the habits survey were caught.
- Whelks from the pipeline area could be replaced by king scallops from the pipeline area, since all adults in the critical group for molluscs were consuming king scallops and not whelks.
- Cuttlefish from Hastings could be removed from the sampling programme since Hastings is outside the aquatic survey area used for the habits survey and no consumption of cuttlefish was identified.
- A one-off sample of sea kale from Dungeness could be monitored since it was being consumed by two people. Analyses should be for radionuclides relevant to the liquid and gaseous discharges.
- Cabbage could be introduced as it is the most commonly consumed vegetable in the green vegetable group. No green vegetables are currently monitored although high consumption rates for adults for this food group were noted.
- Peas could be replaced by tomatoes in the other vegetables group because they were more commonly consumed and high consumption rates for adults were noted for this food group.
- Onions could be introduced, as they are the most commonly consumed vegetable in the root vegetable group. No root vegetables are currently monitored although high consumption rates for adults for this food group were noted.

- Sheep meat could be introduced since this is the type of meat that is eaten in the largest quantities and high consumption rates for 15 year olds were noted. No meat samples are currently taken from the area.
- Chicken eggs could be introduced since no monitoring of eggs currently takes place and high rates were noted for adults in this food group.
- A one-off sample of rabbit could be analysed because this species was potentially a carrier for transferring radioactivity off-site, and rabbit was eaten by 2 consumers.
- Mud and sand, and sediment samples from Rye Harbour could be removed as no sediment handling takes place there.
- Gamma and beta dose rate measurements over mud and sand at Rye Harbour could be changed to over mud because this is more radiologically significant and the houseboat dweller's boat was grounded on mud.

9 ACKNOWLEDGEMENTS

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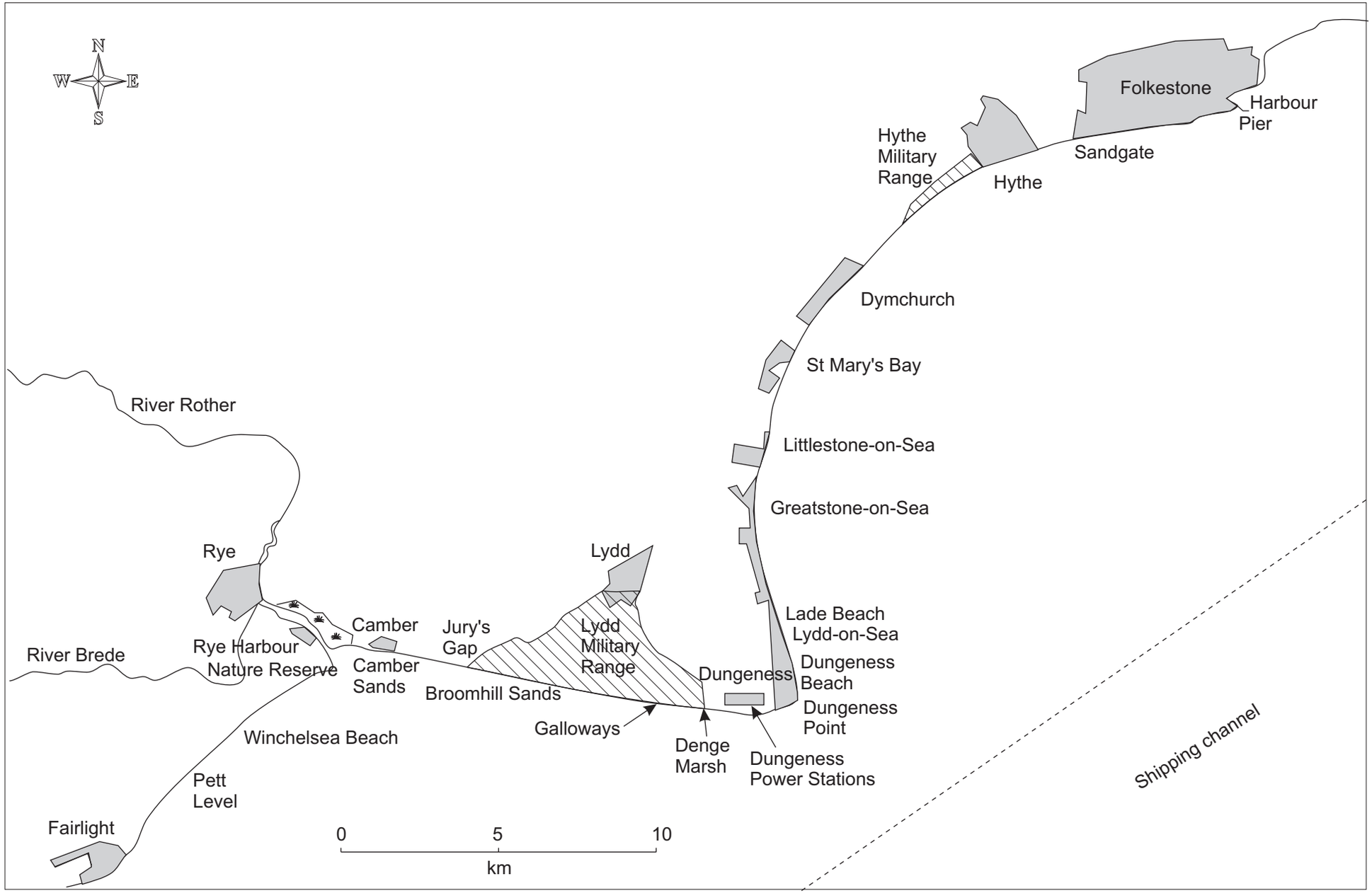

Figure 1. The Dungeness aquatic survey area

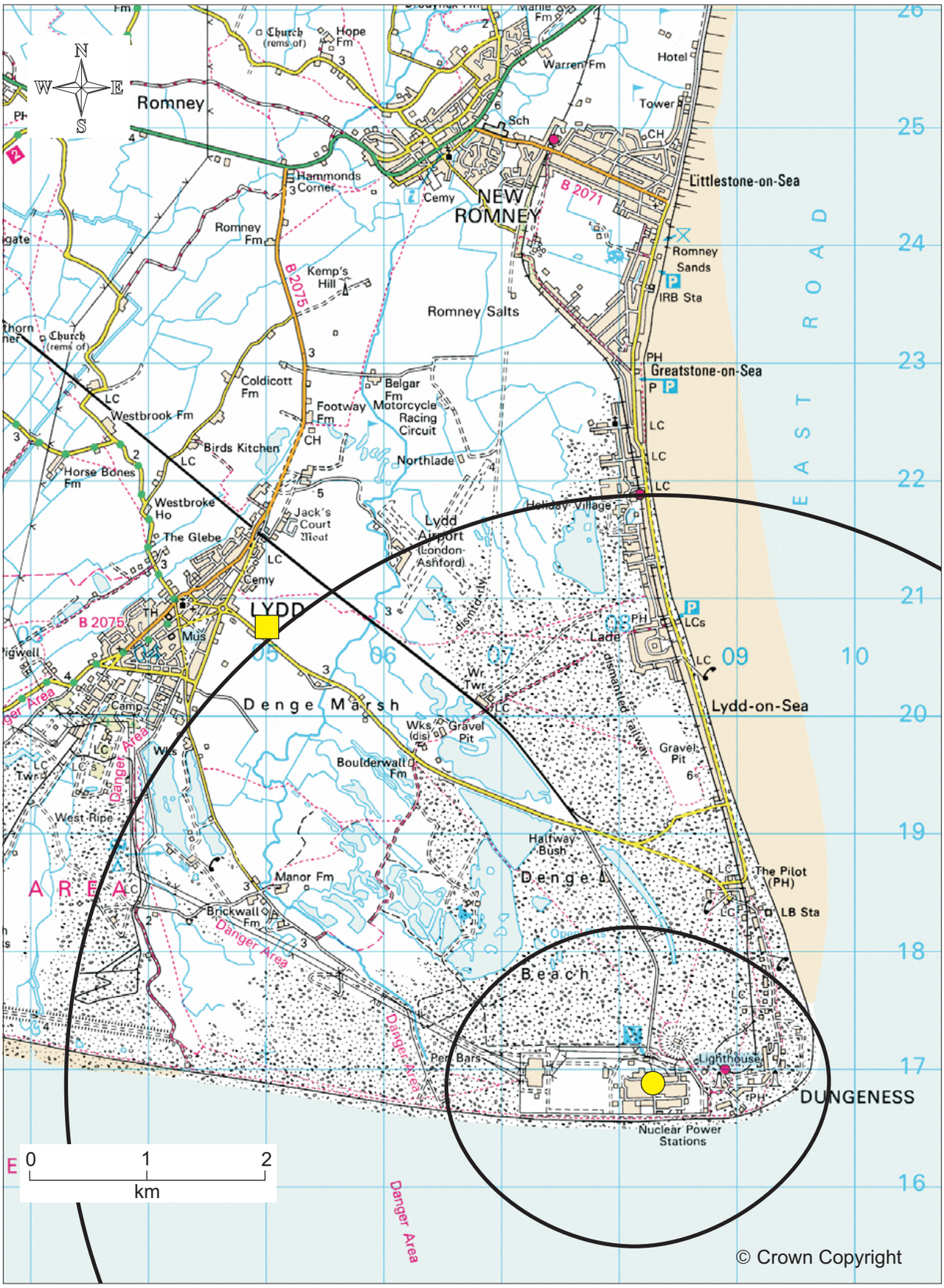

Figure 2. The Dungeness terrestrial (outer ring) and direct radiation (inner ring) survey areas

Dungeness site centre

Lydd allotments

Table 1. Survey coverage

Group	Criteria	Estimate of complete coverage	Number for whom positive data was obtained	Coverage for positive observations	Notes
SUMMARY OF ALL PATHWAYS					
All potential people in Dungeness aquatic, terrestrial and direct radiation survey areas	Number of people resident in terrestrial survey area (excluding those resident in the direct radiation survey area) (See (B) terrestrial pathways)	1900^	179^^	*	Not all people resident in the 5 km area were interviewed. The survey targeted individuals who were potentially the most exposed (see Section 2.4), mostly producers of local food (farmers and allotment holders). Number for whom positive data was obtained includes 31 people who consumed terrestrial foods but lived outside 5 km, 34 people who lived within 5 km but only had aquatic pathways and 74 people who only had occupancy in/on freshwater.
	Number of people resident in the direct radiation survey area (See C, direct radiation pathways)	100	62	****	Number for whom positive data was obtained includes 2 holiday home occupants and 10 people that also work in the direct radiation survey area.
	Number of people working in or visiting, but not resident in the direct radiation survey area (See C, direct radiation pathways)	U	48	U	Excluding employees and contractors of Magnox Electric Ltd and British Energy Generation Ltd., and people living in the direct radiation survey area.
	Number of people affected by liquid discharges (excluding people resident in the terrestrial survey area) (See (A) aquatic pathways)	U	583^^	U	
	Approximate total for aquatic, terrestrial and direct radiation survey areas	U	872^^	U	In the Summary of All Pathways section each interviewee for whom positive data was obtained has only been counted once. This is in the section where their predominant activities took place.
(A) AQUATIC PATHWAYS					
Commercial fishermen	Number of commercial fishermen actively fishing in survey area	50	35	****	Does not include crew members other than skippers.
Charter fishermen	Number of charter fishermen actively fishing in survey area	8	7	*****	Excludes boats based outside the survey area who only come into the survey area occasionally.
Boat anglers and hobby fishermen	Number spoken to or heard of during survey	120	29	**	Interview with 1 boat angling club representative provided generic data for 12 people. Excludes push netters.
Push netters	Number spoken to or heard of during survey	15	9	****	
Shore anglers and other beach users	Number seen in action or spoken to during survey	U	285	U	
Baitdiggers	Number of commercial baitdiggers spoken to or heard of during survey	15	12	*****	Excludes people who go baitdigging for their own angling purposes.
Water and beach sports participants, swimmers and divers	Members of clubs in survey area and people seen in action or spoken to during survey period	350	220	****	Interviews with a 2 diving clubs, a rowing club, a sailing club, a yachting club, a windsurfing club and a land sailing club provided generic data for 160 of their keenest members.

Table 1. Survey coverage

Group	Criteria	Estimate of complete coverage	Number for whom positive data was obtained	Coverage for positive observations	Notes
(B) TERRESTRIAL PATHWAYS^^^					
Farms and smallholdings	Number of farmers and their family members consuming farm produce from the survey area	25	23	*****	Estimate of 7 farms or smallholdings in the area, all of which were interviewed.
Bee keepers	Number of people consuming honey from the survey area	U	11	U	Estimate of 4 beekeepers in the area, of which 3 were interviewed.
(C)DIRECT RADIATION PATHWAYS					
Occupancy of area	Number with occupancies > 100 hours (excluding site employees)	U	109	U	Excluding 14 people who have occupancies of > 100 h/y.
Residents	Number of residents in the survey area	100	62	****	Estimate of 56 occupied houses in the area (including holiday and weekend homes), occupants from 35 of which were interviewed.
Employees	Number of people predominantly based in survey area (>500 hours)	30	29	*****	Including 10 people who live in the direct radiation area, excluding 13 people who work < 500 hours, site employees and contractors.
BREAKDOWN OF AGE GROUPS					
Adults	Individuals over 17	U	813	U	
15 year old	More than 12.0 year old to 17.0 year old	U	25	U	
10 year old	More than 7.0 year old to 12.0 year old	U	22	U	
5 year old	More than 2.0 year old to 7.0 year old	U	12	U	
1 year old	More than 1.0 year old to 2.0 year old	U	0	U	
3 months old	From 0 to 1.0 year old	U	0	U	

Notes

^ - Data from www.statistics.gov.uk were used to estimate this figure for people resident in the 5 km survey area

^^ - The number of people for whom positive data was obtained, for pathways (A) and (B), will not equal the relevant totals in the summary. This is because some individuals, for example someone who fishes from a boat and the shore and digs their own bait, will be counted three times within the pathway, whereas others, such as the families of fishermen, will not be counted at all.

^^^ - 3 retail outlets, out of a possible 3 were visited during the survey

U - Unknown

Coverage

* = >0-20% ** = 20 - 40% *** = 40 - 60% **** = 60-80% ***** =80-100%

Table 2. Typical food groups used in habits surveys

Green vegetables	Globe artichoke, asparagus, broccoli, brussel sprout, cabbage, calabrese, cauliflower, chard, courgettes, cucumber, gherkin, herbs, kale, leaf beet, lettuce, marrow, spinach
Other vegetables	Aubergine, broad bean, chilli pepper, french bean, mangetout, pea, pepper, runner bean, sweetcorn, tomato
Root vegetables	Jerusalem artichoke, beetroot, carrot, celeriac, celery, chicory, fennel, garlic, kohl rabi, leek, onion, parsnip, radish, shallot, spring onion, swede, turnip
Potato	
Domestic fruit	Apple, apricot, blackberry, blackcurrant, boysenberry, cherry, damson, fig, gooseberry, grapes, greengages, huckleberry, loganberry, melon, nectarines, peach, pear, plum, pumpkin, raspberry, redcurrants, rhubarb, rowanberry, strawberry, tayberry, whitecurrant
Milk	Milk, butter, cream, cheese, yoghurt, goats milk
Cattle meat †	
Pig meat †	
Sheep meat †	
Poultry	Chicken, duck, goose, grouse, guinea fowl, partridge, pheasant, pigeon, snipe, turkey, woodcock
Eggs	Chicken egg, duck egg, goose egg
Wild/free foods	Blackberry, blackcurrant, chestnut, crab apple, damson, dandelion root, elderberry, nettle, raspberry, rowanberry, samphire, sloe, strawberry, watercress, wild apple
Honey	
Wild Fungi	Mushrooms
Rabbits/Hare	Hare, rabbit
Venison †	
Fish (sea)	Bass, brill, cod, common ling, dab, Dover sole, flounder, gurnard, haddock, hake, herring, lemon sole, mackerel, monkfish, mullet, plaice, pollack, witch saithe, salmon, sea trout, squid*, cuttlefish*, rays, turbot, whitebait, whiting
Fish (freshwater)	Brown trout, rainbow trout, perch, pike, salmon (river), eels
Crustaceans	Brown crab, spider crab, crawfish, lobster, *Nephrops*, squat lobster, prawn, shrimp
Molluscs	Cockles, limpets, mussels, oysters, queens, scallops, razor shell, whelks, winkles

Notes:
* Although squid and cuttlefish are molluscs, radiologically they are more akin to fish
† Including offal

Table 3. Adults' consumption rates of fish in the Dungeness area (kg/y)

Observation number	Bass	Bream	Brill	Cod	Dab	Dover sole	Eel	Flounder	Grey gurnard	Grey mullet	Herring	Huss	John Dory	Lemon sole	Lesser spotted dogfish	Mackerel	Mixed fish	Plaice	Pollack	Pouting	Red mullet	Sprat	Spurdog	Thornback ray	Turbot	Whiting	Total
59																	**117.0**										**117.0**
751	**0.7**			**11.8**	**2.7**	**23.6**					**4.1**		**0.2**			**2.3**		**2.7**			**0.1**			**23.6**			**71.7**
675	**22.7**			**7.2**	**25.5**											**5.9**										**5.8**	**67.1**
791	**12.8**					**3.8**	**39.9**				**2.0**					**6.6**											**65.1**
439				**3.4**	**2.7**						**18.1**			**22.7**		**3.3**		**8.2**								**1.4**	**59.8**
450				**3.6**	**18.8**	**23.3**					**1.3**					**2.2**						**3.6**					**52.8**
652				**10.9**		**25.3**					**1.7**					**4.4**					**1.1**	**3.0**		**4.5**			**50.9**
641-642	**0.9**	**0.9**		**44.9**												**2.7**											**49.4**
643-644				**15.9**		**7.9**								**7.9**		**6.4**		**3.5**						**6.0**			**47.6**
850						**15.7**									**15.7**			**15.7**									**47.1**
443					**7.7**	**23.6**					**7.7**											**7.7**					**46.7**
55																	**46.3**										**46.3**
820										**9.6**	**10.1**					**9.5**						**5.8**				**10.1**	**45.1**
113-115											**43.6**																**43.6**
689-690	**8.5**	**1.4**		**8.5**											**14.7**	**5.4**								**4.3**	**0.5**		**43.3**
7-8																	**41.3**										**41.3**
46						**20.6**												**20.6**									**41.3**
49						**20.6**												**20.6**									**41.3**
477																		**17.2**								**22.2**	**39.4**
158	1.9				15.0	2.3												1.7								17.1	38.0
752-753	0.3			5.9	1.4	11.8					2.0					1.1		1.4						11.8			35.7
56-57																	35.4										35.4
102-103						11.8			11.8														11.8				35.4
121																	35.4										35.4
116	9.2			9.2		6.9																				9.2	34.5
809				6.6		2.8										22.9		0.7									32.9
342-343	9.4			16.5		1.2																				4.3	31.3
818-819	2.0			7.3		5.6												15.6									30.4
31																	29.5										29.5
811				5.9		9.9					0.9					2.9		6.8				2.3					28.7
810				5.9		9.9					0.9					2.9		6.8				2.3					28.7
446-447	4.1			4.1	4.1						4.1					4.1		4.1								4.1	28.6
1-2																	28.4										28.4
141-143											13.6					13.6											27.2
34																	26.5										26.5
372				21.0														3.0							1.9		25.8
110-112	8.4										8.4					8.4											25.2
73-74				11.8														11.8									23.6
86						11.8																	11.8				23.6
341																	23.6										23.6
851						7.8									7.8			7.8									23.5
32-33																	22.7										22.7
53-54					11.3													11.3									22.7
484																14.6										6.8	21.4
624				4.5							4.0											12.8					21.3
108-109				10.3		5.2												5.2									20.6
60-61																	17.7										17.7
87-88																		13.3					4.4				17.7
423	14.1															2.7											16.8
3				16.0																							16.0
600							9.0									6.4											15.4

Table 3. Adults' consumption rates of fish in the Dungeness area (kg/y)

Observation number	Bass	Bream	Brill	Cod	Dab	Dover sole	Eel	Flounder	Grey gurnard	Grey mullet	Herring	Huss	John Dory	Lemon sole	Lesser spotted dogfish	Mackerel	Mixed fish	Plaice	Pollack	Pouting	Red mullet	Sprat	Spurdog	Thornback ray	Turbot	Whiting	Total
684-685			2.7	5.1		2.0												2.0						3.4			15.3
417-418	1.4							8.1			0.4					3.7		1.0									14.6
444				5.4	3.0						4.3					1.5											14.2
93-94				7.5																						6.5	13.9
415-416	1.9			9.9														0.2									11.9
863																	11.8										11.8
148																	10.9										10.9
441				0.9	1.4	2.3					0.9					1.8		2.3				1.4					10.9
159	0.9				3.8	0.9												0.3								4.3	10.2
391-393				3.3								3.3						3.3									10.0
149						0.5									5.6	1.5										2.1	9.7
472				2.3	0.7									6.2												0.5	9.6
489				3.0												4.4										1.7	9.1
483	8.5																										8.5
69																	8.2										8.2
71																	8.2										8.2
747				4.4		0.7					0.7					0.7		0.7				0.7					8.1
448					3.4	4.5																					7.9
168-169	2.8					0.7										2.7		0.8	0.8								7.8
799-800				2.7		2.7					1.0					1.1											7.5
162-163						0.5									4.0	2.3		0.3									7.1
824												1.4				2.3		3.0				0.5					7.1
749						4.2												2.4									6.6
601-603																6.4											6.4
253-254						1.2												0.8		4.3							6.3
90-92	6.2																										6.2
434-435														5.9													5.9
440						5.9																					5.9
442	1.3			0.9	1.4													2.3									5.8
792-793																2.9		2.7									5.6
151	0.9														1.4	2.3				0.9							5.5
445				5.4																							5.4
432-433					1.1																					4.3	5.4
23-26																2.8										2.6	5.4
18-19					4.0																					1.3	5.3
250-251					2.8	1.2												1.3									5.2
748				2.9		0.5					0.5					0.5		0.5				0.5					5.2
247-249	3.1															0.5										1.4	5.1
825												1.4						3.0				0.5					4.8
117	1.3			1.3		0.9																				1.3	4.8
513-518																4.6											4.6
427-428	0.9			1.8	0.7											1.2											4.6
89																	4.5										4.5
217-218	0.9				1.9											1.5											4.3
27-30																4.2											4.2
413-414	0.5			0.5	0.7	0.5										0.7		0.7						0.7			4.1
646					4.1																						4.1
429-431	0.9			0.4														2.6									4.0
160-161																3.8											3.8
645														3.7													3.7
647														3.7													3.7

Table 3. Adults' consumption rates of fish in the Dungeness area (kg/y)

Observation number	Bass	Bream	Brill	Cod	Dab	Dover sole	Eel	Flounder	Grey gurnard	Grey mullet	Herring	Huss	John Dory	Lemon sole	Lesser spotted dogfish	Mackerel	Mixed fish	Plaice	Pollack	Pouting	Red mullet	Sprat	Spurdog	Thornback ray	Turbot	Whiting	Total
486	1.1						0.7									1.1										0.9	3.7
236-237																1.5				1.1						1.1	3.7
511-512																2.7										0.9	3.6
473-474				3.6																							3.6
152	0.9			1.1												1.5											3.6
20-22					2.6																					0.9	3.5
84-85								3.4																			3.4
750						3.4																					3.4
164	3.1																										3.1
500-505																3.1											3.1
240-241				1.0												1.3										0.6	3.0
238-239	0.5					0.2									1.4	0.8											2.9
257-258	0.9					1.2										0.8											2.9
118-119																2.8											2.8
50																	2.7										2.7
12-13					1.1																					1.3	2.4
625-626				2.0												0.3		0.1									2.4
628				2.0												0.3		0.1									2.4
132-135																	2.3										2.3
45																	2.0										2.0
47-48																	2.0										2.0
219-220	0.5				0.4											0.8		0.3									1.9
492																1.8											1.8
680				0.9												0.7											1.6
255-256																1.5											1.5
96-98				1.5																							1.5
100-101				1.5																							1.5
167	0.4															0.1			0.9								1.4
14-17																										1.3	1.3
232-233					0.5	0.1																				0.5	1.1
411-412																1.0											1.0
424																0.9											0.9
681				0.9																							0.9
226-227	0.2					0.2										0.4											0.8
244-246																0.8											0.8
648-650																0.5											0.5

Notes

Emboldened observations are the critical group consumers

The critical group consumption rate of fish based on the 25 highest adult consumers is 51.4 kg/y

The observed 97.5 percentile rate based on 235 observations is 51.2 kg/y

Table 4. Adults' consumption rates of crustaceans in the Dungeness area (kg/y)

Observation number	Brown shrimp	Crab	Lobster	Total
59	**8.8**	**2.7**	**4.6**	**16.1**
121		**7.3**	**7.6**	**14.9**
477	**11.8**	**2.3**		**14.1**
69	**5.9**	**5.8**	**0.9**	**12.5**
446-447	**11.8**			**11.8**
810	**11.8**			**11.8**
473	**0.7**	**7.8**		**8.5**
32-33		**8.0**		**8.0**
74		**4.6**	**2.4**	**7.0**
809		**6.9**		**6.9**
646	**5.7**	**0.8**		**6.5**
751	**1.4**	**4.4**	**0.5**	**6.3**
372	**3.4**	**1.4**	**1.3**	**6.1**
645	**5.7**			**5.7**
439	**2.7**	**2.7**		**5.4**
863		**4.1**	**1.3**	**5.4**
102-103		4.5		4.5
799-800	0.8	2.3	1.1	4.1
752-753	0.7	2.2	0.2	3.1
445	0.9	0.8	1.3	3.0
652		1.6	1.3	2.9
811	2.9			2.9
749	1.1	1.6		2.8
87-88		2.7		2.7
73			2.4	2.4
7-8	1.4	0.8		2.2
643-644			2.2	2.2
450	1.8	0.3		2.1
747-748	1.1	0.5	0.2	1.9
86		1.7		1.7
444	0.9	0.8		1.7
413-414		1.6		1.6
443		1.6		1.6
441	1.4	0.3		1.6
440	1.4			1.4
442	1.4			1.4
624	1.4			1.4
813-814	1.4			1.4
472	0.7		0.6	1.3
818-819		1.1		1.1
684-685		0.8	0.3	1.1
792-793		0.9	0.1	1.0
391		0.8		0.8
825		0.8		0.8
801-802	0.8			0.8
489		0.3	0.4	0.7
423	0.7			0.7
434	0.7			0.7
45			0.6	0.6
47-48			0.6	0.6
448		0.5		0.5
521-522	0.5			0.5

Table 4. Adults' consumption rates of crustaceans in the Dungeness area (kg/y)

Observation number	Brown shrimp	Crab	Lobster	Total
821	0.5			0.5
108-109		0.4		0.4
805	0.4			0.4
405-406		0.3		0.3
418		0.1		0.1
669-672	0.1			0.1
625-626	0.1			0.1
628	0.1			0.1

Notes

Emboldened observations are the critical group consumers

The critical group consumption rate of crustaceans based on the 18 highest adult consumers is 9.3 kg/y

The observed 97.5 percentile rate based on 83 observations is 14.0 kg/y

Table 5. Adults' consumption rates of molluscs in the Dungeness area (kg/y)

Observation number	King scallop	Whelk	Total
59	**33.7**		**33.7**
102-103	**19.7**		**19.7**
850	**18.7**		**18.7**
751	**13.0**		**13.0**
46	**11.2**		**11.2**
49	**11.2**		**11.2**
851	**11.2**		**11.2**
747-748	10.4		10.4
652	10.4		10.4
863		8.2	8.2
752-753	6.5		6.5
60-61	5.6		5.6
643-644	5.4		5.4
648	5.4		5.4
473		5.2	5.2
69	5.2		5.2
445	5.2		5.2
749	5.2		5.2
32-33	4.2		4.2
55-57	4.2		4.2
450	3.6	0.3	3.9
439	2.6	1.2	3.8
809		3.7	3.7
792		2.9	2.9
50	2.9		2.9
34	2.8		2.8
440-441	2.6		2.6
820	2.5		2.5
681	1.4	0.8	2.2
434-435	2.2		2.2
684	2.2		2.2
791	1.7		1.7
680	1.4		1.4
372	1.3		1.3
645-646	1.3		1.3
108-109		1.2	1.2
45	1.1		1.1
47-48	1.1		1.1
121		1.0	1.0
818-819		0.8	0.8
236-237		0.7	0.7
7-8		0.5	0.5
248		0.5	0.5
472	0.4		0.4
825	0.2		0.2
429-432		0.1	0.1

Notes

Emboldened observations are the critical group consumers

The critical group consumption rate of molluscs based on the 8 highest adult consumers is 17.3 kg/y

The observed 97.5 percentile rate based on 65 observations is 19.7 kg/y

Table 6. Adults' consumption rates of marine plants and algae in the Dungeness area (kg/y)

Observation number	Sea kale
822	**0.5**
138	**0.2**

Notes

Emboldened observations are the critical group consumers

The critical group consumption rate of marine plants and algae based on the 2 highest adult consumers is 0.3 kg/y

The observed 97.5 percentile rate based on 2 observations is 0.4 kg/y

Table 7. Children's consumption rates of fish in the Dungeness area (kg/y)

15 year old age group

Observation number	Age	Bass	Brill	Cod	Dab	Dover sole	Grey gurnard	Herring	Lemon sole	Lesser spotted dogfish	Mackerel	Mixed fish	Plaice	Sprat	Spurdog	Thornback ray	Whiting	Total
104	**16**					**11.8**	**11.8**								**11.8**			**35.4**
105	**14**					**8.8**	**8.8**								**8.8**			**26.5**
107	**13**					**8.8**	**8.8**								**8.8**			**26.5**
485	12	6.6		0.2							1.8						0.4	9.1
72	13											8.2						8.2
436	13								3.9									3.9
475	13			3.6														3.6
165	13	3.1																3.1
242	14			1.0							1.3						0.6	3.0
154	13	0.7		0.8							1.1							2.5
627	16			2.0							0.3		0.1					2.4
682	12			0.9							0.7							1.6
99	14			1.5														1.5
488	12										1.1							1.1
651	13										0.5							0.5

Notes

Emboldened observations are the critical group consumers

The critical group consumption rate of fish based on the 3 highest 15 year old consumers is 29.5 kg/y

The observed 97.5 percentile rate based on 15 observations is 32.3 kg/y

Table 7. Children's consumption rates of fish in the Dungeness area (kg/y)

10 year old age group

Observation number	Age	Bass	Brill	Cod	Dab	Dover sole	Grey gurnard	Herring	Lemon sole	Lesser spotted dogfish	Mackerel	Mixed fish	Plaice	Sprat	Spurdog	Thornback ray	Whiting	Total
58	**10**											**35.4**						**35.4**
451	**11**			**1.8**	**9.5**	**11.8**					**1.1**			**3.6**				**27.8**
106	**11**					**8.8**	**8.8**								**8.8**			**26.5**
754	**8**	**0.2**		**2.9**	**0.7**	**5.9**		**1.0**			**0.6**		**0.7**			**5.9**		**17.9**
852	**8**					**3.9**				**3.9**			**3.9**					**11.8**
75	11			4.1									4.1					8.2
76	9			4.1									4.1					8.2
687	8		1.1	2.1		0.9							0.9			1.4		6.4
686	11		1.1	2.1		0.9							0.9			1.4		6.4
688	7		1.1	2.1		0.9							0.9			1.4		6.4
437	11								3.9									3.9
438	8								3.9									3.9
476	11			3.6														3.6
166	11	3.1																3.1
243	7			0.5							0.7						0.3	1.5
487	9										1.1							1.1
425	8										0.9							0.9
228	10	0.2				0.2					0.4							0.8
229	8	0.2				0.2					0.4							0.8
235	10				0.3	0.1											0.4	0.8

Notes

Emboldened observations are the critical group consumers

The critical group consumption rate of fish based on the 5 highest 10 year old consumers is 23.9 kg/y

The observed 97.5 percentile rate based on 20 observations is 31.8 kg/y

Table 7. Children's consumption rates of fish in the Dungeness area (kg/y)

5 year old age group

Observation number	Age	Bass	Brill	Cod	Dab	Dover sole	Grey gurnard	Herring	Lemon sole	Lesser spotted dogfish	Mackerel	Mixed fish	Plaice	Sprat	Spurdog	Thornback ray	Whiting	Total
4	**5**			**8.0**														**8.0**
853	**4**					**2.0**				**2.0**			**2.0**					**5.9**
426	4										0.9							0.9
153	3	0.3		0.2							0.3							0.8
234	6				0.1	0.02											0.1	0.2

Notes

Emboldened observations are the critical group consumers

The critical group consumption rate of fish based on the 2 highest 5 year old consumers is 6.9 kg/y

The observed 97.5 percentile rate based on 5 observations is 7.8 kg/y

Table 8. Children's consumption rates of crustaceans in the Dungeness area (kg/y)

15 year old age group

Observation number	Age	Brown shrimp	Crab	Lobster	Total
104	**16**		**4.5**		**4.5**
105	**14**		**4.5**		**4.5**
107	**13**		**4.5**		**4.5**
673	15	0.1			0.1
627	16	0.1			0.1

Notes
Emboldened observations are the critical group consumers
The critical group consumption rate of crustaceans based on the 3 highest 15 year old consumers is 4.5 kg/y
The observed 97.5 percentile rate based on 5 observations is 4.5 kg/y

10 year old age group

Observation number	Age	Brown shrimp	Crab	Lobster	Total
75	**11**		**4.6**		**4.6**
76	**9**		**4.6**		**4.6**
106	**11**		**4.5**		**4.5**
451	**11**	**1.8**	**0.3**		**2.1**
754	**8**	**0.3**	**1.1**	**0.1**	**1.6**
686	11		0.8	0.3	1.1
687	8		0.8	0.3	1.1
688	7		0.8	0.3	1.1
438	8	0.7			0.7
674	8	0.1			0.1

Notes
Emboldened observations are the critical group consumers
The critical group consumption rate of crustaceans based on the 5 highest 10 year old consumers is 3.5 kg/y
The observed 97.5 percentile rate based on 10 observations is 4.6 kg/y

5 year old age group

Observation number	Age	Brown shrimp	Crab	Lobster	Total
803	**6**	**0.4**			**0.4**
804	**4**	**0.4**			**0.4**

Notes
Emboldened observations are the critical group consumers
The critical group consumption rate of crustaceans based on the 2 highest 5 year old consumers is 0.4 kg/y
The observed 97.5 percentile rate based on 2 observations is 0.4 kg/y

Table 9. Children's consumption rates of molluscs in the Dungeness area (kg/y)

15 year old age group

Observation number	Age	King scallop	Whelk	Total
104	**16**	**19.7**		**19.7**
105	**14**	**19.7**		**19.7**
107	**13**	**19.7**		**19.7**
683	15	1.4	0.8	2.2
682	12	1.4		1.4

Notes
Emboldened observations are the critical group consumers
The critical group consumption rate of molluscs based on the 3 highest 15 year old consumers is 19.7 kg/y
The observed 97.5 percentile rate based on 5 observations is 19.7 kg/y

10 year old age group

Observation number	Age	King scallop	Whelk	Total
106	**11**	**19.7**		**19.7**
852	**8**	**7.5**		**7.5**
58	10	4.2		4.2
754	8	3.2		3.2
451	11	2.3	0.3	2.6

Notes
Emboldened observations are the critical group consumers
The critical group consumption rate of molluscs based on the 2 highest 10 year old consumers is 13.6 kg/y
The observed 97.5 percentile rate based on 5 observations is 18.4 kg/y

5 year old age group

Observation number	Age	King scallop	Whelk	Total
853	**4**	**3.7**		**3.7**

Notes
Emboldened observations are the critical group consumers
The critical group consumption rate of molluscs based on the only 5 year old consumer is 3.7 kg/y
The observed 97.5 percentile is not applicable for 1 observation

Table 10. Summary of adults' consumption rates in the Dungeness area (kg/y or l/y)

Food group	Number of observations	No. higher rate consumers	Observed maximum critical group consumption rate	Observed minimum critical group consumption rate	Observed mean critical group consumption rate	Observed 97.5 %ile consumption rate	Generic mean consumption rate	Generic 97.5 %ile consumption rate
Fish	235	25	117.0	39.4	51.4	51.2	15.0	40.0
Crustaceans	83	18	16.1	5.4	9.3	14.0	3.5	10.0
Molluscs	65	8	33.7	11.2	17.3	19.7	3.5	10.0
Marine plants and algae	2	2	0.45	0.20	0.33	0.45	ND	ND
Green vegetables	30	5	56.6	19.9	34.6	56.6	15.0	45.0
Other vegetables	40	3	88.8	53.9	65.5	54.7	20.0	50.0
Root vegetables	38	9	48.3	25.4	36.1	48.3	10.0	40.0
Potato	38	12	86.8	41.0	64.2	86.8	50.0	120.0
Domestic fruit	30	10	10.0	4.5	7.5	10.0	20.0	75.0
Milk	NC	NC	NC	NC	NC	NC	95.0	240.0
Cattle meat	NC	NC	NC	NC	NC	NC	15.0	45.0
Pig meat	NC	NC	NC	NC	NC	NC	15.0	40.0
Sheep meat	14	14	18.8	18.8	18.8	18.8	8.0	25.0
Poultry	8	6	3.8	2.0	2.9	3.8	10.0	30.0
Eggs	18	14	26.4	8.9	19.9	26.4	8.5	25.0
Wild/free foods	20	1	11.3	11.3	11.3	7.0	7.0	25.0
Rabbits/hares	2	2	2.3	2.3	2.3	2.3	6.0	15.0
Honey	8	3	5.7	2.7	4.7	5.7	2.5	9.5
Wild fungi	18	11	0.9	0.5	0.5	0.8	3.0	10.0
Venison	NC	NC	NC	NC	NC	NC	ND	ND
Fish (freshwater)	NC	NC	NC	NC	NC	NC	15.0	40.0

Notes

ND = not determined

NC = not consumed

For 1 observation, the terms maximum, minimum and mean are not strictly valid

Table 11. Summary of 15 year old children's consumption rates in the Dungeness area (kg/y or l/y)

Food group	Number of observations	No. higher rate consumers	Observed maximum critical group consumption rate	Observed minimum critical group consumption rate	Observed mean critical group consumption rate	Observed 97.5 %ile consumption rate	Generic mean consumption rate	Generic 97.5 %ile consumption rate
Fish	15	3	35.4	26.5	29.5	32.3	6.5	20.0
Crustaceans	5	3	4.5	4.5	4.5	4.5	2.5	6.0
Molluscs	5	3	19.7	19.7	19.7	19.7	2.5	6.0
Marine plants and algae	NC	NC	NC	NC	NC	NC	ND	ND
Green vegetables	NC	NC	NC	NC	NC	NC	9.0	25.0
Other vegetables	NC	NC	NC	NC	NC	NC	10.0	30.0
Root vegetables	NC	NC	NC	NC	NC	NC	7.5	20.0
Potato	NC	NC	NC	NC	NC	NC	60.0	130.0
Domestic fruit	2	2	0.2	0.2	0.2	0.2	15.0	50.0
Milk	NC	NC	NC	NC	NC	NC	110.0	260.0
Cattle meat	NC	NC	NC	NC	NC	NC	15.0	35.0
Pig meat	NC	NC	NC	NC	NC	NC	10.0	30.0
Sheep meat	1	1	18.8	18.8	18.8	NA	5.5	15.0
Poultry	1	1	3.8	3.8	3.8	NA	6.5	20.0
Eggs	NC	NC	NC	NC	NC	NC	7.0	25.0
Wild/free foods	1	1	0.2	0.2	0.2	NA	3.0	13.0
Rabbits/hares	NC	NC	NC	NC	NC	NC	ND	ND
Honey	1	1	0.2	0.2	0.2	NA	2.0	5.0
Wild fungi	3	3	0.2	0.1	0.1	0.2	2.0	5.5
Venison	NC	NC	NC	NC	NC	NC	ND	ND
Fish (freshwater)	NC	NC	NC	NC	NC	NC	6.5	20.0

Notes

ND = not determined

NC = not consumed

NA = not applicable

For 1 observation, the terms maximum, minimum and mean are not strictly valid

Table 12. Summary of 10 year old children's consumption rates in the Dungeness area (kg/y or l/y)

Food group	Number of observations	No. higher rate consumers	Observed maximum critical group consumption rate	Observed minimum critical group consumption rate	Observed mean critical group consumption rate	Observed 97.5 %ile consumption rate	Generic mean consumption rate	Generic 97.5 %ile consumption rate
Fish	20	5	35.4	11.8	23.9	31.8	6.0	20.0
Crustaceans	10	5	4.6	1.6	3.5	4.6	2.5	7.0
Molluscs	5	2	19.7	7.5	13.6	18.4	2.5	7.0
Marine plants and algae	NC	NC	NC	NC	NC	NC	ND	ND
Green vegetables	NC	NC	NC	NC	NC	NC	6.0	20.0
Other vegetables	NC	NC	NC	NC	NC	NC	8.0	25.0
Root vegetables	1	1	0.2	0.2	0.2	NA	6.0	20.0
Potato	1	1	7.6	7.6	7.6	NA	45.0	85.0
Domestic fruit	1	1	0.2	0.2	0.2	NA	15.0	50.0
Milk	NC	NC	NC	NC	NC	NC	110.0	240.0
Cattle meat	NC	NC	NC	NC	NC	NC	15.0	30.0
Pig meat	NC	NC	NC	NC	NC	NC	8.5	25.0
Sheep meat	NC	NC	NC	NC	NC	NC	4.0	10.0
Poultry	NC	NC	NC	NC	NC	NC	5.5	15.0
Eggs	NC	NC	NC	NC	NC	NC	6.5	20.0
Wild/free foods	1	1	0.2	0.2	0.2	NA	3.0	11.0
Rabbits/hares	NC	NC	NC	NC	NC	NC	ND	ND
Honey	NC	NC	NC	NC	NC	NC	2.0	7.5
Wild fungi	2	2	0.2	0.1	0.1	0.2	1.5	4.5
Venison	NC	NC	NC	NC	NC	NC	ND	ND
Fish (freshwater)	NC	NC	NC	NC	NC	NC	6.0	20.0

Notes

ND = not determined

NC = not consumed

NA = not applicable

For 1 observation, the terms maximum, minimum and mean are not strictly valid

Table 13. Summary of 5 year old children's consumption rates in the Dungeness area (kg/y or l/y)

Food group	Number of observations	No. higher rate consumers	Observed maximum critical group consumption rate	Observed minimum critical group consumption rate	Observed mean critical group consumption rate	Observed 97.5 %ile consumption rate	Generic mean consumption rate	Generic 97.5 %ile consumption rate
Fish	5	2	8.0	5.9	6.9	7.8	ND	ND
Crustaceans	2	2	0.4	0.4	0.4	0.4	ND	ND
Molluscs	1	1	3.7	3.7	3.7	NA	ND	ND
Marine plants and algae	NC	NC	NC	NC	NC	NC	ND	ND
Green vegetables	NC	NC	NC	NC	NC	NC	ND	ND
Other vegetables	2	2	3.4	3.4	3.4	3.4	ND	ND
Root vegetables	2	2	0.8	0.8	0.8	0.8	ND	ND
Potato	2	2	1.5	1.5	1.5	1.5	ND	ND
Domestic fruit	2	2	1.7	1.7	1.7	1.7	ND	ND
Milk	NC	NC	NC	NC	NC	NC	ND	ND
Cattle meat	NC	NC	NC	NC	NC	NC	ND	ND
Pig meat	NC	NC	NC	NC	NC	NC	ND	ND
Sheep meat	NC	NC	NC	NC	NC	NC	ND	ND
Poultry	NC	NC	NC	NC	NC	NC	ND	ND
Eggs	NC	NC	NC	NC	NC	NC	ND	ND
Wild/free foods	NC	NC	NC	NC	NC	NC	ND	ND
Rabbits/hares	NC	NC	NC	NC	NC	NC	ND	ND
Honey	2	1	2.3	2.3	2.3	2.2	ND	ND
Wild fungi	NC	NC	NC	NC	NC	NC	ND	ND
Venison	NC	NC	NC	NC	NC	NC	ND	ND
Fish (freshwater)	NC	NC	NC	NC	NC	NC	ND	ND

Notes

ND = not determined

NC = not consumed

NA = not applicable

For 1 observation, the terms maximum, minimum and mean are not strictly valid

Table 14. Intertidal occupancy rates in the Dungeness area (h/y)

Observation number	Location*	Activity*	Salt marsh	Sand	Sand and mud	Sand and stones	Boat dwelling
84	**Opposite Rye docks**	**Angling**	**150**				
738-746	**Dymchurch to Hythe Military Range**	**Sea defence work**		**1950**			
717-737	**Dymchurch to Hythe Military Range**	**Sea defence work**		**1800**			
699-716	**Dymchurch to Hythe Military Range**	**Sea defence work**		**1650**			
693-698	**Dymchurch to Hythe Military Range**	**Sea defence work**		**1500**			
110	**Winchelsea Beach**	**Working on the shore**		**1356**			
648	**Dymchurch to Winchelsea/**Dungeness, Denge Marsh, Galloways and Littlestone-on-Sea	**Bait digging/**Angling		**1274**		30	
7	**Dungeness Beach**	**Dog walking**		**1095**			
116	**Pett Level**	**Angling**/Bait digging		**1001**	84		
10-11	**Greatstone-on-Sea Beach**	**Bait digging**		**780**			
680	**St. Mary's Bay to Winchelsea**/Lydd-on-Sea Beach	**Bait digging**/Angling		**730**		30	
675	**Dungeness Beach**	**Bait digging/Angling, beach combing and working on the shore**		**650**		**868**	
791	Lydd-on-Sea Beach	Bait digging, angling and working on the shore		328			
604-605	Camber Sands, Broomhill Sands, Greatstone-on-Sea and Littlestone-on-Sea	Water sports instructor		320			
132-133	Dungeness Beach	Angling		300			
749	Dungeness Beach	Bait digging		273			
606	Greatstone-on-Sea, Dymchurch and Camber Sands	Beach sports		260			
113	Winchelsea and Pett Level	Working on the shore and angling		242			
18	Dungeness and Hythe	Angling		234			
20	Dungeness and Hythe	Angling		234			
607-623	Greatstone-on-Sea, Dymchurch and Camber Sands	Beach sports		208			
825	Greatstone Beach	Walking		208			
90	Winchelsea Beach	Angling		180			
600	Greatstone-on-Sea Beach	Bait digging and angling		178			
481-482	Broomhill Sands and Greatstone-on-Sea	Beach sports		156			
23	Dungeness Beach	Angling		150			
25	Dungeness Beach	Angling		150			
867-872	Broomhill Sands and Greatstone-on-Sea	Beach sports		144			

Table 14. Intertidal occupancy rates in the Dungeness area (h/y)

Observation number	Location*	Activity*	Salt marsh	Sand	Sand and mud	Sand and stones	Boat dwelling
625	Dungeness, Denge Marsh, Galloways and Littlestone-on-Sea	Dog walking/Angling		104		30	
808	St. Mary's Bay	Angling		104			
810	St. Mary's Bay	Dog walking/Working on the shore		100		100	
473-476	Lydd-on-Sea Beach	Dog walking		78			
806-807	St. Mary's Bay	Dog walking		78			
96	Pett Level/Winchelsea Beach	Angling/Bait digging		76	100		
100	Pett Level/Winchelsea Beach	Angling/Bait digging		76	100		
452-471	Dungeness Beach	RNLI volunteer work		75			
490-493	Denge Marsh	Angling		72			
417-418	Dungeness Beach	Angling		64			
89	Winchelsea Beach	Angling and bait digging		60			
164-166	Sunny Sands Beach (Folkestone)	Playing		60			
814	Dungeness Beach	Walking		52			
12-13	Dungeness Beach	Angling		41			
597-598	Greatstone-on-Sea Beach/Dungeness Beach	Bait digging/Angling		36		48	
599	Greatstone-on-Sea Beach	Walking		36			
118	Pett Level	Angling		32			
489	Jury's Gap/Denge Marsh	Angling		30		30	
27	Dungeness Beach	Angling		27			
29	Dungeness Beach	Angling		27			
423	Camber Sands/Dungeness, Camber Sands and Jury's Gap	Bait digging/Angling		26		260	
519	Dymchurch Beach/Dungeness, Denge Marsh and Hythe	Angling		24		80	
500	Dungeness and Denge Marsh	Angling		20			
446	Dungeness Beach	Bait digging/Angling		18		104	
14	Dungeness Beach	Angling		16			
16	Dungeness Beach	Angling		16			
645	Greatstone-on-Sea and Lydd-on-Sea**/Dymchurch to Winchelsea**	Angling**/Bait digging**		12	**1040**		
93	**Winchelsea Beach**	**Bait digging and angling**			**1952**		
95	**Winchelsea Beach**	**Bait digging**			**1950**		
477	**Littlestone-on-Sea, Dungeness, Winchelsea and Camber Sands**	**Bait digging**			**1350**		

Table 14. Intertidal occupancy rates in the Dungeness area (h/y)

Observation number	Location*	Activity*	Salt marsh	Sand	Sand and mud	Sand and stones	Boat dwelling
624	**Local beaches**	**Bait digging**			**1170**		
450	Dungeness Beach/Dungeness and Lydd-on-Sea	Bait digging/Working on the shore and playing			564	108	
410	Dungeness and Greatstone-on-Sea	Bird watching			156		
809	Littlestone-on-Sea and Dymchurch/Dymchurch and Hythe	Bait digging/Angling			105	210	
444	**Dungeness Beach**	Bait digging/**Working on the shore**			39	**360**	
342	Folkestone, Dymchurch and Dungeness/**Folkestone to Dungeness**	Bait digging/**Angling**			24	**700**	
818	**Lydd-on-Sea Beach**	Bait digging/**Beach cleaning and angling**			24	**468**	
427	Greatstone-on-Sea Beach/Dungeness, Denge Marsh, Jury's Gap and Galloways	Bait digging/Angling			18	144	
168	**Folkestone to Dungeness**	**Angling**				**1000**	
155	**Folkestone to Dungeness**	**Angling**				**880**	
158-159	**Folkestone to Dungeness**	**Angling**				**800**	
486-488	**Dungeness and Denge Marsh**	**Angling**				**720**	
151	**Folkestone to Hythe**	**Angling**				**500**	
252	**Folkestone to Dungeness**	**Angling**				**500**	
230	**Sandgate Beach**	**Angling**				**400**	
483	**Dungeness, Denge Marsh and Hythe**	**Angling**				**368**	
830-831	**Dungeness Beach**	**Walking**				**365**	
484-485	**Dungeness and Denge Marsh**	**Angling**				**350**	
244	Sandgate Beach	Angling				300	
506-507	Denge Marsh	Angling				300	
238	Folkestone to Dungeness	Angling				290	
245-246	Folkestone to Dungeness	Angling				250	
827-828	Dungeness Beach	Dog walking				245	
236-237	Sandgate to Dungeness	Angling				220	
257-258	Folkestone, Hythe and Dungeness	Angling				220	
409	Dungeness and Greatstone-on-Sea	Bird watching				208	
448	Dungeness Beach	Working on the shore				202	
152	Folkestone to Dungeness	Angling				200	
217-218	Folkestone, Hythe and Dungeness	Angling				200	
231	Sandgate Beach	Dog walking				200	
684	Hythe Beach	Working on the shore				183	

Table 14. Intertidal occupancy rates in the Dungeness area (h/y)

Observation number	Location*	Activity*	Salt marsh	Sand	Sand and mud	Sand and stones	Boat dwelling
628	Greatstone-on-Sea Beach	Walking				182	
224-225	Folkestone Beach	Dog walking				180	
247	Folkestone to Hythe	Angling				180	
167	Folkestone to Dungeness	Angling				160	
855-856	Dungeness Beach	Walking				156	
449	Dungeness Beach	Working on the shore				150	
413	Dungeness Beach	Angling				144	
318	Dungeness Beach	Beach combing				140	
240	Sandgate to Dungeness	Angling				130	
242	Sandgate to Dungeness	Angling				130	
820	Dungeness Beach	Working on the shore				120	
223	Folkestone Beach	Dog walking				110	
232	Sandgate and Hythe	Angling				110	
253	Sandgate to Dungeness	Angling				110	
255	Sandgate to Dungeness	Angling				110	
443	Dungeness Beach	Walking				104	
146	Dungeness Beach	Beach combing				100	
149-150	Folkestone and Hythe	Angling				100	
415	Dungeness and Folkestone	Angling				96	
520	Dungeness, Denge Marsh and Hythe	Angling				80	
160	Dungeness and Hythe	Angling				70	
157	Dungeness and Hythe	Angling				60	
280-297	Hythe	Water sports preparation				60	
511-512	Dungeness, Denge Marsh and Hythe	Angling				60	
451	Lydd-on-Sea Beach	Playing				56	
753	Dungeness Beach	Working on the shore				52	
755	Dungeness Beach	Working on the shore				52	
145	Dungeness Beach	Walking				50	
156	Hythe Beach	Dog walking				50	
429	Dungeness Beach	Angling				48	
431	Dungeness Beach	Angling				48	
434	Dungeness Beach	Working on the shore				44	
439	Dungeness Beach	Working on the shore				44	
226	Sandgate and Dungeness	Angling				40	
411	Dungeness Beach	Angling				33	
412	Dungeness Beach	Sunbathing				33	

Table 14. Intertidal occupancy rates in the Dungeness area (h/y)

Observation number	Location*	Activity*	Salt marsh	Sand	Sand and mud	Sand and stones	Boat dwelling
250-251	Folkestone to Dungeness	Angling				30	
643	Dungeness Beach	Angling				30	
441	Lydd-on-Sea Beach	Angling				24	
508-509	Denge Marsh	Angling				24	
227-229	Sandgate and Dungeness	Playing				20	
243	Sandgate to Dungeness	Angling				20	
432	Dungeness Beach	Angling				20	
494	Denge Marsh	Angling				20	
495	Denge Marsh	Angling				20	
496	Denge Marsh	Angling				20	
497	Denge Marsh	Angling				20	
498	Denge Marsh	Angling				20	
499	Denge Marsh	Angling				20	
510	Hythe Beach	Angling				15	
419	Dungeness and Denge Marsh	Angling				6	
420	Dungeness and Denge Marsh	Angling				6	
421	Dungeness and Denge Marsh	Sunbathing				6	
422	Dungeness and Denge Marsh	Sunbathing				6	
144	**Brede Boatyard (Rye)**	**Boat dwelling (tide out)**					**3943**

Notes

Emboldened observations are the critical group members
The critical group intertidal occupancy rate over salt marsh based on 1 observation is 150 h/y
The observed 97.5 percentile rate is not applicable for 1 observation
The critical group intertidal occupancy rate over sand based on 62 observations is 1641 h/y
The observed 97.5 percentile rate based on 160 observations for sand is 1950 h/y
The critical group intertidal occupancy rate over sand and mud based on 5 observations is 1492 h/y
The observed 97.5 percentile rate based on 15 observations for sand and mud is 1951 h/y
The critical group intertidal occupancy rate over sand and stones based on 19 observations is 591 h/y
The observed 97.5 percentile rate based on 130 observations for sand and stones is 800 h/y
The critical group intertidal occupancy rate for houseboat dwelling based on 1 observation is 3943 h/y
The observed 97.5 percentile rate is not applicable for 1 observation

*The forward slash (/), separates the locations of, and activities taking place on, the separate substrates for that individual

Table 15. Handling rates of fishing gear and sediment in the Dungeness area (h/y)

Observation number	Location	Activity*	Fishing gear	Sediment
799	**Dungeness**	**Gear handling**	**1800**	
801	**Dungeness**	**Gear handling**	**1800**	
86	**Rye Bay**	**Gear handling**	**1710**	
120-121	**Rye Bay**	**Gear handling**	**1638**	
87-88	**Rye Bay**	**Gear handling**	**1456**	
110	**Winchelsea Beach**	**Gear handling**	**1356**	
148	**Folkestone**	**Gear handling**	**1300**	
337-338	**Folkestone to Dungeness**	**Gear handling**	**1300**	
108	**Rye Bay**	**Gear handling**	**1170**	
69-70	**Rye Bay**	**Gear handling**	**1092**	
62-68	**Rye Bay**	**Gear handling**	**1047**	
102	**Rye Bay**	**Gear handling**	**1047**	
815	**Various**	**Gear handling**	**1006**	
73	**Rye Bay**	**Gear handling**	**1000**	
684	**Hythe**	**Gear handling**	**800**	
850	**Folkestone to Dungeness**	**Gear handling**	**789**	
854	**Folkestone to Dungeness**	**Gear handling**	**789**	
55	**Rye Bay**	**Gear handling**	**728**	
863	**Folkestone**	**Gear handling**	**701**	
864	**Folkestone**	**Gear handling**	**701**	
444	**Dungeness**	**Gear handling**/Bait digging	**700**	39
751	**Dungeness**	**Gear handling**	**700**	
335	**Folkestone to Dymchurch**	**Gear handling**	**600**	
336	**Folkestone to Dymchurch**	**Gear handling**	**600**	
339	Folkestone to Dungeness	Gear handling	580	
340	Folkestone to Dungeness	Gear handling	580	
45	Rye Bay	Gear handling	500	
46	Rye Bay	Gear handling	500	
52	Rye Bay	Gear handling	500	
53	Rye Bay	Gear handling	500	
34	Dungeness	Gear handling	499	
820	Dungeness	Gear handling	492	
216	Folkestone	Gear handling	400	
653	Dungeness	Gear handling	356	
50	Rye Bay	Gear handling	300	
51	Rye Bay	Gear handling	300	
810	St. Mary's Bay	Gear handling	284	
753	Dungeness	Gear handling	182	
755	Dungeness	Gear handling	182	
652	Dungeness	Gear handling	178	
113	Winchelsea	Gear handling	84	
341	Folkestone	Gear handling	70	
434	Dungeness	Gear handling	33	
439	Dungeness	Gear handling	33	
95	**Winchelsea Beach**	**Bait digging**		**1950**
93	**Winchelsea Beach**	**Bait digging**		**1872**
477	**Littlestone-on-Sea, Dungeness, Winchelsea, Camber Sands**	**Bait digging**		**1350**
648	**Dymchurch to Winchelsea**	**Bait digging**		**1274**
624	**Various**	**Bait digging**		**1170**
645	**Dymchurch to Winchelsea**	**Bait digging**		**1040**
10-11	**Greatstone-on-Sea Beach**	**Bait digging**		**780**
680	**St. Mary's Bay to Winchelsea**	**Bait digging**		**730**

Table 15. Handling rates of fishing gear and sediment in the Dungeness area (h/y)

Observation number	Location	Activity*	Fishing gear	Sediment
675	**Dungeness Beach**	**Bait digging**		**650**
450	Dungeness Beach	Bait digging		564
738-746	Dymchurch to Hythe Military Range	Sea defence work		480
736-737	Dymchurch to Hythe Military Range	Sea defence work		450
706-716	Dymchurch to Hythe Military Range	Sea defence work		420
749	Dungeness Beach	Bait digging		273
809	Littlestone-on-Sea and Dymchurch	Bait digging		105
96	Winchelsea Beach	Bait digging		100
100	Winchelsea Beach	Bait digging		100
116	Pett Level	Bait digging		84
600	Greatstone-on-Sea Beach	Bait digging		52
597-598	Greatstone-on-Sea Beach	Bait digging		36
423	Camber Sands	Bait digging		26
342	Folkestone, Dymchurch and Dungeness	Bait digging		24
818	Lydd-on-Sea Beach	Bait digging		24
427	Greatstone-on-Sea Beach	Bait digging		18
446	Dungeness Beach	Bait digging		18
89	Winchelsea Beach	Bait digging		12
791	Lydd-on-Sea Beach	Bait digging		6

Notes

Emboldened observations are the critical group members
The critical group fishing gear handling rate based on 34 observations is 1106 h/y
The observed 97.5 percentile rate based on 54 observations for fishing gear is 1771 h/y
The critical group sediment handling rate based on 10 observations is 1160 h/y
The observed 97.5 percentile rate based on 49 observations for sediment is 1768 h/y

*The forward slash (/), separates the activities taking place on the separate substrates for that individual

Table 16. Gamma dose rate measurements over intertidal substrates in the Dungeness area (µGy/h)

Location	NGR	Substrate	Gamma dose rate at 1 metre
Sandgate Beach	TR 195 348	Sand and stone	0.042
Hythe Beach (west)	TR 156 338	Sand and stone	0.044
Folkestone Beach	TR 231 355	Sand and stone	0.045
Hythe Beach (east)	TR 171 343	Sand and stone	0.045
Camber Sands	TQ 972 183	Sand	0.051
Dymchurch Beach	TR 106 295	Sand and mud	0.053
Pett Level Beach	TQ 895 135	Sand and mud	0.053
Lydd-on-Sea Beach	TR 087 199	Sand and stone	0.053
Winchelsea Beach	TQ 920 160	Sand and mud	0.053
Dungeness Point	TR 096 168	Sand and stone	0.054
Sunny Sands Beach (Folkestone)	TR 236 362	Sand	0.054
Folkestone Harbour	TR 234 360	Sand and mud	0.058
Jury's Gap	TQ 992 179	Sand and stone	0.059
Rye Fish Quay	TQ 924 205	Salt marsh	0.059
Broomhill Sands	TQ 981 180	Sand	0.060
Littlestone-on-Sea Beach	TR 086 245	Sand and mud	0.060
Rye Harbour	TQ 924 206	Mud	0.061
Hythe Military Range (south)	TR 126 316	Sand	0.063
Littlestone-on-Sea Beach	TR 086 245	Sand	0.063
St. Mary's Bay (north)	TR 094 278	Sand	0.063
St. Mary's Bay (south)	TR 089 267	Sand	0.064
Jury's Gap	TQ 987 179	Sand	0.066
Brede Boatyard	TQ 923 199	Mud	0.066

Table 17. Occupancy rates in and on water in the Dungeness area (h/y)

Observation number	Location**	Activity**	In water	On water
122-131	Camber Sands	Kitesurfing	520	
7	Dungeness Beach	Swimming	485	
820	Dungeness Beach	Push netting/Hobby fishing	390	492
791	Lydd-on-Sea Beach	Fyke netting (checking)	360	
604-605	Camber Sands, Greatstone-on-Sea, Littlestone-on-Sea and Broomhill Sands	Kitesurfing	320	
446	Dungeness Beach	Push netting/Angling	208	80
280-297	Hythe	Windsurfing	190	
680	Lydd-on-Sea Beach	Windsurfing and swimming	176	
606	Greatstone-on-Sea, Dymchurch and Camber Sands	Windsurfing	156	
595-596	*Lydd Water Sports Centre*	*Water sports Instructor*	*134*	*1205*
810	St. Mary's Bay	Push netting/Hobby fishing	100	312
521	Dungeness Beach	Push netting	45	
523-594	*Lydd Water Sports Centre*	*Water-skiing, wake boarding/Jet-skiing*	*39*	*39*
244	Sandgate Beach	Swimming	30	
850	Folkestone Beach/Folkestone to Dungeness	Swimming/Commercial fishing	26	2366
423	Camber Sands and Jury's Gap	Push netting	26	
852-853*	Folkestone Beach	Paddling	26	
345-369	Folkestone to Dungeness	Diving/Boating to dives	25	25
751	Lydd-on-Sea Beach/Dungeness	Push netting/Commercial fishing	20	2000
221	Folkestone Beach/Folkestone to Dungeness	Swimming/Angling	20	290
450	Lydd-on-Sea Beach/Dungeness	Push netting/Working on a boat	16	112
444	Dungeness	Push netting/Commercial fishing	12	2160
766-790	Folkestone to Hythe	Diving/Boating to dives	12	59
645	Lydd-on-Sea Beach	Push netting	12	
506	Folkestone	Diving/Boating to dives	10	80
164-166*	Sunny Sands Beach (Folkestone)	Swimming	10	
250	Dymchurch Beach	Swimming	10	
822	Greatstone-on-Sea Beach	Swimming	10	
52-53	Rye Bay	Commercial fishing		3000
45-46	Rye Bay	Commercial fishing		2400
799	Dungeness	Commercial fishing		2400
801	Dungeness	Commercial fishing		2400
854	Folkestone to Dungeness	Commercial fishing		2366
863-864	Folkestone	Commercial fishing		2237
55	Rye Bay	Commercial fishing		2184
69-70	Rye Bay	Commercial fishing		2184
120-121	Rye Bay	Commercial fishing		2184
62-68	Rye Bay	Commercial fishing		2160
102	Rye Bay	Commercial fishing		2160
815	Various	Commercial fishing		2013
148	Folkestone	Commercial fishing		2000
337-338	Folkestone to Dungeness	Commercial fishing		2000
50-51	Rye Bay	Commercial fishing		1800
86	Rye Bay	Commercial fishing		1620
747	Dungeness	Charter boat skipper		1600
652-653	Dungeness	Commercial fishing		1584
108	Rye Bay	Commercial fishing		1560

Table 17. Occupancy rates in and on water in the Dungeness area (h/y)

Observation number	Location**	Activity**	In water	On water
87-88	Rye Bay	Commercial fishing		1456
405	Dungeness	Working on a boat		1392
335-336	Folkestone to Dymchurch	Commercial fishing		1200
684	Hythe	Commercial fishing		1200
339-340	Folkestone to Dungeness	Commercial fishing		1150
8	Dungeness	Charter boat skipper		1092
73	Rye Bay	Commercial fishing		1000
34	Dungeness	Commercial fishing		874
144	Brede Boatyard (Rye)	Boat dwelling (tide in)		789
215	Folkestone	Charter boat skipper		770
449	Dungeness	Charter boat skipper		608
216	Folkestone	Commercial fishing		500
675	Dungeness	Charter boat skipper		400
222	Folkestone to Dungeness	Angling		290
259-279	Hythe	Sailing		260
344	Folkestone to Dungeness	Angling		260
753	Dungeness	Commercial fishing		208
755*	Dungeness	Commercial fishing		208
35-44	Hythe and Lydd-on-Sea	Working on a boat		192
96	Pett Level	Angling		182
100	Pett Level	Angling		182
434	Dungeness	Commercial fishing and RNLI volunteer work		166
628*	Littlestone-on-Sea	Angling		156
298-317	Folkestone, Sandgate and Dymchurch	Jetskiing		140
170-214	Sandgate to Hythe	Rowing		130
641	Littlestone-on-Sea	Angling		120
448	Dungeness	Working on a boat		112
756-765	Folkestone to Hythe	Yachting		104
77-80	Rye Harbour	Jetskiing		100
341	Folkestone	Commercial fishing		100
600	Greatstone-on-Sea Beach	Angling		100
629-640	Littlestone-on-Sea Beach	Angling		90
689	Various	Charter boat skipper		75
625	Littlestone-on-Sea Beach	Angling		72
439	Dungeness	Commercial fishing		66
81-83	Rye Harbour	Jetskiing		53
113	Pett Level	Angling		45
474	Lydd-on-Sea	Jetskiing		40
247	Folkestone	Canoeing		40
643	Dungeness	Angling		40
452-471	Dungeness	RNLI volunteer work		37
158-159	Folkestone	Angling		30
429	Dungeness	Angling		12
473	Lydd-on-Sea	Jetskiing		10
475-476*	Lydd-on-Sea	Jetskiing		10

Notes

* Observations 165, 166, 475, 476, 628, 755, 852 and 853 are for children aged 13, 11, 13, 11, 17, 14, 8 and 4 respectively

Observations in italics are for fresh water affected by gaseous discharges.

Other observations are for sea water affected by aquatic discharges.

**The forward slash (/), separates the locations of, and activities taking place on, the separate substrates for that individual

Table 18. Adults' consumption rates of green vegetables in the Dungeness area (kg/y)

Observation number	Broccoli	Brussel sprout	Cabbage	Cauliflower	Chard	Courgettes	Cucumber	Herbs	Lettuce	Marrow	Rocket	Spinach	Total
333	**6.7**	**16.4**	**5.5**		**14.4**				**1.4**			**12.2**	**56.6**
334	**6.7**	**16.4**	**5.5**		**14.4**				**1.4**			**12.2**	**56.6**
391			**6.1**			**4.9**	**2.7**		**1.5**	**3.4**		**1.4**	**19.9**
392			**6.1**			**4.9**	**2.7**		**1.5**	**3.4**		**1.4**	**19.9**
393			**6.1**			**4.9**	**2.7**		**1.5**	**3.4**		**1.4**	**19.9**
372	15.9												15.9
331	4.5			4.5		1.5		0.7		1.4		2.0	14.6
332	4.5			4.5		1.5		0.7		1.4		2.0	14.6
374		3.8	5.0						2.5				11.3
375		3.8	5.0						2.5				11.3
379		1.0	5.3	2.8					1.7				10.8
380		1.0	5.3	2.8					1.7				10.8
381		1.0	5.3	2.8					1.7				10.8
382		1.0	5.3	2.8					1.7				10.8
383		1.0	5.3	2.8					1.7				10.8
384		1.0	5.3	2.8					1.7				10.8
385		1.0	5.3	2.8					1.7				10.8
386		1.0	5.3	2.8					1.7				10.8
387		1.0	5.3	2.8					1.7				10.8
388		1.0	5.3	2.8					1.7				10.8
389		1.0	5.3	2.8					1.7				10.8
390		1.0	5.3	2.8					1.7				10.8
446			9.1										9.1
447			9.1										9.1
749			5.1				0.5		1.2				6.8
750			5.1				0.5		1.2				6.8
373	1.8												1.8
792											0.8	0.9	1.6
793											0.8	0.9	1.6
138					0.6			0.5					1.1

Notes

Emboldened observations are the critical group consumers

The critical group consumption rate of green vegetables based on the 5 highest adult consumers is 34.6 kg/y

The observed 97.5 percentile rate based on 30 observations is 56.6 kg/y

Table 19. Adults' consumption rates of other vegetables in the Dungeness area (kg/y)

Observation number	Broad bean	Chilli pepper	French bean	Olive	Pea	Pepper	Runner bean	Squash	Sweet-corn	Tomato	Total
404			**14.4**		**18.0**	**8.8**	**20.4**			**27.2**	**88.8**
333-334	**4.1**		**2.4**		**2.3**	**8.8**	**13.8**			**22.5**	**53.9**
319					2.3		9.1			14.4	25.7
374-375	1.8				3.7		12.8			5.4	23.7
331-332			13.0				0.4			7.6	21.0
446-447	4.6						13.6				18.2
5							10.2			3.6	13.8
391-393							10.2	0.4	0.9	1.8	13.3
379-390	1.1								2.7	7.5	11.2
372				0.4						7.3	7.8
820-821							6.8				6.8
139-140										5.4	5.4
792-793										5.4	5.4
749-750										4.5	4.5
145-146					0.5					3.6	4.1
405-406		0.1					1.5			1.8	3.4
373				0.05						0.8	0.9

Notes

Emboldened observations are the critical group consumers

The critical group consumption rate of other vegetables based on the 3 highest adult consumers is 65.5 kg/y

The observed 97.5 percentile rate based on 40 observations is 54.7 kg/y

Table 20. Adults' consumption rates of root vegetables in the Dungeness area (kg/y)

Observation number	Beet-root	Carrot	Celery	Garlic	Leek	Onion	Parsnip	Radish	Shallot	Spring onion	Swede	Total
333-334	**4.1**	**4.1**				**6.5**		**0.8**	**1.4**	**0.9**	**30.6**	**48.3**
404	**9.0**	**4.5**				**21.6**	**3.6**	**1.8**				**40.5**
391-393	**11.3**	**2.3**			**5.6**	**5.4**		**0.7**	**8.0**		**3.8**	**37.1**
446-447		**4.5**	**5.4**			**10.8**			**4.8**			**25.5**
372			**7.6**	**1.4**	**9.0**	**5.9**		**1.0**		**0.5**		**25.4**
331-332		2.7		1.6	2.7	8.6						15.6
139-140						4.4		2.7				7.1
138	4.5	2.6										7.1
379-390		1.0			1.7	3.7				0.03		6.4
792-793	4.1		1.4									5.5
374-375	1.8	1.8								0.8		4.4
373			0.8	0.2	1.0	0.7		0.1		0.1		2.8
405-406		0.8								0.1		0.8
749-750								0.5				0.5
751-753		0.2										0.2

Notes

Emboldened observations are the critical group consumers

The critical group consumption rate of root vegetables based on the 9 highest adult consumers is 36.1 kg/y

The observed 97.5 percentile rate based on 38 observations is 48.3 kg/y

Table 21. Adults' consumption rates of potato in the Dungeness area (kg/y)

Observation number	Potato
391	**86.8**
392	**86.8**
393	**86.8**
331	**69.2**
332	**69.2**
404	**65.4**
376	**59.0**
377	**59.0**
378	**59.0**
370	**47.2**
333	**41.0**
334	**41.0**
379	20.2
380	20.2
381	20.2
382	20.2
383	20.2
384	20.2
385	20.2
386	20.2
387	20.2
388	20.2
389	20.2
390	20.2
138	20.2
446	18.2
447	18.2
751	7.6
752	7.6
753	7.6
792	6.8
793	6.8
749	4.6
750	4.6
374	3.6
375	3.6
405	1.5
406	1.5

Notes

Emboldened observations are the critical group consumers

The critical group consumption rate of potato based on the 12 highest adult consumers is 64.2 kg/y

The observed 97.5 percentile rate based on 38 observations is 86.8 kg/y

Table 22. Adults' consumption rates of domestic fruit in the Dungeness area (kg/y)

Observation number	Apple	Blackberry	Cherry	Gooseberry	Plum	Pumpkin	Raspberry	Rhubarb	Strawberry	Tayberry	Total
334	**4.1**		**5.4**			**0.4**					**10.0**
333	**4.1**		**5.4**			**0.4**					**10.0**
393								**3.1**	**5.7**	**0.3**	**9.0**
391								**3.1**	**5.7**	**0.3**	**9.0**
392								**3.1**	**5.7**	**0.3**	**9.0**
331					**1.1**	**0.4**	**1.1**	**0.9**	**2.9**		**6.4**
332					**1.1**	**0.4**	**1.1**	**0.9**	**2.9**		**6.4**
5				**4.1**					**1.4**		**5.4**
372								**4.9**			**4.9**
138								**4.5**			**4.5**
145									2.0		2.0
146									2.0		2.0
379								1.9			1.9
380								1.9			1.9
381								1.9			1.9
382								1.9			1.9
383								1.9			1.9
384								1.9			1.9
385								1.9			1.9
386								1.9			1.9
387								1.9			1.9
388								1.9			1.9
389								1.9			1.9
390								1.9			1.9
405									1.7		1.7
406									1.7		1.7
373								0.5			0.5

Table 22. Adults' consumption rates of domestic fruit in the Dungeness area (kg/y)

Observation number	Apple	Blackberry	Cherry	Gooseberry	Plum	Pumpkin	Raspberry	Rhubarb	Strawberry	Tayberry	Total
792								0.5			0.5
793								0.5			0.5
676		0.2									0.2

Notes

Emboldened observations are the critical group consumers

The critical group consumption rate of domestic fruit based on the 10 highest adult consumers is 7.5 kg/y

The observed 97.5 percentile rate based on 30 observations is 10.0 kg/y

Table 23. Adults' consumption rates of sheep meat in the Dungeness area (kg/y)

Observation number	Lamb
654-656	**18.8**
658-668	**18.8**

Notes
Emboldened observations are the critical group consumers
The critical group consumption rate of sheep meat based on the 14 highest adult consumers is 18.8 kg/y
The observed 97.5 percentile rate based on 14 observations is 18.8 kg/y

Table 24. Adults' consumption rates of poultry in the Dungeness area (kg/y)

Observation number	Chicken	Partridge	Total
654-656		**3.8**	**3.8**
391-393	**2.0**		**2.0**
333-334		0.4	0.4

Notes
Emboldened observations are the critical group consumers
The critical group consumption rate of poultry based on the 6 highest adult consumers is 2.9 kg/y
The observed 97.5 percentile rate based on 8 observations is 3.8 kg/y

Table 25. Adults' consumption rates of eggs in the Dungeness area (kg/y)

Observation number	Chicken egg	Duck egg	Goose egg	Total
391-393	**23.7**		**2.7**	**26.4**
855-856	**20.8**			**20.8**
379-384	**19.8**			**19.8**
319	**17.8**			**17.8**
374	**11.9**			**11.9**
822	**8.9**			**8.9**
375	4.4			4.4
832	4.1			4.1
792-793		1.4		1.4

Notes
Emboldened observations are the critical group consumers
The critical group consumption rate of eggs based on the 14 highest adult consumers is 19.9 kg/y
The observed 97.5 percentile rate based on 18 observations is 26.4 kg/y

Table 26. Adults' consumption rates of wild/free foods in the Dungeness area (kg/y)

Observation number	Blackberry	Pear	Sloe	Total
443	**11.3**			**11.3**
404	2.3			2.3
823-825	1.8	0.5		2.3
138			1.8	1.8
372	1.8			1.8
331-332	1.1			1.1
477	0.5			0.5
749-750	0.5			0.5
812	0.5			0.5
792-793	0.2			0.2
675	0.2			0.2
669-672	0.2			0.2

Notes

Emboldened observations are the critical group consumers

The critical group consumption rate of wild/free foods based on the highest adult consumer is 11.3 kg/y

The observed 97.5 percentile rate based on 20 observations is 7.0 kg/y

Table 27. Adults' consumption rates of rabbits/hares in the Dungeness area (kg/y)

Observation number	Rabbit
333	**2.3**
334	**2.3**

Notes

Emboldened observations are the critical group consumers

The critical group consumption rate of rabbits/hares based on the 2 highest adult consumers is 2.3 kg/y

The observed 97.5 percentile rate based on 2 observations is 2.3 kg/y

Table 28. Adults' consumption rates of honey in the Dungeness area (kg/y)

Observation number	Honey
398-399	**5.7**
375	**2.7**
401-402	0.3
394-396	0.2

Notes
Emboldened observations are the critical group consumers
The critical group consumption rate of honey based on the 3 highest adult consumers is 4.7 kg/y
The observed 97.5 percentile rate based on 8 observations is 5.7 kg/y

Table 29. Adults' consumption rates of wild fungi in the Dungeness area (kg/y)

Observation number	Mushrooms
372	**0.9**
391-393	**0.6**
374-375	**0.5**
792-793	**0.5**
812	**0.5**
822-823	**0.5**
825	0.2
675-676	0.2
669-672	0.1

Notes
Emboldened observations are the critical group consumers
The critical group consumption rate of wild fungi based on the 11 highest adult consumers is 0.5 kg/y
The observed 97.5 percentile rate based on 18 observations is 0.8 kg/y

Table 30. Children's consumption rates of other vegetables in the Dungeness area (kg/y)

5 year old age group

Observation number	Age	Chilli pepper	Runner bean	Tomato	Total
407	**6**	**0.1**	**1.5**	**1.8**	**3.4**
408	**3**	**0.1**	**1.5**	**1.8**	**3.4**

Notes

Emboldened observations are the critical group consumers

The critical group consumption rate of other vegetables based on the 2 highest 5 year old consumers is 3.4 kg/y

The observed 97.5 percentile rate based on 2 observations is 3.4 kg/y

Table 31. Children's consumption rates of root vegetables in the Dungeness area (kg/y)

10 year old age group

Observation number	Age	Carrot	Spring onion	Total
754	**8**	**0.2**		**0.2**

Notes

Emboldened observations are the critical group consumers

The critical group consumption rate of root vegetables based on the only 10 year old consumer is 0.2 kg/y

The observed 97.5 percentile is not applicable for 1 observation

5 year old age group

Observation number	Age	Carrot	Spring onion	Total
407	**6**	**0.8**	**0.1**	**0.8**
408	**3**	**0.8**	**0.1**	**0.8**

Notes

Emboldened observations are the critical group consumers

The critical group consumption rate of root vegetables based on the 2 highest 5 year old consumers is 0.8 kg/y

The observed 97.5 percentile rate based on 2 observations is 0.8 kg/y

Table 32. Children's consumption rates of potato in the Dungeness area (kg/y)

10 year old age group

Observation number	Age	Potato
754	**8**	**7.6**

Notes
Emboldened observations are the critical group consumers
The critical group consumption rate of potato based on the only 10 year old consumer is 7.6 kg/y
The observed 97.5 percentile is not applicable for 1 observation

5 year old age group

Observation number	Age	Potato
407	**6**	**1.5**
408	**3**	**1.5**

Notes
Emboldened observations are the critical group consumers
The critical group consumption rate of potato based on the 2 highest 5 year old consumers is 1.5 kg/y
The observed 97.5 percentile rate based on 2 observations is 1.5 kg/y

Table 33. Children's consumption rates of domestic fruit in the Dungeness area (kg/y)

15 year old age group

Observation number	Age	Blackberry	Strawberry	Total
677	**14**	**0.2**		**0.2**
678	**12**	**0.2**		**0.2**

Notes
Emboldened observations are the critical group consumers
The critical group consumption rate of domestic fruit based on the 2 highest 15 year old consumers is 0.2 kg/y
The observed 97.5 percentile rate based on 2 observations is 0.2 kg/y

10 year old age group

Observation number	Age	Blackberry	Strawberry	Total
679	**10**	**0.2**		**0.2**

Notes
Emboldened observations are the critical group consumers
The critical group consumption rate of domestic fruit based on the only 10 year old consumer is 0.2 kg/y
The observed 97.5 percentile is not applicable for 1 observation

5 year old age group

Observation number	Age	Blackberry	Strawberry	Total
407	**6**		**1.7**	**1.7**
408	**3**		**1.7**	**1.7**

Notes
Emboldened observations are the critical group consumers
The critical group consumption rate of domestic fruit based on the 2 highest 5 year old consumers is 1.7 kg/y
The observed 97.5 percentile rate based on 2 observations is 1.7 kg/y

Table 34. Children's consumption rates of sheep meat in the Dungeness area (kg/y)

15 year old age group

Observation number	Age	Lamb
657	**16**	**18.8**

Notes
Emboldened observations are the critical group consumers
The critical group consumption rate of sheep meat based on the only 15 year old consumer is 18.8 kg/y
The observed 97.5 percentile is not applicable for 1 observation

Table 35. Children's consumption rates of poultry in the Dungeness area (kg/y)

15 year old age group

Observation number	Age	Partridge
657	**16**	**3.8**

Notes
Emboldened observations are the critical group consumers
The critical group consumption rate of poultry based on the only 15 year old consumer is 3.8 kg/y
The observed 97.5 percentile is not applicable for 1 observation

Table 36. Children's consumption rates of wild/free foods in the Dungeness area (kg/y)

15 year old age group

Observation number	Age	Blackberry
673	**15**	**0.2**

Notes
Emboldened observations are the critical group consumers
The critical group consumption rate of wild/free foods based on the only 15 year old consumer is 0.2 kg/y
The observed 97.5 percentile is not applicable for 1 observation

10 year old age group

Observation number	Age	Blackberry
674	**8**	**0.2**

Notes
Emboldened observations are the critical group consumers
The critical group consumption rate of wild/free foods based on the only 10 year old consumer is 0.2 kg/y
The observed 97.5 percentile is not applicable for 1 observation

Table 37. Children's consumption rates of honey in the Dungeness area (kg/y)

15 year old age group

Observation number	Age	Honey
397	**13**	**0.2**

Notes
Emboldened observations are the critical group consumers
The critical group consumption rate of honey based on the only 15 year old consumer is 0.2 kg/y
The observed 97.5 percentile is not applicable for 1 observation

5 year old age group

Observation number	Age	Honey
400	**3**	**2.3**
403	2	0.3

Notes
Emboldened observations are the critical group consumers
The critical group consumption rate of honey based on the highest 5 year old consumer is 2.3 kg/y
The observed 97.5 percentile rate based on 2 observations is 2.2 kg/y

Table 38. Children's consumption rates of wild fungi in the Dungeness area (kg/y)

15 year old age group

Observation number	Age	Mushrooms
677	**14**	**0.2**
678	**12**	**0.2**
673	**15**	**0.1**

Notes
Emboldened observations are the critical group consumers
The critical group consumption rate of wild fungi based on the 3 highest 15 year old consumers is 0.1 kg/y
The observed 97.5 percentile rate based on 3 observations is 0.2 kg/y

10 year old age group

Observation number	Age	Mushrooms
679	**10**	**0.2**
674	**8**	**0.1**

Notes
Emboldened observations are the critical group consumers
The critical group consumption rate of wild fungi based on the 2 highest 10 year old consumers is 0.1 kg/y
The observed 97.5 percentile rate based on 2 observations is 0.2 kg/y

Table 39. Percentage contribution each food type makes to its terrestrial food group for adults

Green vegetables	
Cabbage	32.2 %
Brussel sprout	12.9 %
Cauliflower	10.5 %
Broccoli	9.8 %
Lettuce	8.5 %
Spinach	8.4 %
Chard	7.2 %
Courgettes	4.3 %
Marrow	3.2 %
Cucumber	2.2 %
Herbs	0.4 %
Rocket	0.4 %

Other vegetables	
Tomato	43.2 %
Runner bean	27.8 %
French Bean	7.5 %
Sweetcorn	5.8 %
Broad bean	5.6 %
***Pea**	**5.5 %**
Pepper	4.4 %
Squash	0.2 %
Olive	0.1 %
Chilli pepper	0.04 %

Root vegetables	
Onion	31.1 %
Swede	15.2 %
Beetroot	14.0 %
Carrot	11.3 %
Leek	10.9 %
Shallot	7.6 %
Celery	4.6 %
Radish	2.7 %
Garlic	1.0 %
Spring onion	0.9 %
Parsnip	0.8 %

Domestic fruit	
Rhubarb	42.0 %
Strawberry	29.5 %
Cherry	10.2 %
Apple	7.6 %
Gooseberry	3.8 %
Plum	2.1 %
Raspberry	2.1 %
Pumpkin	1.6 %
Tayberry	0.8 %
Blackberry	0.2 %

Poultry	
Partridge	66.6 %
Chicken	33.4 %

Eggs	
Chicken egg	96.2 %
Goose egg	2.8 %
Duck egg	0.9 %

Wild/free foods	
***Blackberry**	**89.2 %**
Sloe	6.2 %
Pears	4.6 %

Rabbits/hares	
Rabbit	100.0 %

Notes

Food types asterisked and emboldened were monitored by FSA in 2004 (EA, EHS, FSA and SEPA, 2005)
Other foods monitored were milk, honey, potato, sea kale and wheat
Percentages are based on the consumption of all adults in the survey consuming that particular food group

Table 40. Occupancy rates in the Dungeness direct radiation survey area for adults and children (h/y)

Observation Number	Age (in years) (U if unknown)	Distance from site perimeter fence (km)	Indoor occupancy	Outdoor occupancy	Total occupancy
0 to 0.25 km zone					
370	48	0.18	7340	758	8098
372	46	0.18	6054	2010	8064
405	26	0.17	7251	209	7460
409	46	0.18	4006	3290	7296
147	56	0.15	5436	1134	6570
406	26	0.17	5848	320	6168
407	6	0.17	5848	320	6168
408	3	0.17	5848	320	6168
827	40	0.25	4286	1309	5595
828	49	0.25	5202	393	5595
145	52	0.18	5644	260	5904
410	26	0.18	2613	2922	5535
816	22	0.17	4976	520	5496
814	44	0.17	4887	365	5252
146	45	0.18	3908	400	4308
815	23	0.17	4092	200	4292
829	16	0.25	1984	182	2166
320-321	U	0.20	1880		1880
826	U	0.25		1300	1300
373	U	0.18	1248		1248
813	63	0.17	1248		1248
322	U	0.20	940		940
812	57	0.25	208	702	910
794-795	U	0.05	864		864
796	5	0.05	864		864
817	27	0.17	682	182	864
822	U	0.25		786	786
848	U	0.20	720		720
371	48	0.18	480		480
849	U	0.20	480		480
323-328	U	0.20	440		440
797-798	U	0.05	312		312
857-860	U	0.20		192	192
825	U	0.25		156	156
0.25 to 0.5 km zone					
855	46	0.30	7954	418	8372
856	47	0.30	7119	653	7772
831	56	0.30	6363	967	7330
830	59	0.30	6147	967	7114
319	67	0.30	6296	700	6996
318	U	0.48	5674	830	6504
865	51	0.30	5938	442	6380
866	25	0.30	5152	52	5204
862	U	0.50	1274	1274	2548
861	U	0.50	1040	1040	2080
833-847	U	0.40	1920		1920

Table 40. Occupancy rates in the Dungeness direct radiation survey area for adults and children (h/y)

Observation Number	Age (in years) (U if unknown)	Distance from site perimeter fence (km)	Indoor occupancy	Outdoor occupancy	Total occupancy
0.5 to 1 km zone					
472	78	0.90	8135	549	8684
140	60	0.60	8357	91	8448
136	70	0.95	7910	364	8274
139	60	0.60	7226	910	8136
141	62	0.65	7847	183	8030
142	61	0.65	7847	183	8030
749	70	0.90	7276	730	8006
750	62	0.90	7357	575	7932
5	71	0.70	7511	253	7764
8	70	0.70	5038	2630	7668
137	69	0.95	6142	1274	7416
803	6	0.95	6848	365	7213
800	47	0.60	6349	575	6924
31	51	0.65	5816	1092	6908
143	29	0.65	6618	182	6800
802	36	0.95	6413	365	6778
804	4	0.95	6413	365	6778
7	70	0.70	4857	1907	6764
4	5	0.60	5654	1069	6723
3	49	0.60	4876	1676	6552
479	18	0.80	6326	200	6526
801	40	0.95	3628	2600	6228
480	16	0.80	6129	52	6181
477	42	0.80	4924	1050	5974
138	45	1.00	2911	2873	5784
799	53	0.60	3074	2500	5574
478	40	0.80	5161	52	5213
1	48	0.55	4209	655	4864
2	48	0.55	3905	655	4560
32	49	0.80	2760	864	3624
33	42	0.80	2760	864	3624
6	70	0.70	340	20	360
9	70	0.70	340	20	360
413	60	0.90		108	108
415	50	0.90		64	64
417	59	0.90		64	64
418	57	0.90		64	64
429	47	0.90		48	48
431	41	0.90		48	48
411	56	0.90		33	33
412	55	0.90		33	33
691	U	0.80		30	30
432	59	0.90		20	20
692	U	0.80		10	10
419	49	0.90		6	6
420	19	0.90		6	6
421	47	0.90		6	6
422	16	0.90		6	6

Table 41. Analysis of occupancy rates in the Dungeness direct radiation survey area

0 to 0.25 km zone	
Number of hours per year	Number of observations
8000 to 8760	2
7000 to 8000	2
6000 to 7000	6
5000 to 6000	8
4000 to 5000	3
3000 to 4000	0
2000 to 3000	1
1000 to 2000	9
0 to 1000	19

0.25 to 0.5 km zone	
Number of hours per year	Number of observations
8000 to 8760	1
7000 to 8000	3
6000 to 7000	3
5000 to 6000	1
4000 to 5000	0
3000 to 4000	0
2000 to 3000	2
1000 to 2000	15
0 to 1000	0

0.5 to 1 km zone	
Number of hours per year	Number of observations
8000 to 8760	7
7000 to 8000	5
6000 to 7000	11
5000 to 6000	4
4000 to 5000	2
3000 to 4000	2
2000 to 3000	0
1000 to 2000	0
0 to 1000	17

Table 42. Gamma dose rate measurements for the Dungeness direct radiation survey (µGy/h)

Location	Distance (km)	NGR	Outdoor substrate	Gamma dose rate at 1 metre	Indoor substrate	Gamma dose rate at 1 metre
House 1	0.05	TR 086 169			Concrete	0.078
House 2	0.14	TR 088 167	Sand and stone	0.047	Concrete	0.048
House 3	0.16	TR 089 167			Wood	0.058
House 4	0.18	TR 088 168	Grass	0.065	Wood	0.092
House 5	0.18	TR 084 172	Grass	0.081	Wood	0.117
House 6	0.18	TR 084 172	Grass	0.081	Wood	0.125
House 7	0.25	TR 090 168	Sand and stone	0.059		
House 8	0.30	TR 091 168	Grass, sand and stone	0.047	Wood	0.047
House 9	0.48	TR 092 168	Grass, sand and stone	0.058	Wood	0.053
House 10	0.55	TR 092 169	Sand and stone	0.062	Wood	0.061
House 11	0.60	TR 092 170	Grass	0.053	Wood	0.054
House 12	0.80	TR 093 172	Grass	0.045	Wood	0.050
House 13	0.90	TR 093 175	Sand and stone	0.059	Concrete	0.066
Background 1	5.00	TR 047 208	Grass	0.061		
Background 2	13.50	TQ 975 246	Grass	0.076		

Notes

It should be noted that due to two of the four reactors being off-line for the duration of the survey, these gamma dose rates may be lower than usual.

Table 43. Examples of food groups eaten and external exposure combinations by adults for consideration for dose assessment purposes

Combination number	Fish	Crustaceans	Molluscs	Marine plants and algae	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits/hares	Honey	Wild fungi	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and mud	Intertidal occupancy over sand and stones	Intertidal occupancy in houseboat (tide out)	Handling fishing gear	Handling sediment	Occupancy in water	Occupancy on water	Indoor occupancy within 1 km of site perimeter fence	Outdoor occupancy within 1 km of site perimeter fence
1	*	*	*															*						*		*	*
2	*	*	*																						*	*	*
3	*																	*	*				*		*		
4	*	*	*				*	*												*		*			*		
5	*																*										
6	*	*																*		*		*		*	*		
7				*	*		*	*	*				*											*		*	*
8	*	*	*		*	*	*	*	*			*	*			*										*	*
9																					*				*		
10						*			*											*						*	*
11	*		*																	*					*		*
12	*	*																	*	*		*	*	*	*		
13	*	*			*	*	*	*										*		*			*	*	*		
14					*	*	*	*	*					*													
15	*	*	*																*	*			*	*	*		
16					*	*	*	*				*			*	*											
17	*	*			*	*	*	*	*		*	*				*											
18		*				*	*	*	*																*	*	*
19	*	*											*						*				*			*	*
20	*	*																		*							*
21	*	*											*							*							
22	*	*	*															*							*		
23	*	*	*															*	*				*	*			
24	*		*															*		*			*	*			
25										*	*																
26	*												*			*		*		*			*		*		
27	*	*	*		*	*	*	*					*					*					*			*	*
28	*	*	*				*	*														*		*	*		
29	*	*																				*			*	*	*
30	*		*			*														*		*		*	*		
31				*								*				*								*			*
32	*	*	*										*			*		*									*
33												*								*						*	*

Notes

The food groups and external exposure pathways marked with an asterisk are combined for the corresponding combination number. For example, combination number 1 represents an individual from Annex 1 who had positive data in the following pathways; fish, crustaceans, molluscs, intertidal occupancy over sand, occupancy in water, indoor occupancy and outdoor occupancy.

Annex 1. Adults' consumption rates (kg/y or l/y) and occupancy rates (h/y) in the Dungeness area

Observation number	Sex (U if unknown)	Age in years (U if unknown)	Distance of residence from site (km) (U if unknown)	Fish	Crustaceans	Molluscs	Marine plants and algae	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits/hares	Honey	Wild fungi	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and mud	Intertidal occupancy over sand and stones	Intertidal occupancy in a houseboat	Handling fishing gear	Handling sediment	Occupancy in water*	Occupancy on water*	Indoor occupancy within 1 km of site perimeter fence	Outdoor occupancy within 1 km of site perimeter fence
1	M	48	0.6	28.4																									4209	655
2	F	48	0.6	28.4																									3905	655
3	M	49	0.6	16.0																									4876	1676
5	F	71	0.7						13.8			**5.4**																	7511	253
6	F	70	U																										340	20
7	F	70	0.7	**41.3**	2.2	0.5															**1095**						485		4857	1907
8	M	70	0.7	**41.3**	2.2	0.5																						1092	5038	2630
9	F	70	U																										340	20
10-11	M	U	U																		**780**					**780**				
12	M	52	55.0	2.4																	41									
13	F	51	55.0	2.4																	41									
14	M	58	50.0	1.3																	16									
15	F	58	50.0	1.3																										
16	M	53	50.0	1.3																	16									
17	F	53	50.0	1.3																										
18	M	47	50.0	5.3																	234									
19	F	47	50.0	5.3																										
20	M	44	50.0	3.5																	234									
21	F	44	50.0	3.5																										
22	F	19	50.0	3.5																										
23	M	33	50.0	5.4																	150									
24	F	33	50.0	5.4																										
25	M	29	50.0	5.4																	150									
26	F	29	50.0	5.4																										
27	M	47	5.5	4.2																	27									
28	F	47	5.5	4.2																										
29	M	39	5.5	4.2																	27									
30	F	39	5.5	4.2																										
31	M	51	0.7	29.5																									5816	1092
32	F	49	0.8	22.7	**8.0**	4.2																							2760	864
33	F	42	0.8	22.7	**8.0**	4.2																							2760	864
34	M	54	U	26.5		2.8																				499		874		
35-44	M	U	U																									192		
45	M	45	U	2.0	0.6	1.1																				500		2400		
46	M	30	U	**41.3**		**11.2**																				500		2400		
47	F	45	U	2.0	0.6	1.1																								

Annex 1. Adults' consumption rates (kg/y or l/y) and occupancy rates (h/y) in the Dungeness area

Observation number	Sex (U if unknown)	Age in years (U if unknown)	Distance of residence from site (km) (U if unknown)	Fish	Crustaceans	Molluscs	Marine plants and algae	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits/hares	Honey	Wild fungi	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and mud	Intertidal occupancy over sand and stones	Intertidal occupancy in a houseboat	Handling fishing gear	Handling sediment	Occupancy in water*	Occupancy on water*	Indoor occupancy within 1 km of site perimeter fence	Outdoor occupancy within 1 km of site perimeter fence
48	F	17	U	2.0	0.6	1.1																								
49	F	30	U	**41.3**		**11.2**																								
50	M	55	U	2.7		2.9																			300			1800		
51	M	U	U																						300			1800		
52	M	39	U																						500			3000		
53	M	28	U	22.7																					500			3000		
54	F	28	U	22.7																										
55	M	42	U	**46.3**		4.2																			**728**			2184		
56	F	42	U	35.4		4.2																								
57	M	18	U	35.4		4.2																								
59	M	70	U	**117.0**	**16.1**	**33.7**																								
60	M	56	U	17.7		5.6																								
61	F	55	U	17.7		5.6																								
62-68	M	U	U																						**1047**			2160		
69	M	38	U	8.2	**12.5**	5.2																			**1092**			2184		
70	M	U	U																						**1092**			2184		
71	F	38	U	8.2																										
73	M	47	U	23.6	2.4																				**1000**			1000		
74	M	47	U	23.6	**7.0**																									
77	M	32	U																									100		
78	M	31	U																									100		
79	M	28	U																									100		
80	M	19	U																									100		
81	M	33	U																									53		
82	M	25	U																									53		
83	M	24	U																									53		
84	M	43	U	3.4																**150**										
85	F	43	U	3.4																										
86	M	57	U	23.6	1.7																				**1710**			1620		
87	M	47	U	17.7	2.7																				**1456**			1456		
88	M	46	U	17.7	2.7																				**1456**			1456		
89	M	37	U	4.5																	60					12				
90	M	66	U	6.2																	180									
91	M	U	U	6.2																										
92	F	U	U	6.2																										
93	M	35	U	13.9																		**1952**				**1872**				

Annex 1. Adults' consumption rates (kg/y or l/y) and occupancy rates (h/y) in the Dungeness area

Observation number	Sex (U if unknown)	Age in years (U if unknown)	Distance of residence from site (km) (U if unknown)	Fish	Crustaceans	Molluscs	Marine plants and algae	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits/hares	Honey	Wild fungi	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and mud	Intertidal occupancy over sand and stones	Intertidal occupancy in a houseboat	Handling fishing gear	Handling sediment	Occupancy in water*	Occupancy on water*	Indoor occupancy within 1 km of site perimeter fence	Outdoor occupancy within 1 km of site perimeter fence
94	F	35	U	13.9																										
95	M	52	U																			**1950**				**1950**				
96	M	58	U	1.5																	76	100				100		182		
97	M	U	U	1.5																										
98	F	U	U	1.5																										
100	M	55	U	1.5																	76	100				100		182		
101	M	55	U	1.5																										
102	M	46	U	35.4	4.5	**19.7**																			**1047**			2160		
103	F	46	U	35.4	4.5	**19.7**																								
108	M	51	U	20.6	0.4	1.2																			**1170**			1560		
109	F	51	U	20.6	0.4	1.2																								
110	M	46	U	25.2																	**1356**				**1356**					
111	F	46	U	25.2																										
112	M	22	U	25.2																										
113	M	68	U	**43.6**																	242				84			45		
114	M	U	U	**43.6**																										
115	F	U	U	**43.6**																										
116	M	63	U	34.5																	**1001**	84				84				
117	M	63	U	4.8																										
118	M	37	U	2.8																	32									
119	F	37	U	2.8																										
120	M	58	U																						**1638**			2184		
121	M	24	U	35.4	**14.9**	1.0																			**1638**			2184		
122-131	M	U	U																								520			
132	M	42	26.0	2.3																	300									
133	M	29	26.0	2.3																	300									
134	F	42	26.0	2.3																										
135	F	29	26.0	2.3																										
136	M	70	1.0																										7910	364
137	F	69	1.0																										6142	1274
138	M	45	1.0				**0.2**	1.1		7.1	20.2	**4.5**				1.8													2911	2873
139	F	60	0.6						5.4	7.1																			7226	910
140	M	60	0.6						5.4	7.1																			8357	91
141	M	62	0.6	27.2																									7847	183
142	F	61	0.6	27.2																									7847	183
143	F	29	0.6	27.2																									6618	182

Annex 1. Adults' consumption rates (kg/y or l/y) and occupancy rates (h/y) in the Dungeness area

Observation number	Sex (U if unknown)	Age in years (U if unknown)	Distance of residence from site (km) (U if unknown)	Fish	Crustaceans	Molluscs	Marine plants and algae	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits/hares	Honey	Wild fungi	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and mud	Intertidal occupancy over sand and stones	Intertidal occupancy in a houseboat	Handling fishing gear	Handling sediment	Occupancy in water*	Occupancy on water*	Indoor occupancy within 1 km of site perimeter fence	Outdoor occupancy within 1 km of site perimeter fence
144	M	45	U																					**3943**				789		
145	F	52	0.2						4.1			2.0											50						5644	260
146	M	45	0.2						4.1			2.0											100						3908	400
147	M	56	0.2																										5436	1134
148	M	30	U	10.9																					**1300**			2000		
149	M	35	U	9.7																			100							
150	M	38	U																				100							
151	M	40	U	5.5																			**500**							
152	M	38	U	3.6																			200							
155	M	43	U																				**880**							
156	F	25	U																				50							
157	M	75	U																				60							
158	M	57	U	38.0																			**800**					30		
159	M	39	U	10.2																			**800**					30		
160	M	60	U	3.8																			70							
161	F	U	U	3.8																										
162	M	U	U	7.1																										
163	F	U	U	7.1																										
164	M	43	U	3.1																	60						10			
167	M	U	U	1.4																			160							
168	M	U	U	7.8																			**1000**							
169	F	U	U	7.8																										
170-214	U	U	U																									130		
215	M	U	U																									770		
216	M	U	U																						400			500		
217	M	70	U	4.3																			200							
218	M	56	U	4.3																			200							
219	M	43	U	1.9																										
220	F	35	U	1.9																										
221	M	65	U																								20	290		
222	M	67	U																									290		
223	F	38	U																				110							
224	M	43	U																				180							
225	F	40	U																				180							
226	M	38	U	0.8																			40							
227	F	35	U	0.8																			20							

Annex 1. Adults' consumption rates (kg/y or l/y) and occupancy rates (h/y) in the Dungeness area

Observation number	Sex (U if unknown)	Age in years (U if unknown)	Distance of residence from site (km) (U if unknown)	Fish	Crustaceans	Molluscs	Marine plants and algae	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits/hares	Honey	Wild fungi	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and mud	Intertidal occupancy over sand and stones	Intertidal occupancy in a houseboat	Handling fishing gear	Handling sediment	Occupancy in water*	Occupancy on water*	Indoor occupancy within 1 km of site perimeter fence	Outdoor occupancy within 1 km of site perimeter fence
230	M	52	U																				**400**							
231	F	U	U																				200							
232	M	40	U	1.1																			110							
233	F	39	U	1.1																										
236	M	70	U	3.7		0.7																	220							
237	F	68	U	3.7		0.7																	220							
238	M	58	U	2.9																			290							
239	F	58	U	2.9																										
240	M	U	U	3.0																			130							
241	F	U	U	3.0																										
244	M	54	U	0.8																			300				30			
245	M	63	U	0.8																			250							
246	M	35	U	0.8																			250							
247	M	33	U	5.1																			180					40		
248	M	60	U	5.1		0.5																								
249	F	60	U	5.1																										
250	M	42	U	5.2																			30				10			
251	M	44	U	5.2																			30							
252	M	37	U																				**500**							
253	M	33	U	6.3																			110							
254	F	U	U	6.3																										
255	M	52	U	1.5																			110							
256	F	U	U	1.5																										
257	M	60	U	2.9																			220							
258	F	45	U	2.9																			220							
259-279	U	U	U																									260		
280-297	U	U	U																				60				190			
298-317	U	U	U																									140		
318	F	U	0.5																				140						5674	830
319	M	67	0.3						25.7						**17.8**														6296	700
320-321	U	U	U																										1880	
322	U	U	U																										940	
323-328	U	U	U																										440	
329	M	54																											5128	400
330	F	50																											6258	400
331	M	81	U					14.6	21.0	15.6	**69.2**	**6.4**				1.1														

Annex 1. Adults' consumption rates (kg/y or l/y) and occupancy rates (h/y) in the Dungeness area

Observation number	Sex (U if unknown)	Age in years (U if unknown)	Distance of residence from site (km) (U if unknown)	Fish	Crustaceans	Molluscs	Marine plants and algae	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits/hares	Honey	Wild fungi	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and mud	Intertidal occupancy over sand and stones	Intertidal occupancy in a houseboat	Handling fishing gear	Handling sediment	Occupancy in water*	Occupancy on water*	Indoor occupancy within 1 km of site perimeter fence	Outdoor occupancy within 1 km of site perimeter fence
332	F	72	U					14.6	21.0	15.6	**69.2**	**6.4**				1.1														
333	M	62	U					**56.6**	**53.9**	**48.3**	**41.0**	**10.0**		0.4			**2.3**													
334	F	60	U					**56.6**	**53.9**	**48.3**	**41.0**	**10.0**		0.4			**2.3**													
335	M	58	U																						**600**			1200		
336	M	38	U																						**600**			1200		
337	M	52	U																						**1300**			2000		
338	M	47	U																						**1300**			2000		
339	M	38	U																						580			1150		
340	M	35	U																						580			1150		
341	M	U	U	23.6																					70			100		
342	M	54	U	31.3																		24	**700**			24				
343	F	U	U	31.3																										
344	M	U	U																									260		
345-369	U	U	U																								25	25		
370	F	48	0.2								**47.2**																	7340	758	
371	M	48	0.2																									480		
372	M	46	0.2	25.8	**6.1**	1.3		15.9	7.8	**25.4**		**4.9**				1.8			**0.9**									6054	2010	
373	F	U	0.2					1.8	0.9	2.8		0.5																1248		
374	M	76	3.8					11.3	23.7	4.4	3.6				**11.9**				**0.5**											
375	F	63	3.8					11.3	23.7	4.4	3.6				4.4			**2.7**	**0.5**											
376	M	67	5.0								**59.0**																			
377	F	69	5.0								**59.0**																			
378	M	39	5.0								**59.0**																			
379	M	18	5.0					10.8	11.2	6.4	20.2	1.9			**19.8**															
380	M	40	5.0					10.8	11.2	6.4	20.2	1.9			**19.8**															
381	M	41	5.0					10.8	11.2	6.4	20.2	1.9			**19.8**															
382	M	43	5.0					10.8	11.2	6.4	20.2	1.9			**19.8**															
383	M	36	5.0					10.8	11.2	6.4	20.2	1.9			**19.8**															
384	M	41	5.0					10.8	11.2	6.4	20.2	1.9			**19.8**															
385-387	M	U	5.0					10.8	11.2	6.4	20.2	1.9																		
388-390	F	U	5.0					10.8	11.2	6.4	20.2	1.9																		
391	M	U	5.5	10.0	0.8			**19.9**	13.3	**37.1**	**86.8**	**9.0**		**2.0**	**26.4**				**0.6**											
392	F	U	5.5	10.0				**19.9**	13.3	**37.1**	**86.8**	**9.0**		**2.0**	**26.4**				**0.6**											
393	F	U	5.5	10.0				**19.9**	13.3	**37.1**	**86.8**	**9.0**		**2.0**	**26.4**				**0.6**											
394	M	U	26.0															0.2												
395	F	U	26.0															0.2												

Annex 1. Adults' consumption rates (kg/y or l/y) and occupancy rates (h/y) in the Dungeness area

Observation number	Sex (U if unknown)	Age in years (U if unknown)	Distance of residence from site (km) (U if unknown)	Fish	Crustaceans	Molluscs	Marine plants and algae	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits/hares	Honey	Wild fungi	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and mud	Intertidal occupancy over sand and stones	Intertidal occupancy in a houseboat	Handling fishing gear	Handling sediment	Occupancy in water*	Occupancy on water*	Indoor occupancy within 1 km of site perimeter fence	Outdoor occupancy within 1 km of site perimeter fence
396	F	18	26.0															0.2												
398	F	36	3.0															**5.7**												
399	M	41	3.0															**5.7**												
401	M	28	26.0															0.3												
402	F	27	26.0															0.3												
404	M	U	5.5						**88.8**	**40.5**	**65.4**					2.3														
405	M	26	0.2		0.3				3.4	0.8	1.5	1.7																1392	7251	209
406	F	26	0.2		0.3				3.4	0.8	1.5	1.7																	5848	320
409	M	46	0.2																				208						4006	3290
410	M	26	0.2																			156							2613	2922
411	M	56	60.0	1.0																			33							33
412	F	55	60.0	1.0																			33							33
413	M	60	5.5	4.1	1.6																		144							108
414	F	59	5.5	4.1	1.6																									
415	M	50	56.0	11.9																			96							64
416	F	50	56.0	11.9																										
417	M	59	120.0	14.6																	64									64
418	F	57	120.0	14.6	0.1																64									64
419	M	49	50.0																				6							6
420	M	19	50.0																				6							6
421	F	47	50.0																				6							6
423	M	39	26.0	16.8	0.7																26		260			26	26			
424	F	U	26.0	0.9																										
427	M	68	U	4.6																		18	144			18				
428	F	65	U	4.6																										
429	M	47	13.0	4.0		0.1																	48					12		48
430	F	48	13.0	4.0		0.1																								
431	M	41	13.0	4.0		0.1																	48							48
432	M	59	55.0	5.4		0.1																	20							20
433	F	58	55.0	5.4																										
434	M	36	1.8	5.9	0.7	2.2																	44		33			166		
435	F	33	1.8	5.9		2.2																								
439	M	59	3.8	**59.8**	**5.4**	3.8																	44		33			66		
440	F	58	3.8	5.9	1.4	2.6																								
441	M	73	1.8	10.9	1.6	2.6																	24							
442	F	60	1.8	5.8	1.4																									

Annex 1. Adults' consumption rates (kg/y or l/y) and occupancy rates (h/y) in the Dungeness area

Observation number	Sex (U if unknown)	Age in years (U if unknown)	Distance of residence from site (km) (U if unknown)	Fish	Crustaceans	Molluscs	Marine plants and algae	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits/hares	Honey	Wild fungi	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and mud	Intertidal occupancy over sand and stones	Intertidal occupancy in a houseboat	Handling fishing gear	Handling sediment	Occupancy in water*	Occupancy on water*	Indoor occupancy within 1 km of site perimeter fence	Outdoor occupancy within 1 km of site perimeter fence
443	M	U	1.8	**46.7**	1.6											**11.3**							104							
444	M	U	1.5	14.2	1.7																	39	**360**		**700**	39	12	2160		
445	F	56	1.5	5.4	3.0	5.2																								
446	M	69	1.5	28.6	**11.8**			9.1	18.2	**25.5**	18.2										18		104			18	208	80		
447	F	69	1.5	28.6	**11.8**			9.1	18.2	**25.5**	18.2																			
448	M	37	1.8	7.9	0.5																		202					112		
449	M	U	8.0																				150					608		
450	M	44	1.8	**52.8**	2.1	3.9																564	108			564	16	112		
452-471	M	U	U																		75							37		
472	F	78	0.9	9.6	1.3	0.4																							8135	549
473	F	36	4.3	3.6	**8.5**	5.2															78							10		
474	M	38	4.3	3.6																	78							40		
477	M	42	0.8	**39.4**	**14.1**											0.5						**1350**				**1350**			4924	1050
478	M	40	0.8																										5161	52
479	F	18	0.8																										6326	200
481	M	46	50.0																		156									
482	M	17	50.0																		156									
483	M	42	U	8.5																			**368**							
484	M	59	100.0	21.4																			**350**							
486	M	57	55.0	3.7																			**720**							
489	M	U	U	9.1	0.7																30		30							
490	M	37	U																		72									
491	M	36	U																		72									
492	M	31	U	1.8																	72									
493	M	U	U																		72									
494-499	M	U	U																				20							
500	M	56	55.0	3.1																	20									
501	F	52	55.0	3.1																										
502	M	25	55.0	3.1																										
503	M	32	55.0	3.1																										
504	F	24	55.0	3.1																										
505	F	21	55.0	3.1																										
506	M	47	70.0																				300				10	80		
507	F	42	70.0																				300							
508	M	U	70.0																				24							
509	F	U	70.0																				24							

Annex 1. Adults' consumption rates (kg/y or l/y) and occupancy rates (h/y) in the Dungeness area

Observation number	Sex (U if unknown)	Age in years (U if unknown)	Distance of residence from site (km) (U if unknown)	Fish	Crustaceans	Molluscs	Marine plants and algae	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits/hares	Honey	Wild fungi	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and mud	Intertidal occupancy over sand and stones	Intertidal occupancy in a houseboat	Handling fishing gear	Handling sediment	Occupancy in water*	Occupancy on water*	Indoor occupancy within 1 km of site perimeter fence	Outdoor occupancy within 1 km of site perimeter fence
510	M	49	50.0																				15							
511	M	22	26.0	3.6																			60							
512	M	23	26.0	3.6																			60							
513-518	U	U	26.0	4.6																										
519	M	37	65.0																		24		80							
520	M	39	50.0																				80							
521	M	71	U		0.5																						45			
522	F	58	U		0.5																									
523-594	U	U	U																								*39*	*39*		
595	M	42	U																								*134*	*1205*		
596	F	40	U																								*134*	*1205*		
597-598	M	U	U																		36		48			36				
599	F	U	U																		36									
600	M	65	3.5	15.4																	178					52		100		
601-603	U	U	3.5	6.4																										
604	M	31	70.0																		320						320			
605	F	29	70.0																		320						320			
606	M	44	U																		260						156			
607-623	U	U	U																		208									
624	M	46	3.5	21.3	1.4																	**1170**				**1170**				
625	M	54	5.5	2.4	0.1																104		30					72		
626	F	56	5.5	2.4	0.1																									
628	M	17	5.5	2.4	0.1																		182					156		
629-640	U	U	U																									90		
641	M	U	U	**49.4**																								120		
642	F	U	U	**49.4**																										
643	M	40	26.0	**47.6**	2.2	5.4																	30					40		
644	F	38	26.0	**47.6**	2.2	5.4																								
645	M	44	3.5	3.7	**5.7**	1.3															12	**1040**				**1040**	12			
646	F	45	3.5	4.1	**6.5**	1.3																								
647	F	18	3.5	3.7																										
648	M	43	5.5	0.5		5.4															**1274**		30			**1274**				
649	F	43	5.5	0.5																										
650	M	18	5.5	0.5																										
652	M	43	1.1	**50.9**	2.9	10.4																			178			1584		
653	M	20	1.1																						356			1584		

Annex 1. Adults' consumption rates (kg/y or l/y) and occupancy rates (h/y) in the Dungeness area

Observation number	Sex (U if unknown)	Age in years (U if unknown)	Distance of residence from site (km) (U if unknown)	Fish	Crustaceans	Molluscs	Marine plants and algae	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits/hares	Honey	Wild fungi	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and mud	Intertidal occupancy over sand and stones	Intertidal occupancy in a houseboat	Handling fishing gear	Handling sediment	Occupancy in water*	Occupancy on water*	Indoor occupancy within 1 km of site perimeter fence	Outdoor occupancy within 1 km of site perimeter fence
654	M	69	14.0										**18.8**	**3.8**																
655	F	52	14.0										**18.8**	**3.8**																
656	F	20	14.0										**18.8**	**3.8**																
658-668	U	U	U										**18.8**																	
669	M	65	4.0		0.1											0.2			0.1											
670	F	20	4.0		0.1											0.2			0.1											
671	M	36	4.0		0.1											0.2			0.1											
672	M	21	4.0		0.1											0.2			0.1											
675	M	51	1.8	**67.1**												0.2			0.2		**650**		**868**			**650**		400		
676	F	42	1.8									0.2							0.2											
680	M	40	3.0	1.6		1.4															**730**		30			**730**	176			
681	F	38	3.0	0.9		2.2																								
684	M	41	18.0	15.3	1.1	2.2																	183		**800**			1200		
685	F	40	18.0	15.3	1.1																									
689	M	36	60.0	**43.3**																								75		
690	F	34	60.0	**43.3**																										
691	M	U	U																											30
692	M	U	U																											10
693-698	M	U	U																		**1500**									
699-705	M	U	U																		**1650**									
706-716	M	U	U																		**1650**					420				
717-735	M	U	U																		**1800**									
736-737	M	U	U																		**1800**					450				
738-746	M	U	U																		**1950**					480				
747	M	U	U	8.1	1.9	10.4																						1600		
748	F	U	U	5.2	1.9	10.4																								
749	M	70	0.9	6.6	2.8	5.2		6.8	4.5	0.5	4.6					0.5					273					273			7276	730
750	F	62	0.9	3.4				6.8	4.5	0.5	4.6					0.5													7357	575
751	M	72	2.8	**71.7**	**6.3**	**13.0**				0.2	7.6														**700**		20	2000		
752	F	47	2.8	35.7	3.1	6.5				0.2	7.6																			
753	M	18	2.8	35.7	3.1	6.5				0.2	7.6												52		182			208		
756-765	U	U	U																									104		
766-790	U	U	U																								12	59		
791	M	57	3.8	**65.1**		1.7															328					6	360			
792	F	53	[redacted]	5.6	1.0	2.9		1.6	5.4	5.5	6.8	0.5			1.4	0.2			**0.5**										5596	416
793	M	48	[redacted]	5.6	1.0			1.6	5.4	5.5	6.8	0.5			1.4	0.2			**0.5**										5516	416

Annex 1. Adults' consumption rates (kg/y or l/y) and occupancy rates (h/y) in the Dungeness area

Observation number	Sex (U if unknown)	Age in years (U if unknown)	Distance of residence from site (km) (U if unknown)	Fish	Crustaceans	Molluscs	Marine plants and algae	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits/hares	Honey	Wild fungi	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and mud	Intertidal occupancy over sand and stones	Intertidal occupancy in a houseboat	Handling fishing gear	Handling sediment	Occupancy in water*	Occupancy on water*	Indoor occupancy within 1 km of site perimeter fence	Outdoor occupancy within 1 km of site perimeter fence
794	M	U	U																										864	
795	F	U	U																										864	
797	M	U	U																										312	
798	F	U	U																										312	
799	M	53	0.6	7.5	4.1																				**1800**			2400	3074	2500
800	F	47	0.6	7.5	4.1																								6349	575
801	M	40	1.0		0.8																				**1800**			2400	3628	2600
802	F	36	1.0		0.8																								6413	365
805	F	65	U		0.4																									
806	M	33	50.0																		78									
807	F	20	50.0																		78									
808	M	53	8.0																		104									
809	M	31	50.0	32.9	**6.9**	3.7																105	210			105				
810	M	69	U	28.7	**11.8**																100		100		284		100	312		
811	F	65	U	28.7	2.9																									
812	F	57	26.0													0.5			**0.5**										208	702
813	M	63	0.2		1.4																								1248	
814	F	44	0.2		1.4																52								4887	365
815	M	23	0.2																						**1006**			2013	4092	200
816	F	22	0.2																										4976	520
817	M	27	0.2																										682	182
818	M	60	3.8	30.4	1.1	0.8																24	**468**			24				
819	F	50	3.8	30.4	1.1	0.8																								
820	M	66	3.3	**45.1**		2.5			6.8														120		492		390	492		
821	F	63	3.3		0.5				6.8																					
822	M	U	6.0				**0.5**								**8.9**				**0.5**								10			786
823	F	U	6.0													2.3			**0.5**											
824	F	U	5.5	7.1												2.3														
825	F	U	5.5	4.8	0.8	0.2										2.3			0.2		208									156
826	M	U	6.3																											1300
827	M	40	0.3																				245						4286	1309
828	F	49	0.3																				245						5202	393
830	F	59	0.3																				**365**						6147	967
831	M	56	0.3																				**365**						6363	967
832	M	67													4.1														4535	117
833-847	U	U	U																										1920	

Annex 1. Adults' consumption rates (kg/y or l/y) and occupancy rates (h/y) in the Dungeness area

Observation number	Sex (U if unknown)	Age in years (U if unknown)	Distance of residence from site (km) (U if unknown)	Fish	Crustaceans	Molluscs	Marine plants and algae	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits/hares	Honey	Wild fungi	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and mud	Intertidal occupancy over sand and stones	Intertidal occupancy in a houseboat	Handling fishing gear	Handling sediment	Occupancy in water*	Occupancy on water*	Indoor occupancy within 1 km of site perimeter fence	Outdoor occupancy within 1 km of site perimeter fence
848	F	U	U																										720	
849	F	U	U																										480	
850	M	40	22.0	**47.1**		**18.7**																			**789**		26	2366		
851	F	40	22.0	23.5		**11.2**																								
854	M	36	U												**20.8**								156						7954	418
855	F	46	0.3												**20.8**								156						7119	653
856	M	47	0.3																											192
857-860	M	U	U																										1040	1040
861	M	U	U																										1274	1274
862	M	U	U																						**701**			2237		
863	M	55	19.0	11.8	**5.4**	8.2																			**701**			2237		
864	M	23	19.0																										5938	442
865	F	51	0.3																										5152	52
866	M	25	0.3																											
867	M	37	12.0																		144									
868-870	M	U	28.0																		144									
871-872	M	U	16.0																		144									

Notes

Emboldened observations are rates included in the critical groups.

* Occupancy rates in italics were for water affected by gaseous discharges rather than by aqueous discharges.

Annex 2. Children's consumption rates (kg/y or l/y) and occupancy rates (h/y) in the Dungeness area

Observation number	Sex (U if unknown)	Age in years	Distance of residence from site (km) (U if unknown)	Fish	Crustaceans	Molluscs	Other vegetables	Root vegetables	Potato	Domestic fruit	Sheep meat	Poultry	Wild/free foods	Honey	Wild fungi	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Handling fishing gear	Occupancy in water	Occupancy on water	Indoor occupancy within 1 km of site perimeter fence	Outdoor occupancy within 1 km of site perimeter fence
15 year old																						
104	M	16	U	**35.4**	**4.5**	**19.7**																
422	F	16	50.0														6					6
480	M	16	0.8																		6129	52
627	M	16	5.5	2.4	0.1																	
657	F	16	14.0								**18.8**	**3.8**										
829	M	16	0.3																		1984	182
673	M	15	4.0		0.1								**0.2**		**0.1**							
683	F	15	3.0			2.2																
99	F	14	U	1.5																		
105	F	14	U	**26.5**	**4.5**	**19.7**																
242	M	14	U	3.0													130					
677	F	14	1.8							**0.2**					**0.2**							
755	M	14	U														52	182		208		
72	M	13	U	8.2																		
107	M	13	U	**26.5**	**4.5**	**19.7**																
154	M	13	U	2.5																		
165	M	13	U	3.1												60			10			
397	M	13	26.0											**0.2**								
436	F	13	1.8	3.9																		
475	F	13	4.3	3.6												78				10		
651	F	13	5.5	0.5																		
485	M	12	100.0	9.1													**350**					
488	M	12	55.0	1.1													**720**					
678	F	12	1.8							**0.2**					**0.2**							
682	M	12	3.0	1.6		1.4																

Annex 2. Children's consumption rates (kg/y or l/y) and occupancy rates (h/y) in the Dungeness area

Observation number	Sex (U if unknown)	Age in years	Distance of residence from site (km) (U if unknown)	Fish	Crustaceans	Molluscs	Other vegetables	Root vegetables	Potato	Domestic fruit	Sheep meat	Poultry	Wild/free foods	Honey	Wild fungi	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Handling fishing gear	Occupancy in water	Occupancy on water	Indoor occupancy within 1 km of site perimeter fence	Outdoor occupancy within 1 km of site perimeter fence
10 year old																						
75	M	11	U	8.2	**4.6**																	
106	F	11	U	**26.5**	**4.5**	**19.7**																
166	M	11	U	3.1												60			10			
437	M	11	1.8	3.9																		
451	M	11	1.8	**27.8**	**2.1**	2.6											56					
476	F	11	4.3	3.6												78				10		
686	M	11	18.0	6.4	1.1																	
58	F	10	U	**35.4**		4.2																
228	M	10	U	0.8													20					
235	M	10	U	0.8																		
679	F	10	1.8							**0.2**					**0.2**							
76	F	9	U	8.2	**4.6**																	
487	M	9	55.0	1.1													**720**					
229	F	8	U	0.8													20					
425	M	8	26.0	0.9																		
438	F	8	1.8	3.9	0.7																	
674	F	8	4.0		0.1								**0.2**		**0.1**							
687	M	8	18.0	6.4	1.1																	
754	F	8	2.8	**17.9**	**1.6**	3.2		**0.2**	**7.6**													
852	F	8	22.0	**11.8**		**7.5**													26			
243	M	7	U	1.5													20					
688	F	7	18.0	6.4	1.1																	

Annex 2. Children's consumption rates (kg/y or l/y) and occupancy rates (h/y) in the Dungeness area

Observation number	Sex (U if unknown)	Age in years	Distance of residence from site (km) (U if unknown)	Fish	Crustaceans	Molluscs	Other vegetables	Root vegetables	Potato	Domestic fruit	Sheep meat	Poultry	Wild/free foods	Honey	Wild fungi	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Handling fishing gear	Occupancy in water	Occupancy on water	Indoor occupancy within 1 km of site perimeter fence	Outdoor occupancy within 1 km of site perimeter fence
5 year old																						
234	M	6	U	0.2																		
407	F	6	0.2				**3.4**	**0.8**	**1.5**	**1.7**											5848	320
803	F	6	1.0		**0.4**																6848	365
4	F	5	0.6	**8.0**																	5654	1069
796	F	5	U																		864	
426	M	4	26.0	0.9																		
804	M	4	1.0		**0.4**																6413	365
853	F	4	22.0	**5.9**		**3.7**													26			
153	F	3	U	0.8																		
400	F	3	3.0											**2.3**								
408	M	3	0.2				**3.4**	**0.8**	**1.5**	**1.7**											5848	320
403	F	2	26.0											0.3								

Notes

Emboldened observations are rates included in the critical groups.

Annex 3. Qualitative and estimated data for use in dose assessment

	Details of activity	Exposure pathways involved	Estimated rate	Other related exposure pathways potentially involved
1	About 6 individuals are known to go wildfowling at the Rye Harbour Nature Reserve. Wildfowlers do not shoot from the tide washed areas but may consume birds from these areas.	Consumption of wildfowl.	Insufficient data to estimate a rate.	
2	Livestock were seen grazing on salt marsh on the eastern bank of the River Rother but no contact was made with the farmer.	Occupancy over salt marsh.	Experience from other habits surveys suggests rates are unlikely to exceed 200 h/y.	Consumption of livestock, which have grazed on tide-washed pastures.

Annex 4. Ratios for determining consumption rates for children

Food group	Ratio child/adult[1]	
	1 yr old	10 yr old
Fish[2]	0.050	0.200
Crustaceans[2]	0.050	0.250
Molluscs[2]	0.050	0.250
Green vegetables	0.222	0.444
Other vegetables	0.200	0.500
Root vegetables	0.375	0.500
Potatoes	0.292	0.708
Domestic fruit	0.467	0.667
Milk	1.333	1.000
Cattle meat	0.222	0.667
Pig meat	0.138	0.625
Sheep meat	0.120	0.400
Poultry	0.183	0.500
Eggs	0.600	0.800
Wild/free foods[3]	0.110	0.490
Game[4]	0.140	0.500
Honey	0.789	0.789
Wild fungi	0.150	0.450
Freshwater fish[2]	0.050	0.250
Direct radiation	1.000	1.000
External exposure	0.500	0.030
Plume	1.000	1.000

Notes

1. The age groups suggested for assessment in this table are those relating to dose coefficients representing 1 to 2 yr olds (labelled 1 yr old) and 7 to 12 yr olds (labelled 10 yr old). Excepting notes 2 and 3, ratios were derived from Byrom et al., (1995) for 1yr old (6 - 12 months) and 10 yr old children (10 - 11 yrs).
2. Ratios were derived from Smith and Jones, (2003) which presented data for infants and children.
3. Ratios were derived from FSA data for wild fruit and nuts for infants and 10 yr old children.
4. Game includes rabbits/hares and venison.

Annex 5. Summary of adults' profiled habits data in the Dungeness area

Profile Name	Number of individuals	Pathway Name	Crustacea	Direct[4]	Eggs	Fish - Sea	Fruit - Domestic	Fruit and nuts - Wild	Gamma ext - Houseboat	Gamma ext - Sediment[1]	Honey	Marine plants and algae	Meat - Game[2]	Meat - Poultry	Meat - Sheep	Mollusca	Mushrooms	Occupancy In Water	Occupancy On Water	Plume (IN; 0-0.25km)[3]	Plume (MID; 0.25-0.5km)[3]	Plume (OUT; 0.5-1km)[3]	Vegetables - Green	Vegetables - Other Domestic	Vegetables - Potatoes	Vegetables - Root
			kg	-	kg	kg	kg	kg	h	h	kg	kg	kg	kg	kg	kg	kg	h	h	h	h	h	kg	kg	kg	kg
Crustacean consumers	18		9.3	0.22		31.6	0.3			176						4.8	0.1	19	504	448		735	1.9	2.4	2.4	4.3
Occupants for direct radiation	114		0.5	1	0.7	4.3	0.2			50						0.2		4	82	840	1129	1640	0.3	0.8	0.8	0.6
Egg consumers	14		0.1	0.29	19.9	2.1	2.8			22				0.4			0.2	1		56	1653		9.7	11.2	27.5	11.0
Sea fish consumers	25		2.3	0.12		51.4		0.5		220						5.0		52	519			816		0.3	0.3	
Domestic fruit consumers	10		0.7	0.3	7.9	5.6	7.5	0.6					0.5	0.7		0.1	0.3			806		1355	21.9	21.1	50.1	27.2
Wild fruit and nut consumers	1		0.9	0.33		9.4	2.5	11.3		35						0.2	0.2			913		643	5.1	15.4	24.9	11.6
Occupants for exposure - Houseboat	1								3943										789							
Occupants for exposure - Sediment	74		0.3	0.03		5.3				1565						0.2		9	8			172				
Honey consumers	3				1.5						4.7						0.2						3.8	7.9	1.2	1.5
Marine plants and algae consumers	2			1	4.4		2.3	0.9				0.3					0.2	5		393		2892	0.5		10.1	3.5
Game meat consumers	2						10.0						2.3	0.4									56.6	53.9	41.0	48.3
Poultry meat consumers	6		0.1		13.2	5.0	4.5							2.9	9.4		0.3						10.0	6.7	43.4	18.5
Sheep meat consumers	14													0.8	18.8											
Mollusc consumers	8		3.9			51.6										17.3		6	1116						0.9	
Mushroom consumers	11		0.8	0.45	9.7	6.1	3.0	0.5			0.2			0.5		0.4	0.5	1		1973			9.2	9.6	25.6	14.2
Occupants in water	35		0.4	0.03		5.2				118						0.2		311	16			193	0.3	0.7	0.5	0.7
Occupants on water	48		1.4	0.1		12.0				12						2.3		7	1905	245		406		0.1	0.2	
Occupants for plume pathways (inner area)	14		0.7	1	0.5	2.7	0.7			30						0.3	0.1		243	6175			1.4	1.8	4.6	2.7
Occupants for plume pathways (middle area)	13			1	4.6		0.3			140											6434			2.6		
Occupants for plume pathways (outer area)	27		1.8	1		14.3	0.4			101						0.6		18	218			6707	0.5	1.2	1.1	0.8
Green vegetable consumers	5		0.2		15.9	6.0	9.4						0.9	1.3			0.4						34.6	29.5	68.5	41.6
Other domestic vegetable consumers	3						6.6	0.8					1.5	0.2									37.7	65.5	49.1	45.7
Potato consumers	12		0.1	0.08	6.6	2.5	5.0							0.6			0.2			675			16.9	23.2	64.2	23.3
Root vegetable consumers	9		3.4	0.11	8.8	12.5	5.8	0.5		14			0.5	0.7		0.1	0.3	23	9	896			23.0	31.2	49.4	36.1

Notes

1. Gamma ext - Sediment includes occupancy over salt marsh, sand, sand and mud, and sand and stone
2. Game meat includes rabbits/hares
3. Plume times are the sums of individuals' indoor and outdoor times
4. Expressed as proportion of group who are present within 1km of site

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