

Cefas contract report C2848

# Radiological Habits Survey: Heysham, 2011

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Final report

# Radiological Habits Survey: Heysham, 2011

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2012

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## SUMMARY

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This report presents the results of a survey conducted in 2011 to determine the habits and consumption patterns of people living, working and pursuing recreational activities in the vicinity of the Heysham nuclear site. There are two separate nuclear power stations, Heysham 1 and Heysham 2, and for the purpose of this survey they were considered together as one site. Each station has two Advanced Gas-Cooled Reactors. The site discharges gaseous radioactive wastes via stacks to the atmosphere, liquid radioactive wastes into Morecambe Bay and contains sources of direct radiation. Areas likely to be most affected by the discharges and sources of radiation were defined as the aquatic survey area for liquid discharges, the terrestrial survey area for the deposition from gaseous discharges, and the direct radiation survey area for ionising radiation emanating directly from the site. The occupancy data collected from the direct radiation survey area is also applicable to the direct exposure arising from gaseous releases from the site.

The following potential exposure pathways related to the site were investigated:

- The consumption of food from the aquatic survey area
- Activities and occupancy over intertidal substrates
- The handling of fishing gear and sediment
- Activities and occupancy in and on water
- The use of seaweed as a fertiliser or animal feed
- The consumption of food from the terrestrial survey area
- The use and destination of produce originating from the survey areas
- The consumption and use of groundwater and surface water in the terrestrial survey area
- The transfer of contamination off-site by wildlife
- Activities and occupancy within the direct radiation survey area
- Any new or unusual exposure pathways

Interviews were conducted with members of the public and data collected for 851 individuals are presented and discussed. High rates of consumption, intertidal occupancy and handling are identified using established methods comprising (a) a 'cut off' to define the high-rate group and (b) 97.5<sup>th</sup> percentiles. The rates so identified can be used in dose assessments. Additionally, profiles of integrated habits data are presented specifically for use in total dose assessments.

### ***The aquatic survey area***

The aquatic survey area (Figure 1) was defined as the waters and intertidal areas of Morecambe Bay to the north-east of a line extending from South East Point on Walney Island, to Rossall Point in Fleetwood. Walney Channel, which lies between Walney Island and the mainland, and the estuaries of the rivers Leven, Kent, Lune and Wyre were included in the survey area.

Foods from the aquatic survey area were consumed from the following food groups: fish; crustaceans; molluscs; wildfowl; marine plants/algae; salt marsh grazed sheep meat. The predominant foods consumed by the high-rate groups were:

- For fish; bass, plaice, flounder and sea trout, with smaller quantities of cod, Dover sole, grey mullet, salmon and thornback ray
- For crustaceans; brown shrimp and common lobster
- For molluscs; cockles and mussels
- For wildfowl; pink-footed goose, mallard, greylag goose and pintail, with smaller quantities of Canada goose, teal and wigeon
- For marine plants/algae; samphire

The mean consumption rate for the adult high-rate group for fish was 27 kg y<sup>-1</sup>, for crustaceans was 11 kg y<sup>-1</sup>, for molluscs was 6.7 kg y<sup>-1</sup>, for wildfowl was 13 kg y<sup>-1</sup>, for marine plants/algae was 1.6 kg y<sup>-1</sup> and for salt marsh grazed sheep meat was 8.6 kg y<sup>-1</sup>. The mean consumption rate for the adult high-rate group exceeded the generic 97.5<sup>th</sup> percentile rate for crustaceans but not for fish or molluscs. Generic consumption rates have not been determined for wildfowl, marine plants/algae or salt marsh grazed sheep meat.

The activities undertaken by adults in the high-rate groups for intertidal occupancy included collecting mussels, wildfowling, elver fishing, long-lining, walking, shore angling, bird watching, turf cutting, dog walking, tractor fishing, setting nets, leading guided walks, lave netting, oyster farming, collecting samphire, bait digging, collecting cockles, collecting crabs and boat maintenance. Gamma dose rate measurements were taken at most locations in the aquatic survey area where activities were occurring. The only activity undertaken by adults in the high-rate group for handling fishing gear was handling nets. The activities undertaken by adults in the high-rate group for handling sediment were collecting mussels, collecting seaweed, turf cutting, oyster farming and wildfowling. The activities undertaken by people in and on the water included kitesurfing, windsurfing, snorkelling, kayaking, lifeguard duties, swimming, sailing, canoeing, boat dwelling, trawling, potting, boat angling, RNLI duties, boatman duties, gill netting, drift netting, push netting, wildfowling, stow netting, passenger ferry crew, tractor fishing, lave netting and haaf netting. It was reported that seaweed was used as a fertiliser on an allotment plot. The use of seaweed as an animal feed was not identified.

### ***The terrestrial survey area***

The terrestrial survey area (Figure 2) was defined as the land within 5 km of the centre of the Heysham site. Thirteen farms were identified that produced milk (from dairy cattle), beef cattle, lambs and pigs. The farmers and their families consumed foods that were produced on their land. One allotment site with approximately 80 plots in total was identified where a variety of fruit and vegetables were grown. Some allotment holders kept chickens for eggs on their allotment plots. Two beekeepers were identified who kept hives within the survey area.

Foods from the terrestrial survey area were consumed from the following food groups: green vegetables; other vegetables; root vegetables; potato; domestic fruit; milk; cattle meat; pig meat; sheep meat; poultry; eggs; wild/free foods; rabbits/hares; honey; wild fungi. Two mean consumption rates for the adult high-rate groups were found to be greater than the generic 97.5<sup>th</sup> percentile consumption rates. These were for milk and cattle meat. The consumption of cereals or venison was not identified.

The consumption of borehole water by humans was identified. Livestock were consuming borehole water and spring water. Control measures taken by the Heysham site against wildlife in order to limit the possibility that contamination is transferred off-site included using a falconer to discourage birds, using nets to prevent birds from accessing the buildings and periodically culling rabbits.

### ***The direct radiation survey area***

The direct radiation survey area (Figure 2) was defined as the land and sea within 1 km of the Heysham nuclear licensed site boundary. Occupancy rates were obtained for residents, employees, children attending nursery school, people undertaking nature conservation duties, angling, bird watching, crabbing, dog walking, bait digging and collecting shellfish.

The occupancy rates were analysed in zones according to the distance from the Heysham nuclear licensed site boundary. The highest indoor, outdoor and total occupancy rates in the 0 – 0.25 km and the >0.25 – 0.5 km zones were for residents, two of whom also worked in the survey area. Two residents had the same highest indoor and total occupancy rates in the >0.5 – 1.0 km zone and four employees had the highest outdoor occupancy rate.

Gamma dose rate measurements were taken indoors and outdoors at most properties where interviews were conducted in the direct radiation survey area. Background readings were taken at distances beyond 5 km of the Heysham site centre.

### ***Comparisons with the previous survey***

Comparisons were made with the results from a previous habits survey undertaken around the Heysham site in 2006. Reasons for significant changes in the consumption, occupancy and handling rates were identified for certain pathways and these are provided in Section 8.

In the aquatic survey area in 2011, compared with 2006, there were increases in the mean consumption rates for the adult high-rate groups for fish, from 25 kg y<sup>-1</sup> to 27 kg y<sup>-1</sup>, for molluscs, from 4.5 kg y<sup>-1</sup> to 6.7 kg y<sup>-1</sup>, for wildfowl, from 11 kg y<sup>-1</sup> to 13 kg y<sup>-1</sup> and for salt marsh grazed sheep meat, from 5.4 kg y<sup>-1</sup> to 8.6 kg y<sup>-1</sup>. There were decreases in the mean consumption rates for the adult

high-rate groups for crustaceans, from 16 kg y<sup>-1</sup> to 11 kg y<sup>-1</sup> and for marine plants/algae, from 2.4 kg y<sup>-1</sup> to 1.6 kg y<sup>-1</sup>.

The mean intertidal occupancy rates for the adult high-rate groups decreased in 2011 compared to 2006 over the following substrates: mud, from 1300 h y<sup>-1</sup> to 270 h y<sup>-1</sup>; mud and sand, from 700 h y<sup>-1</sup> to 270 h y<sup>-1</sup>; sand, from 2300 h y<sup>-1</sup> to 750 h y<sup>-1</sup>; sand and stones, from 1000 h y<sup>-1</sup> to 410 h y<sup>-1</sup>. The mean intertidal occupancy rates for the high rate groups increased in 2011 compared with 2006 for rock, from 170 h y<sup>-1</sup> to 260 h y<sup>-1</sup> and for salt marsh, from 490 h y<sup>-1</sup> to 510 h y<sup>-1</sup>. Activities were recorded over stones and on board a boat resting on mud at low tide in 2011 but were not recorded over these substrates in 2006. The mean rate for the adult high-rate group for handling fishing gear decreased in 2011 compared to 2006 from 800 h y<sup>-1</sup> to 580 h y<sup>-1</sup> and the mean rate for the adult high-rate group for handling sediment decreased in 2011 compared to 2006 from 810 h y<sup>-1</sup> to 450 h y<sup>-1</sup>.

In the terrestrial survey area in 2011, compared with 2006, there were relatively large increases in the mean consumption rates for the adult high-rate groups for milk, from 200 l y<sup>-1</sup> to 250 l y<sup>-1</sup> and for cattle meat, from 10 kg y<sup>-1</sup> to 57 kg y<sup>-1</sup>. There were relatively large decreases in the mean consumption rates for the adult high-rate groups for the following food groups: potato, from 63 kg y<sup>-1</sup> to 49 kg y<sup>-1</sup>; domestic fruit, from 85 kg y<sup>-1</sup> to 44 kg y<sup>-1</sup>; wild fungi, from 4.5 kg y<sup>-1</sup> to 1.3 kg y<sup>-1</sup>. There were small increases in the mean consumption rates for the adult high-rate groups for other vegetables, sheep meat and eggs, and there were small decreases for green vegetables, root vegetables, poultry, wild/free foods, rabbits/hares and honey. The consumption of pig meat was identified in 2011 but was not identified in 2006.

In the direct radiation survey area in 2011 compared with 2006, there was a large increase in the highest total occupancy rate in the 0 - 0.25 km zone, from 5700 h y<sup>-1</sup> to 8500 h y<sup>-1</sup>. There was a slight increase in the highest total occupancy rate in the >0.25 - 0.5 km zone in 2011 compared with 2006 from 8000 h y<sup>-1</sup> to 8200 h y<sup>-1</sup>. In the >0.5 – 1.0 km zone the highest total occupancy rate was 8200 h y<sup>-1</sup> (rounded data) in 2011 and in 2006. Two sets of gamma dose rate measurements taken at the same businesses in 2011 and 2006 were compared. At the time of the 2011 survey, land in the direct radiation survey area to the east, south-east and a small area to the north of the existing Heysham site, which was occupied by a nature reserve, a golf course and a caravan park, had been nominated for development for a new nuclear power station.

### ***Recommendations***

Recommendations for changes to the current environmental monitoring programmes are provided. These are based on the information collected during the survey and also take into account the potential radiological significance of the various pathways that were identified. These include removing the sample of Brussels sprouts from the programme and taking a one-off sample of beef or lamb.

## 1 INTRODUCTION

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The public may be exposed to radiation as a result of the operations of the Heysham nuclear licensed site either through the permitted discharges of liquid or gaseous radioactive wastes into the local environment, or from radiation emanating directly from the site. This report provides information on activities carried out locally 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 Office for Nuclear Regulation in order to support their respective roles in protecting the public from the effects of radiation.

UK policy on the control of radiation exposure has long been based on the recommendations of the International Commission on Radiological Protection (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 'representative person'. This notional individual is defined as being representative of the more highly exposed members of the population. It follows that, if the dose to the representative person is acceptable when compared to dose limits and optimization, other members of the public will receive acceptable doses, and overall protection to the public is provided from the effects of radiation. The term 'representative person' is equivalent to, and replaces, the term 'average member of the critical group' as recommended by ICRP (ICRP, 2006). The recommendations of the ICRP were updated in 2007 (ICRP, 2007) and, for the public, still include the principle of protecting the individuals most highly exposed to radiation, characterised by the representative person.

### 1.1 Regulatory framework

The Environment Agency regulates the discharges of waste under the Environmental Permitting Regulations (UK Parliament, 2010); prior to 6<sup>th</sup> April 2010 regulation was under the Radioactive Substances Act 1993 (RSA 93) (UK Parliament, 1993) as amended by the Environment Act 1995 (EA 95) (UK Parliament, 1995). The regulations take account of the European Union (EU) Basic Safety Standards (BSS) Directive 96/29/Euratom (CEC, 1996) which embody the recommendations of the ICRP, particularly ICRP 60 (ICRP, 1991). Installation and operation of certain prescribed activities can only occur on sites if they are licensed under the Nuclear Installations Act 1965 (as amended) (NIA 65) (UK Parliament, 1965). From 1st April 2011, the Office for Nuclear Regulation (ONR), an agency 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 exposure of the public to direct radiation from the operations occurring on these sites. Prior to 1<sup>st</sup> April 2011 these functions were carried out by the Nuclear Installations Inspectorate of the Health and Safety Executive.

Appropriate discharge limits are set by the Environment Agency after wide-ranging consultations that include the Food Standards Agency. The Food Standards Agency has responsibilities for ensuring that any radioactivity present in food does not compromise food safety and that permitted 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 acceptable limits.

### 1.2 Radiological protection framework

Dose standards for the public are embodied in the national policy (UK Parliament, 2009a), 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 (CEC, 1996). The public dose standards were incorporated into UK law in IRR 99. In order to implement the BSS Directive in England and Wales, the Environment Agency was issued with a direction by the Department of the Environment, Transport and the Regions in 2000 (DETR, 2000). The requirement to observe the conditions laid down in the Basic Safety Standards (BSS) in England and Wales is now incorporated in the Environmental Permitting Regulations 2010 (UK Parliament, 2010). These require that the environment agencies ensure, wherever applicable, that:

- All public radiation exposures from radioactive waste disposals are kept As Low As Reasonably Achievable (ALARA), social and economic factors being taken into account;
- The sum of all exposures does not exceed the dose limit of 1 mSv a year;
- The dose received from any new source does not exceed 0.3 mSv a year;
- The dose received from any single site does not exceed 0.5 mSv a year.

The dose limit of 1 mSv per year to the public from all anthropogenic sources other than medical applications is also the recommendation made by the ICRP (ICRP, 2007).

The environment agencies are also required to ensure that the dose estimates are as realistic as possible for the population as a whole and for reference groups of the population. They are 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 radiological assessment (i.e. assessments of potential future doses) has been provided by the National Dose Assessment Working Group (NDAWG), which consists of representatives of UK Government Bodies and other organisations with responsibilities for dose assessments (EA, SEPA, DoENI, NRPB and FSA, 2002). NDAWG has also published principles underlying retrospective radiological assessment (i.e. assessment of doses already received from past discharges) (Allott, 2005) and possible methods of carrying out these assessments using the data from combined habits surveys (Camplin *et al.*, 2005). NDAWG agreed that the optimal method for performing retrospective dose assessments would be to use habits profiles (profiling method). This approach is being adopted in Radioactivity in Food and the Environment (RIFE) publications, (e.g. EA, NIEA, FSA and SEPA,

2011), as combined habits surveys are completed. NDAWG has also published reports on the collection and use of habits survey data in retrospective and prospective dose assessments (NDAWG, 2005; NDAWG 2009); the principles described in these reports are consistent with those used here.

## 2 THE SURVEY

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### 2.1 Site activity

The Heysham nuclear site is located on the coast of Lancashire in north-west England, approximately 5 km to the south-west of Morecambe and 8 km west of Lancaster. There are two separate nuclear power stations, Heysham 1 and Heysham 2, which are situated directly adjacent to each other. For the purpose of this survey the two power stations are considered together as a single site. Each station has two Advanced Gas-Cooled Reactors. Heysham 1 started generating electricity in 1983 and is expected to continue generating until 2019. Heysham 2 started generating electricity in 1988 and is expected to continue generating until 2023 ([www.edfenergy.com](http://www.edfenergy.com)).

One reactor at each station was operating at nominal full load throughout the period when the habits survey was conducted. The other reactor at Heysham 1 was shut down for refuelling at the start of the survey period, but was operating at full load by the end of the survey. The other reactor at Heysham 2 was operating at full load at the start and end of the survey, but was being refuelled at low power during the middle of the survey period.

The stations are both owned and operated by EDF Energy Nuclear Generation Ltd and each station is permitted, under the Radioactive Substances Regulation of the Environmental Permitting Regulations 2010, to discharge gaseous radioactive wastes via stacks to the atmosphere and liquid radioactive wastes via outfalls into Morecambe Bay. The stations are licensed for the purposes of operating certain activities prescribed under the Nuclear Installations Act, 1965. Both stations contain sources of direct radiation. Details of the amounts of gaseous and liquid radioactive waste discharged are published in the RIFE reports, for example, EA, FSA, NIEA and SEPA, 2011.

Heysham has been suggested as a potential site for a new nuclear power station. Approximately 115 hectares of land adjacent to the existing nuclear site have been nominated for new nuclear building activities (UK Parliament, 2009b). This land is situated mainly to the east and south-east of the existing site, with a small area to the north. At the time of the survey most of this land was occupied by a nature reserve, a golf course and a caravan park and no identifiable impact on the land use or activities were observed during the survey.

## 2.2 Survey objectives

The Centre for Environment, Fisheries & Aquaculture Science (Cefas) undertook the Heysham habits survey in 2011 on behalf of the Environment Agency, the Food Standards Agency, and the Office for Nuclear Regulation. The aim of the survey was to obtain comprehensive information on the habits of the public that might lead to their exposure to radiation via gaseous discharges, liquid discharges and direct radiation from the Heysham nuclear site.

Specifically, investigations were conducted into the following:

- The consumption of food from the aquatic survey area
- Activities and occupancy over intertidal substrates
- The handling of fishing gear and sediment
- Activities and occupancy in and on water
- The use of seaweed as a fertiliser or animal feed
- The consumption of food from the terrestrial survey area
- The use and destination of produce originating from the survey areas
- The consumption and use of groundwater and surface water in the terrestrial survey area
- The transfer of contamination off-site by wildlife
- Activities and occupancy within the direct radiation survey area
- New or unusual exposure pathways

No additional site-specific investigations were requested by the Environment Agency, the Food Standards Agency or the Office for Nuclear Regulation.

## 2.3 Survey areas

The geographic extents of potential effects from liquid discharges, from deposition from gaseous releases, and from direct radiation are different. Therefore, different survey areas were defined to cover each of these three main possible sources of exposure. These were an aquatic area relating to liquid discharges, a terrestrial area relating to deposition from gaseous discharges, and a direct radiation area relating to ionising radiation emanating directly from the site.

The aquatic survey area, shown in Figure 1, covered the waters and intertidal areas of Morecambe Bay to the north-east of a line extending from South East Point on Walney Island, to Rossall Point in Fleetwood. Walney Channel, which lies between Walney Island and the mainland, and the estuaries of the rivers Leven, Kent, Lune and Wyre were included in the survey area. This area was taken to represent the predominant area of mixing of discharged radionuclides in seawater.

The terrestrial survey area, shown in Figure 2, covered all land within 5 km of the site centre (National Grid Reference: SD 401 596), to encompass the main areas of potential deposition from gaseous discharges. No freshwater rivers or lakes were noted within the terrestrial survey area.

The direct radiation survey area, which is also shown in Figure 2, was defined as all land and sea within 1 km of the nuclear licensed site boundary. The occupancy data collected from the direct radiation survey area is also applicable to inhalation and external exposure pathways arising from gaseous releases from the site.

The same aquatic, terrestrial and direct radiation survey areas were used in the previous habits survey conducted by Cefas around the Heysham site, which was in 2006 (McTaggart *et al.*, 2007).



Figure 1. The Heysham aquatic survey area



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

- Heysham site centre
- Osborne Road allotments

## 2.4 Conduct of the survey

As part of the pre-survey preparation, the Environment Agency, the Food Standards Agency and the Office for Nuclear Regulation were contacted to identify any additional site-specific requirements. Information relating to the activities of people in the aquatic and terrestrial survey areas was obtained from Internet searches, Ordnance Survey maps and from previous habits surveys undertaken around the Heysham site. People with local knowledge of the survey area were contacted for information relevant to the various exposure pathways. These included representatives from: the Marine Management Organisation, who provided information on commercial fishing; the North Western Inshore Fisheries and Conservation Authority, who provided information on shellfish harvesting; Morecambe Town Council, who provided information on an allotment site.

A proposed programme for fieldwork was distributed to the Environment Agency, the Food Standards Agency, and the Office for Nuclear Regulation before the fieldwork commenced, for their comment.

The fieldwork was carried out from the 23<sup>rd</sup> August to the 2<sup>nd</sup> September 2011 by a survey team of four people, according to techniques described by Leonard *et al.* (1982). During the fieldwork a meeting was held between the members of the survey team and representatives from the Heysham 1 and Heysham 2 power stations. This discussion provided details about current site activities, local information, potential exposure pathways and activities in the area, and the potential for transfer of contamination off-site by wildlife.

The following information was obtained during the meeting, or subsequently:

- One reactor at each station was operating at nominal full load throughout the period when the habits survey was conducted. The other reactor at Heysham 1 was shut down for refuelling at the start of the survey period, but was operating at full load by the end of the survey. The other reactor at Heysham 2 was operating at full load at the start and end of the survey, but was being refuelled at low power during the middle of the survey period.
- Liquid waste discharges are diluted in cooling water and are only discharged at specific states of high tide.
- Seaweed and debris caught on the cooling water intake screens are sent to landfill.
- Control measures taken against wildlife in order to limit the possibility that contamination is transferred off-site include using birds of prey to discourage birds, using nets to prevent birds from accessing the buildings and periodically culling rabbits. Pigeons have very occasionally gained access to buildings and have been monitored if they were found in controlled areas. Seagull's nests have been removed from the site under a Defra licence, and although this is undertaken primarily for reasons of public safety since the birds become aggressive when nesting, it coincidentally also limits the possibility that contamination is transferred offsite by the gulls.

- Information about potential exposure pathways and activities in the area included dredging in the Port of Heysham, dog walking and nature conservation duties on the nature reserve to the east of the site, angling and bird watching on the sea wall to the west of the site, residents on the caravan park to the south of the site and fishing and shellfish collecting in Morecambe Bay.

Interviews were conducted with individuals who were identified in the pre-survey preparation and others that were identified during the fieldwork. These included, for example, fishermen, anglers, sailors, people carrying out activities on intertidal areas, farmers, gardeners, beekeepers and people living, working and undertaking recreational activities close to the site. Interviews were used to establish individuals' consumption, occupancy and handling rates relevant to the aquatic, terrestrial and direct radiation survey areas. Any other information of possible use to the survey was also obtained. Gamma dose rate measurements were taken over intertidal substrates in the aquatic area, and indoors and outdoors at most properties in the direct radiation survey area where interviews were conducted. Background gamma dose rates were taken at a distance beyond 5 km from the site centre.

For practical and resource reasons, the survey did not involve the whole population in the vicinity of the Heysham site, but targeted subsets or groups, chosen in order to identify those individuals potentially most exposed to radiation pathways. However, it is possible that even within a subset or group there may have been people not interviewed during the survey. Therefore, to aid interpretation, the number of people for whom data were obtained in each group as a percentage of the estimated complete coverage for that group (where it was possible to make such an estimate) 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. 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 because it is difficult to quantify visitors from outside the area or occasional visitors during the year. Based on UK Office of National Statistics residential data for electoral wards ([www.statistics.gov.uk](http://www.statistics.gov.uk)) there were approximately 28,500 people living in the terrestrial survey area, although information was obtained for a significantly smaller number than this. It should be noted that the survey did not include employees or contractors at the Heysham nuclear site while they were at work. This is because dose criteria applicable to these people whilst at work and the dose assessment methods are different from those for members of the public. However, data were collected for employees and contractors while outside work if these people were encountered during the survey.

People were initially questioned about their habits relating to the survey area that their first identified activity occurred in and, where possible, they were also asked about their habits relating to the other two survey areas. For example, people in the terrestrial survey were initially questioned because it was known that they grew or produced significant quantities of terrestrial foodstuffs. However, they

were also asked about habits that might lead to exposure to liquid discharges or direct radiation. During interviews with representatives from groups of people, such as employees at businesses located within the direct radiation survey area, it was not possible to collect data for all pathways (for example consumption of local foods) for each person. In these cases, the data were limited to those relating to the primary reason for the interview, for example, in the case of businesses, the occupancy rates within the direct radiation survey area for the employees.

### 3 METHODS FOR DATA ANALYSIS

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#### 3.1 Data recording and presentation

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 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 and traceability.

The results of the individuals' consumption, occupancy and handling rates collected during the survey were grouped and presented in tables with the high-rate group members indicated in bold and with the calculated mean rates for the high-rate group and 97.5<sup>th</sup> percentile rates. The consumption rates, occupancy rates and handling rates for all groups are presented in Annex 1 for adults and Annex 2 for children and infants, with the high-rate group members indicated in bold.

Where quantifiable data cannot be obtained from interviews but pathways are believed to exist, it is sometimes necessary to provide estimated habits data for use in dose assessments. In this series of habits survey reports, such data is usually presented in Annex 3. It was not necessary to estimate data for the Heysham survey, but Annex 3 is included in this report to maintain consistency of presentation through the series of reports.

#### 3.2 Data conversion

During the interviews, people could not always provide consumption rates in kilograms per year for food or litres per year for milk. In these circumstances, 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 ( $\text{kg y}^{-1}$  for food and  $\text{l y}^{-1}$  for milk) using a variety of conversion factors. These factors 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.

#### 3.3 Rounding and grouping of data

The consumption and occupancy data in the text of this report are rounded to two significant figures, except for values less than 1.0, which are rounded to one decimal place. This method of presentation reflects the authors' judgement on the accuracy of the methods used. In the tables and annexes, the

consumption rate data are presented to one decimal place. Occasionally, this rounding process causes the computed values (row totals, mean rates and 97.5<sup>th</sup> percentiles), which are based on un-rounded data, to appear slightly erroneous. Consumption rates less than 0.05 kg y<sup>-1</sup> are presented to two decimal places in order to avoid the value of 0.0 kg y<sup>-1</sup>. External exposure data are quoted as integer numbers of hours per year.

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. The data are structured into groups when it is reasonable to assume that consistent concentrations or dose rates would apply within the group. 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, occupancies over the same substrate (e.g. sand) are grouped together.

Data were structured into age groups because different dose coefficients (i.e. the factors which convert intakes of radioactivity into dose) can apply to different ages. The International Commission on Radiological Protection (ICRP) revised its recommendations for the age groupings to be used in radiological assessments and these recommendations were adopted in the 2010 habits survey reports. Consequently, the age ranges used in the habits survey reports prior to 2010 differ from those used currently. The age ranges used in this report and the names used for the age groups, based on the recommendations in ICRP 101 (ICRP, 2007), are listed below, together with those used in reports prior to 2010, for comparison.

<b>Age ranges used from 2010 onwards</b>		<b>Age ranges used in reports prior to 2010</b>	
<b>Name of age group<sup>a</sup></b>	<b>Age range in group</b>	<b>Name of age group</b>	<b>Age range in group</b>
• Infant	0 to 5-year-old	• 3-month-old	Under 1-year-old
• Child	6-year-old to 15-year-old	• 1-year-old	1-year-old
• Adult	16-year-old and over	• 5-year-old	2-year-old to 6-year-old
		• 10-year-old	7-year-old to 11-year-old
		• 15-year-old	12-year-old to 16-year-old
		• Adult	17-year-old and over

#### **Notes**

<sup>a</sup> In the 2010 reports only, the infant age group was called the 1-year-old age group and the child age group was called the 10-year-old age group.

Since there are fewer age groups for children in the current regime, there should, in general, be more observations in each group, resulting in greater robustness in the data. However, data for children since 2010 will not be directly comparable with data for children prior to 2010, since the age ranges in the age groups will be different.

For direct radiation pathways, the data were grouped into distance zones from the nuclear site boundary as a coarse indication of the potential dose rate distribution due to this source of exposure. The bands used in this report were: 0 – 0.25 km; >0.25 – 0.5 km; >0.5 – 1.0 km. These distance bands are also useful when assessing exposure to gaseous discharges.

### 3.4 Approaches for the identification of high rates

The habits data have been analysed to identify high rates of consumption, occupancy and handling, which are suitable for use in radiological assessments. Three approaches have been used:

Firstly, 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 values between the maximum observed rate and one third of the maximum observed rate. In this report, the term ‘high-rate group’ is used to represent the individuals derived by the ‘cut-off’ method. The mean of the high-rate group was calculated for each food group, intertidal substrate and handling pathway identified in the survey. In certain cases, using the ‘cut-off’ method resulted in only one person being in the high-rate group. In these cases, expert judgement was used to decide whether the high-rate group should remain as one individual or whether others should be included. If others were included, the second highest rate was divided by three and all observations above this were included in the high-rate group.

Secondly, the 97.5<sup>th</sup> percentile rate was calculated for each group by using the *Microsoft Excel* mathematical function for calculating percentiles. The use of percentiles accords with precedents used in risk assessments of the safety of food consumption. It should be noted that the interviewees in this study are often selected and, therefore, the calculated percentiles are not based on random data.

Thirdly, profiles have been produced that give a complete view of the habits of the individual that might lead to exposure to all the discharges and radiation from the site. The profiles are based on values calculated by the ‘cut-off’ method. The profiled data can be used to assess total dose integrated across all pathways of exposure.

Mean and 97.5<sup>th</sup> percentile consumption rates for adults based on national statistics have been derived by the Ministry of Agriculture, Fisheries and Food (MAFF) (now a part of the Department for Environment, Food and Rural Affairs, Defra) and the Food Standards Agency (Byrom *et al.*, 1995 and FSA, 2002), and these are referred to as generic rates in this report. The generic rates are used as a baseline for comparison with the observed rates.

The mean rates for the high-rate groups for children and infants for consumption, intertidal occupancy and handling pathways, have been calculated. However, in cases where few child or infant

observations were identified, an alternative approach that may be used for assessments is to estimate the mean rates for the high-rate groups for children and infants by applying scaling ratios to the mean rates for the high-rate groups for adults. Ratios for this purpose for the consumption and intertidal occupancy pathways, based on generic 97.5<sup>th</sup> percentile rates, are provided in Annex 4. The age ranges within the age groups in Annex 4 do not correspond exactly with the age ranges within the age groups used throughout the rest of this report, but these ratios are the best available data for estimating child rates and infant rates from adult rates. Adult to child and adult to infant ratios are not available for handling pathways.

For use in assessments of foetal dose, consumption and occupancy rates are provided in Annex 5 for women of childbearing age. The age range used in this report for women of childbearing age is 15 – 44 years old, which is based on the classification used by the Office of National Statistics ([www.statistics.gov.uk](http://www.statistics.gov.uk)).

For the direct radiation pathway, mean occupancy rates and 97.5<sup>th</sup> percentile rates have not been calculated. Such an analysis is of limited value without a detailed knowledge of the spatial extent of dose rates due to direct radiation.

### **3.5 Data quality**

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 the fieldwork and data analysis. 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 considered 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. Local factors were taken into account in these cases.
- Data were manipulated in a purpose-built database using a consistent set of conversion factors.
- Data were stored in a database in order to minimise transcription and other errors.
- Draft reports were reviewed by the Environment Agency, the Food Standards Agency and the Office for Nuclear Regulation, and by a senior radiological consultant.
- Final reports were only issued when the Environment Agency, the Food Standards Agency and the Office for Nuclear Regulation were entirely satisfied with the format and content of the draft report.

## 4 AQUATIC RADIATION PATHWAYS

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### 4.1 Aquatic survey area

The aquatic survey area, shown in Figure 1, covered the waters and intertidal areas of Morecambe Bay to the north-east of a line extending from South East Point on Walney Island, to Rossall Point in Fleetwood. Walney Channel, which lies between Walney Island and the mainland, and the estuaries of the rivers Leven, Kent, Lune and Wyre were included in the survey area. This area was taken to represent the predominant area of mixing of discharged radionuclides in seawater.

Morecambe Bay is a large shallow embayment on the eastern side of the Irish Sea. The bay has a large tidal range, up to 10.5 m on spring tides, and vast areas of intertidal sandflats, covering 310 km<sup>2</sup>, are exposed at low water (see Figure 3). In places the intertidal flats extend out up to 12 km from the land ([www.morecambebay.org.uk](http://www.morecambebay.org.uk)). It is a dynamic environment with strong currents and constantly shifting sediments. There are a number of boulder scars, which are patches of stones and boulders known locally as 'skears', close to the shore in several areas around the bay. The coastline of the bay is approximately 120 km long and the shore is predominantly either beaches of sand and stones or extensive areas of salt marsh.



***Figure 3. Morecambe Bay sandflats (looking south-east from Bardsea).***

Several rivers flow into the bay, the most significant being the River Leven and River Kent to the north and the River Lune and River Wyre, to the east. The estuaries of these rivers become increasingly muddy further upstream.

The bay is an important area for wildlife and part, or all, of the bay is listed under a variety of conservation designations including Special Area of Conservation, Special Protected Area, Wetland of International Importance, Site of Special Scientific Interest and European Marine Site. There are several nature reserves and parts of the bay have been proposed as Marine Conservation Zones.

The description below starts at the Walney Channel and progresses round the bay in a clockwise direction, ending at Fleetwood. Sandflats or mudflats were exposed at low tide in nearly all areas around the bay.

### ***Walney Channel and Barrow-in-Furness***

Walney Channel (see Figure 4) runs between Walney Island, which is long and narrow, and the mainland. Vehicular access to the island is possible via the Jubilee Bridge from Barrow-in-Furness. The substrate in the channel is predominantly mud and sand, with scattered boulder scars, and at the southern end extensive mudflats and sandflats are exposed at low tide. There are large areas of salt marsh on Walney Island, on the western shore of the channel. Some of the marshes were used by wildfowlers.

Many yachts, hobby fishing boats, angling boats and other pleasure craft were moored in Walney Channel. A few part-time commercial fishermen also kept their boats there. Many of the boats rested on mud at low tide and boat maintenance was recorded taking place on board a boat resting on mud. There was a public slipway on Walney Island just to the north of the Jubilee Bridge and a sailing club with 80 members had its own slipway on the opposite side of the channel. It was reported that the members of a sub-aqua diving club based at Barrow-in-Furness sometimes dived in the channel, and canoeing and kayaking were also taking place. A limited amount of angling and bait digging took place on the shore of Walney Channel. One individual collected small quantities of *Porphyra* commercially from boulder scars in the channel and it was reported that two people hooked out lobsters from among the rocks at low tide, for their own consumption. A shellfish wholesaler based in Barrow-in-Furness bought shellfish collected throughout Morecambe Bay.



**Figure 4. Walney Channel, near the Jubilee Bridge.**

The port at Barrow-in-Furness was used mainly by bulk carrying cargo vessels and boats servicing the offshore wind farms. Ships transporting nuclear materials to and from Sellafield also used the port and cruise liners docked there occasionally. No commercial fishing boats were based there, since those that had once worked from the port had moved to other harbours outside the survey area. The port was protected by lock gates that retained the water level at low tide so the vessels did not rest on sediments. Periodic dredging took place in the port and in Walney Channel in order to maintain the water depth. BAE Systems have a shipyard at the port where nuclear submarines are manufactured and commissioned. The facility is a licensed nuclear site and is permitted to discharge liquid and gaseous radioactive wastes into the environment, although no such discharges were made in 2010 (EA, FSA, NIEA and SEPA, 2011).

There are four small islands at the southern end of Walney Channel: Sheep Island, Piel Island, Roa Island and Foulney Island. Sheep Island and Foulney Island were uninhabited, whereas Roa Island and Piel Island were inhabited. Roa Island was accessible by road along a causeway from the mainland and Foulney Island could be reached on foot from the mainland by a path along a stone causeway. Sheep Island and Piel Island could be reached across the sandflats from Walney Island at low water and Piel Island could also be accessed by a small passenger ferry from Roa Island.

A boating club with 180 members and a lifeboat station were located at Roa Island. The boating club catered for yacht sailors, dinghy sailors, boat anglers, kayakers and wind surfers. Kite surfing, canoeing and kayaking also took place in the area. The larger yachts either sailed outside Morecambe Bay or sailed across the bay to Fleetwood and Glasson. Piel Island was a popular

weekend destination for the smaller local sailboats and for the cruising yachts based at Fleetwood, Glasson and the Wyre Estuary. Some of the sailors were also swimming and snorkelling near Piel Island. Boat angling took place within Morecambe Bay but many boat owners preferred to fish outside the survey area.

Commercial mussel collecting took place from mussel beds off Foulney Island and people collected cockles for their own consumption from the sandflats west of Piel Island. Dog walking and walking was recorded on intertidal areas near Roa Island causeway; some of the walkers collected small amounts of samphire.

### ***Rampside to Greenodd***

There was an area of salt marsh at Rampside but northwards from Rampside towards Bardsea the upper shore was predominantly sand and stones, with scattered boulder scars. North of Bardsea the upper shore was predominantly sand and mud, becoming increasingly muddy towards Greenodd, with small patches of salt marsh.

A road, with parking along its side, ran close to the shore between Rampside and Roosebeck, and the beaches in this area were popular for walking and dog walking (see Figure 5). There was an oyster farm, where Pacific oysters were cultivated, approximately 4 km offshore from Roosebeck. The oysters were grown on trestles which were accessed using tractors across the sands at low tide. Further north, at Newbiggin, bait digging took place. An oyster farm was identified offshore of Newbiggin during the 2006 survey but this had since closed.

Two commercial fishermen were based at Newbiggin and one commercial fisherman was based at Canal Foot. Their main method of fishing was to use tractors to tow nets through shallow water at low tide to catch shrimps. One of the fishermen also conducted guided walks across the sands from Newbiggin to Chapel Island.

Bardsea was a popular place for visitors but most people walked on footpaths at the top of the shore that were not tide washed. A shellfish wholesaler identified in Bardsea during the 2006 survey had since relocated to Barrow-in-Furness.

The most popular angling venues between Rampside and Greenodd were at the pier at Canal Foot and along an embankment close to a large car park just to the south of Greenodd.



*Figure 5. East of Rampside.*

### ***Greenodd to Arnside***

The upper shore between Greenodd and Arnside is dominated by large areas of salt marsh. Extensive stretches of the coast do not have road access and therefore are not easily accessible by the public.

Sand Gate Marsh, to the north-west of Flookburgh, was used for grazing sheep. Angling and dog walking also took place along the shore. Five commercial fishermen, who mainly fished for shrimp with tractors, were based at Flookburgh and there was a shrimp processing plant near the village. Lave netting for salmon and sea trout took place in the Leven Estuary and it was reported that wildfowling took place on the salt marshes.

The town of Grange-over-Sands was situated further east along the coast. There had once been a sand beach in front of the town, but since the main channel of the Kent Estuary changed its course several years ago, the beach has been replaced by a substantial area of salt marsh. Small amounts of samphire were collected from the marsh and from further north up the Kent Estuary. Guided walks from across the bay came ashore here and the walkers spent up to an hour crossing the marsh. Other guided walks came ashore at Humphrey Head, further south, and thus avoided the salt marsh. Lave netting for salmon and sea trout took place in the Kent Estuary and wildfowling shot on the salt marshes and foreshore. Angling was very popular at the village of Sandside, on the east bank of the Kent Estuary, where a road with ample parking ran along an embankment. The anglers fished over the railings of the embankment, directly into the main channel of the river.

Sheep were grazed on Hazelslack Marsh, to the south of Sandside, and three individuals cut turf from the marsh, which was used to bolster coastal defences.

Further south the village of Arnside was a popular tourist destination but most visitors stayed on the promenade. There was a small pier and a slipway, and a few pleasure boats were moored offshore. The area was popular with anglers, who mainly fished from the slipway and pier, although a few also fished from the shore, which was mainly mud and sand with patches of grass. One person was identified metal detecting along the shore.

### ***Arnside to Hest Bank***

From the headland located to the south-west of Arnside, southwards past Silverdale to Jenny Brown's Point, the upper shore was mainly a mix of rocky outcrops and stone beaches, with small patches of salt marsh in a few places. The headland to the south-west of Arnside was the starting point for some of the guided walks across the sands of Morecambe Bay to Grange-over-Sands. There was road access and parking at Silverdale and the shore there was popular with anglers, walkers and dog walkers. Angling and dog walking also took place at Jenny Brown's Point, although it was not such a popular area as it could only be reached by foot (see Figure 6).

A wide expanse of salt marsh extended southwards from Jenny Brown's Point to Carnforth. This area was difficult for the public to access and no activities were observed taking place there. The salt marsh continued south in a narrow band from Carnforth to Hest Bank and there was easy access to the shore along this stretch, which was popular with dog walkers. One person was identified collecting small quantities of samphire while walking their dog, for their own family's consumption. Guided walks across the sands to Humphrey Head departed from Hest Bank and sheep were grazed on salt marsh near Bolton-le-Sands.



*Figure 6. Near Jenny Brown's Point.*

### ***Hest Bank to Red Nab***

An extensive range of man-made sea defences stretched down the coast from just south of Hest Bank to the south end of Morecambe. The defences included approximately 12 rock breakwaters and piers jutting out from the shore, which formed a series of small bays between them. The upper shore varied between the bays; some were predominantly stones, some were sand, and others were mud or salt marsh. There were many sets of steps and slipways providing access to the shore but several of the slipways were partially blocked by large boulders to prevent vehicular use. The lower shore was mainly sand and mudflats, with stony scars in places.

Morecambe was a busy seaside town. It was reported that the sandy beach close to the town centre (see Figure 7) could be very busy on hot summer days, with people sun bathing and playing, but relatively few people were observed on this beach during the survey owing to the cool weather at the time. Angling was very popular and took place from the piers and breakwaters and from the beaches. Bait digging and non-commercial cockle collecting took place on the sand and mudflats offshore, and mussels were collected non-commercially from the stony scars. One individual was identified that set long-lines offshore to catch fish for his own family's consumption. Two individuals were identified maintaining a boat launching track on the shore, another was undertaking boat maintenance, another was metal detecting, and one child was recorded horse riding. Two commercial shrimp trawlers and several hobby fishing boats, angling boats and other pleasure craft were moored offshore. Small boats could also be launched from some of the slipways. The area was very popular for sailing and other water activities such as kayaking, windsurfing, kite surfing and swimming. There was a coastguard station and a lifeboat station.



**Figure 7. Morecambe.**

There was a rocky headland at the north end of Heysham and further south was Half Moon Bay and a promontory, where the Port of Heysham and the nuclear power stations were located. Red Nab was situated on the southern side of the promontory (see Figure 8). The lower shore throughout this area was sand and mudflats. The upper shore at Half Moon Bay and Red Nab was a mix of patches of sand or stones or rock and there was access to the shore at these locations. The shore to the north of the Port of Heysham and the shore to the south-west of the nuclear power stations were bordered by a sea wall. The waters of the port entrance divided the sea wall to the north of the port from the sea wall to the south-west of the power stations. The sea wall to the north of the port was steep and access to the shore was possible via a ladder attached to the wall or by walking along the shore at low tide from the beach at Half Moon Bay. The top of the sea wall in front of the power stations was used by the public as a footpath; the wall was sloping and some anglers climbed down the wall to the shore. This shore could also be accessed by walking from Red Nab at low tide.

Half Moon Bay was a very popular area for dog walking. Bait digging, angling, non-commercial cockle collecting, and peeler crab collecting also took place there. One person was observed push netting for shrimps. Anglers fished over the railings from the top of the sea wall to the north of the port and from the top of the sea wall in front of the nuclear power stations near the outfalls. Some anglers walked to the end of one of the outfalls at low tide in order to fish for bass in the warmer water. Bait digging, bird watching and shore angling were taking place at Red Nab. Other activities undertaken offshore of the general Heysham area included collecting mussels commercially, collecting small amounts of cockles, mussels and winkles non-commercially, long-lining and setting

nets. The Port of Heysham is a large commercial port with terminals for freight and passenger Irish Sea ferries. It is also home to numerous vessels that service the offshore oil and gas industry. No commercial fishing vessels were based at the port. The port and its approaches were dredged regularly in order to maintain sufficient depth of water for navigation. The area around the nuclear power stations cooling water intake pipes and outfalls were also dredged (see Section 4.6).



**Figure 8. Red Nab.**

### ***Red Nab to Fleetwood***

Southwards from Red Nab the upper shore was predominantly sand and stones down to Pott's Corner, and salt marsh from there down to Sunderland Point. One family was noted collecting cockles on Middleton Sands, offshore from Pott's Corner, for their own consumption. Beef cattle were grazed on part of the salt marsh.

Sunderland Point marked the entrance to the Lune Estuary (see Figure 9). Most of the upper shore of the estuary was salt marsh and at low tide, sand banks, mud banks and small patches of stony scars were revealed on the lower shore. Most of the salt marsh areas were used for grazing cattle and sheep, and wildfowling took place on the foreshore and many of the marshes. One individual was identified who shot wildfowl from a small boat. Small quantities of samphire were collected from the estuary and one individual was noted dog walking across the marshes. A trawler and a few smaller fishing boats were based at Sunderland Point, and several small scale fishing activities were pursued in the estuary and its approaches. These included: haaf netting and drift netting for salmon and sea trout; stow netting for sprats and whitebait; trawling and push netting for shrimps; fyke netting for eels.



**Figure 9. The Lune Estuary at Sunderland Point.**

Glasson Dock is a small commercial port on the east side of the Lune Estuary. There was a sailing club close to the dock, with approximately 180 members. The club catered for both dinghy sailors, who sailed close to Glasson, and yacht sailors, who mainly sailed across to Piel Island, or made trips outside the survey area. A fish wholesaler/retailer, who bought fish from local fishermen, was based at the dock. A large marina at the end of the Lancaster Canal was adjacent to the dock but it was not considered relevant to the aquatic survey because it was freshwater and therefore not subject to the effects of liquid discharges.

Between the mouth of the Lune Estuary and the village of Knott End there were two significant areas of salt marsh: Cockerham Marsh and Pilling Marsh. These were both used for grazing sheep and wildfowling, and small quantities of samphire were collected from Cockerham Marsh.

Knott End was situated on the eastern side of the mouth of the Wyre Estuary, opposite Fleetwood, which was on the western side of the estuary. At Knott End there was a slipway which was used to launch small angling boats and other pleasure craft, and shore anglers fished from the slipway and the adjoining sea wall. There was a coastguard station and a small passenger ferry operated between Knott End and Fleetwood. Bait digging, dog walking, and kite bugging were carried out on the sandflats offshore and mussels were collected from stony scars exposed at low tide. The area was popular with kite surfers when the tide was in.

At Fleetwood there was a coastguard station and a lifeboat station close to the mouth of the Wyre. A beach extended westwards to Rossall Point. For most of its length the beach was a mix of sand and

stones and these areas were very popular with anglers and dog walkers. There was a stretch of fine sand beach that was patrolled by lifeguards and this area was used for sunbathing, playing and swimming, although it was not very busy at the time of the survey owing to cool weather conditions. Fleetwood was a very popular area for kite surfing and kite buggying. Bait digging took place on the sandflats and the favoured digging area was far out around the Wyre light. Peeler crabs were collected from stony scars for use as angling bait.

Wyre Fish Dock in Fleetwood was once a major fishing port but it has declined over the years and very few fishing boats are based there now, although it remains an important fish processing centre. Some of the fish caught in the survey area were sold through the fish market at the dock or directly to fish merchants in the port. Only one trawler at the dock worked in the survey area. Fleetwood Marina, adjacent to the dock, was home to about 400 craft, mainly sailing yachts. Two small commercial gill net boats, a charter angling vessel that fished outside the survey area and a few hobby and angling boats, were also based in the marina. Several houseboats, which were lived on for all or most of the year, were moored in the dock and marina and these were permanently afloat since the docks were protected by lock gates.

One individual was identified who undertook a small amount of commercial fishing for elvers in the Wyre Estuary. A hobby fisherman was trawling for shrimps in the estuary and also collected small amounts of samphire for his own family's consumption.

### **4.2 Commercial fisheries**

A wide variety of small scale commercial fishing activities were identified in the survey area. These included: otter trawling for plaice, thornback ray, Dover sole, dab and flounder; gill netting for bass and grey mullet; set netting for flounder and plaice; stow netting for herring, sprats, whitebait and whiting; drift netting, lave netting and haaf netting for salmon and sea trout; fyke netting for eels; dip netting for elvers; tractor fishing, trawling and push netting for shrimp; hand raking for mussels; oyster farming. The collection of seaweed also took place. Most fishermen were engaged in several different types of fishing. Many of the fishing activities were carried out from the shore rather than from fishing boats and fishermen used tractors or quad bikes to get to fishing areas out on the sandflats and mudflats, or went by foot. Fishing activities were pursued from many different access points around Morecambe Bay and the estuaries flowing into it.

An otter trawler based at Wyre Dock in Fleetwood fished partly within the survey area in the deeper water known as Lune Deep at the southern end of Morecambe Bay, but mostly fished outside the survey area. A trawler based at Sunderland Point used an otter trawl to target fish within Morecambe Bay for part of the year. The main species caught by otter trawling were plaice, thornback ray, Dover sole, dab and flounder, but brill, turbot and gurnard were also caught.

Several fishermen used gill nets from boats to catch bass. They also caught grey mullet and a range of other species. Set nets were deployed from the shore in several areas around the bay and these mainly caught flounder and plaice, with smaller amounts of bass, grey mullet and other species.

Stow nets, known locally as boogie nets, were operated in the Lune Estuary to catch pelagic species such as herring, sprats and whitebait. Whiting were also caught incidentally. Stow nets are funnel shaped nets that are staked out in the tide and left for the fish to swim into them. They are serviced from small boats.

Fishing for salmon and sea trout took place in the Leven, Kent and Lune estuaries using lave nets, haaf nets and drift nets. Both lave netting and haaf netting involve fishermen standing in water holding a framed net on a pole. Haaf nets are rectangular and approximately 5 meters wide. The fisherman holds the net in the water, facing the water current, and waits for fish to swim into it. Lave nets are smaller and triangular in shape and are actively pushed through the water in order to catch the fish. Salmon drift netting was carried out from small boats. In 2011, two lave net licences were issued for the Leven Estuary, seven lave net licences were issued for the Kent Estuary, and 12 haaf net licences and seven drift net licences were issued for the Lune Estuary. Several fishermen that fished in the Lune Estuary held both haaf net and drift net licences. The permitted fishing season using nets for salmon and sea trout is from 1<sup>st</sup> June to 31<sup>st</sup> August each year. The fishermen reported that salmon fishing had been poor in 2011 and therefore they had reduced their effort in this fishery.

One fisherman was identified who fished for eels with fyke nets set from the shore in Morecambe Bay near the Lune Estuary. One other fisherman fished for elvers for a few nights each year in the Wyre Estuary. This involved standing on a muddy riverbank and using a dip net with a long handle to scoop the elvers from the water. The elvers were kept alive after capture.

Small quantities of mackerel were caught incidentally in several fishing gears but in too small quantities to be marketed and they were usually eaten by the fishermen's families and friends, or discarded.

Tractors were used to tow nets through shallow water at low tide to catch shrimps. One tractor fisherman operated from Canal Foot, two operated from Newbiggin and five operated from Flookburgh. Two shrimp trawling boats operated from Morecambe and a small trawler based at Sunderland Point also fished for shrimps periodically. One individual was identified that used a push net (a small framed net that is pushed through shallow water) to catch shrimps.

Mussels were collected by hand raking at low tide from various areas around the bay including off Foulney Island, off Aldingham, off Morecambe, off Half Moon Bay, off Heysham, off Knott End, and off Fleetwood. Mussels for human consumption and seed (*i.e.* immature) mussels for relaying elsewhere were both collected. Most fishermen only collected mussels when they had an order for them and

demand had been low in 2011. It was reported that a mussel dredging vessel had been working in the bay collecting seed mussel. The mussel fishery is regulated by the local Inshore Fisheries Conservation Authority and all the mussel beds in the bay were open for the collection of edible mussels by licensed fishermen in 2011. Beds of seed mussel are opened on a case by case basis in response to specific requests from the industry if the stock is considered sustainable.

Pacific oysters were cultivated at a commercial oyster farm, situated about 4 km offshore from Roosebeck. One individual collected small quantities of *Porphyra* from Walney Channel on a commercial basis.

Historically, there has been an important cockle fishery in Morecambe Bay but the cockle beds have been closed by the authorities since 2008 owing to low stocks and the small size of the cockles. It is not known when, or if, the beds will be opened again. Many fishermen reported that they would take part in the cockle fishery in Morecambe Bay if the beds were open, but as they were closed several fishermen had diverted their effort to cockle fisheries that were open outside the survey area.

### **4.3 Destination of seafood originating from the aquatic survey area**

Fish and shellfish were sent to many destinations both within and outside the survey area.

White fish (i.e. plaice, Dover sole, bass etc) were mainly sold through Fleetwood fish market, from where they were distributed nationally. They were also sold through retail outlets in Morecambe, Lancaster, Kendal and Manchester, and sold directly to the public by the fishermen. Most of the flounder were sold outside the survey area for use as lobster pot bait, since they are not highly regarded as a food fish and therefore do not command a high market value.

Whitebait and sprats were sold directly to the public and to a wholesaler/retailer in Manchester. One fisherman sold sprats, herring and whiting to a zoo for animal feed.

Salmon and sea trout were sold privately to local customers or sold to fish merchants at Glasson Dock and Fleetwood.

Eels were sold directly to the public and to a retailer at Glasson Dock. Live elvers were sold to a merchant in south-west England and from there exported to Europe for restocking purposes.

Shrimps were sold directly to the public from fishermen's houses and sold directly to local hotels and restaurants. They were also sold from two wet fish shops in Morecambe and a market stall in Kendal. Others were sold to a shrimp processing plant in Flookburgh and a wholesaler/retailer in Manchester. They were distributed regionally and nationally from these businesses. There was a thriving local cottage industry producing potted shrimps and much of the catch was processed in this way.

Mussels were bought by local wholesalers. Edible mussels were sold on to operations in south-west England and France for depuration and seed mussels were sold on for relaying in Wales and Europe.

Pacific oysters were sold for further growing on in Scotland, Ireland and France. Seaweed (*Porphyra*) was sold to a commercial producer of laverbread in Wales.

At least four local fishermen also acted as merchants and bought fish and shellfish from other fishermen for selling on to other merchants or directly to the public.

#### **4.4 Hobby fishing, angling and non-commercial shellfish collecting.**

In this report, the term 'hobby fishing' is used to describe recreational fishing on a small scale with gear such as nets or pots. It is usually carried out by fishermen who do not have commercial fishing licences and therefore it is illegal to offer the catch for sale. Several hobby fishermen operated in the survey area and they mainly set nets from the shore or used shrimp trawls from boats. One individual was identified that set long-lines from the shore off Morecambe and Heysham, and one individual had a few lobster pots which were set offshore from Fleetwood. It was reported that two individuals hooked out lobsters at low tide from among the rocks in Walney Channel and that recreational divers sometimes collected lobsters while diving in Walney Channel. Hobby fishermen mainly caught flounder, plaice, Dover sole, bass, grey mullet, shrimps and lobsters. The catches were consumed by the fishermen's families and friends.

A charter angling boat operated from Fleetwood Marina but it fished outside the survey area. Many private angling boats were moored or launched from slipways in Walney Channel and at Morecambe, Sandylands, Knott End, the Wyre Estuary, Fleetwood Marina and other places throughout the survey area. Shore angling was popular at many locations including Canal Foot, Greenodd, Sandside, Arnside, Silverdale, Jenny Brown's Point, Morecambe, Heysham (including around the north wall of the port and the cooling water outfalls from the power stations), Red Nab, Knott End and Fleetwood. Much of the shore angling was carried out from sea walls, piers and embankments rather than intertidal areas. The main edible species caught by shore anglers were plaice, flounder, dab, cod, whiting, bass and eels. Lesser spotted dogfish were caught in abundance but not usually eaten. Boat anglers caught the same species as shore anglers and also mackerel and thornback rays.

Eight individuals were identified who collected small amounts of molluscs, mainly cockles and mussels, for their own family's consumption. Cockles were collected off Morecambe, off Heysham, at Middleton Sands, off Half Moon Bay and near Piel Island in the Walney Channel. Mussels were collected off Morecambe, off Heysham, around Foulney Island and from Half Moon Bay. Pacific oysters were collected from the area of an abandoned oyster farm off Newbiggin by the people who used to run the farm. Whelks were collected from Walney Channel by one person and winkles were collected from Heysham by two people in the same family.

### 4.5 Wildfowling

Four wildfowling clubs were identified that shot in the survey area and information was obtained about three of them. One club had approximately 150 members, another club had approximately 120 members and the third club had approximately 40 members. Shooting was also undertaken by a few independent wildfowlers that did not belong to clubs. The wildfowling season extended from 1<sup>st</sup> September to 20<sup>th</sup> February. Wildfowling took place on most of the salt marshes and associated foreshores within the survey area. Additionally, one individual was identified who shot wildfowl from a small boat in the Lune Estuary as well as shooting on intertidal areas. The main species being shot were mallard, teal, pintail, wigeon, pink-footed goose and greylag goose. The shot wildfowl were consumed by the wildfowlers and their families and friends.

### 4.6 Other pathways

The Port of Heysham is liable to silting, and therefore it is dredged regularly by a contracted dredging vessel using a trailer suction dredge. Dredging takes place in the port and its approaches in order to maintain sufficient depth of water for navigation, and also around the power stations cooling water intake pipes and outfalls in order to ensure unimpeded water flow. Dredging is carried out over a period of approximately 5 days, every 8 weeks. The dredged sediment is dumped at a spoil ground located approximately 11 km away from the port, towards the mouth of Morecambe Bay. The dredger carries up to 11 crew members at one time. However, the contracted crew is liable to change through the year. Dredging also takes place in Walney Channel and the port at Barrow-in-Furness.

Livestock were identified grazing on salt marsh at 10 farms in the aquatic survey area, five of which were also in the terrestrial survey area. Five farms grazed sheep on salt marsh, one farm grazed sheep and beef cattle on salt marsh, three farms grazed beef cattle on salt marsh and one farm grazed dairy cattle on salt marsh. The dairy cattle were only grazed on salt marsh for about five weeks per year, during a period when they were not producing milk.

Nine people were collecting small quantities of samphire from several different locations including the shore between Roa Island and Rampside, the Kent Estuary, Grange-over-Sands, Bolton-le-Sands, the Lune Estuary, Glasson Marsh, Cockerham Marsh and the Wyre Estuary. The samphire was consumed by the collectors and their families and friends.

It was reported that one allotment holder occasionally collected a carrier bag full of seaweed (probably bladder wrack) for use as fertiliser on his vegetable plot. The seaweed was collected after it had been washed-up onto the seawall in front of the power station during rough weather. Quantitative data for the consumption rate of the vegetables could not be obtained.

#### 4.7 Food consumption data

Consumption data for aquatic foods are presented in Tables 3 to 8 for adults and in Tables 9 to 12 for children and infants. The tables include the mean consumption rates for the high-rate groups and the observed 97.5<sup>th</sup> percentile rates calculated as described in Section 3.4.

##### **Adults' consumption rates**

The people consuming the greatest quantities of food from the aquatic survey area were commercial and hobby fishermen, anglers, wildfowlers, people who collected shellfish or marine plants, and the families and friends of these groups of people.

Table A presents a summary of the adults' consumption rates for the following food groups: fish; crustaceans; molluscs; wildfowl; marine plants/algae; salt marsh grazed sheep meat. The table includes the mean consumption rates for the high-rate groups and the observed 97.5<sup>th</sup> percentile rates. For comparison, the table also includes mean consumption rates and 97.5<sup>th</sup> percentile consumption rates for fish, crustaceans and molluscs based on national data, which are referred to as 'generic' data in this report. No generic rates have been determined for wildfowl, marine plants/algae or salt marsh grazed sheep meat.

**Table A. Summary of adults' consumption rates of foods from the aquatic survey area**

Food group	Number of observations	Number of high-rate consumers	Observed maximum for the high-rate group (kg y <sup>-1</sup> )	Observed minimum for the high-rate group (kg y <sup>-1</sup> )	Observed mean for the high-rate group (kg y <sup>-1</sup> )	Observed 97.5 <sup>th</sup> percentile (kg y <sup>-1</sup> )	Generic mean (kg y <sup>-1</sup> )	Generic 97.5 <sup>th</sup> percentile (kg y <sup>-1</sup> )
<b>Fish</b>	132	23	49.4	17.7	27.2	42.3	15.0	40.0
<b>Crustaceans</b>	32	8	12.9	5.6	10.6	12.9	3.5	10.0
<b>Molluscs</b>	22	2	9.0	4.4	6.7	6.6	3.5	10.0
<b>Wildfowl</b>	27	6	21.7	10.0	12.8	15.8	Not determined	Not determined
<b>Marine plants/algae</b>	15	7	2.3	0.8	1.6	2.3	Not determined	Not determined
<b>Salt marsh grazed sheep meat</b>	21	19	17.0	5.7	8.6	17.0	Not determined	Not determined

The predominant species of fish consumed by adults were bass, flounder and plaice, with smaller quantities of cod, dab, Dover sole, eel, grey mullet, mackerel, salmon, sea trout, thornback ray, whitebait and whiting. Most of these species were caught throughout the aquatic survey area, but the salmon and sea trout were caught in the Leven, Kent and Lune Estuaries, and the whitebait were

caught in the Lune Estuary. Of the fish consumed by the 23 people in the high-rate group, the percentage breakdown of species, rounded to the nearest 5%, was 35% bass, 25% plaice, 20% flounder, 5% sea trout and 15% of a mix of cod, Dover sole, grey mullet, salmon and thornback ray.

The species of crustaceans consumed by adults were brown shrimp and common lobster. The brown shrimp were caught from wide areas of Morecambe Bay and the common lobster were caught in the Walney Channel and off Fleetwood. Of the crustaceans consumed by the eight people in the high-rate group, the percentage breakdown of species, rounded to the nearest 5%, was 95% brown shrimp and 5% common lobster.

The predominant species of molluscs consumed by adults were cockles and mussels, with smaller quantities of Pacific oysters, whelks and winkles. The cockles were collected off Morecambe, off Heysham, at Middleton Sands, off Foulney Island, and near Piel Island to the south of Walney Channel. The mussels were collected off Morecambe, off Heysham, around Foulney Island and from Half Moon Bay. The Pacific oysters were collected from the area of an abandoned oyster farm off Newbiggin. The whelks were collected to the south of Walney Channel and the winkles were collected from Heysham. Of the molluscs consumed by the two people in the high-rate group, the percentage breakdown of species, rounded to the nearest 5%, was 60% cockles and 40% mussels.

The predominant species of wildfowl consumed by adults were pink-footed goose, greylag goose and mallard, with smaller quantities of Canada goose, pintail, shoveler, snipe, teal and widgeon. These were shot on salt marshes and mud flats throughout the survey area. Of the wildfowl consumed by the six people in the high-rate group, the percentage breakdown of species, rounded to the nearest 5%, was 30% pink-footed goose, 25% mallard, 20% greylag goose, 10% pintail and 15% of a mix of Canada goose, teal and widgeon.

The only species of marine plants/algae consumed by adults was samphire, which was collected from the shore between Roa Island and Rampside, the Kent Estuary, Grange-over-Sands, Bolton-le-Sands, the Lune Estuary, Glasson Marsh, Cockerham Marsh and the Wyre Estuary.

Sheep and lambs were grazed on Sand Gate Marsh, marsh near Bolton-le-Sands, Colloway Marsh, Aldcliffe Marsh, Glasson Marsh, Cockerham Marsh and Pilling Marsh. Adults' consumption of lamb meat from animals grazed on these marshes was identified.

### ***Children's and infants' consumption rates***

Table B presents a summary of children's and infants' consumption rates of fish, crustaceans, wildfowl and salt marsh grazed sheep meat from the aquatic survey area. The table includes the mean consumption rates for the high-rate groups and the observed 97.5<sup>th</sup> percentile rates. For the child age group, no consumption of molluscs or marine plants/algae was identified. For the infant age

group, no consumption of molluscs, wildfowl, marine plants/algae or salt marsh grazed sheep meat was identified. No generic rates have been determined for the child or infant age groups.

**Table B. Summary of children's and infants' consumption rates of foods from the aquatic survey area**

Food group	Number of observations	Number of high-rate consumers	Observed maximum for the high-rate group (kg y <sup>-1</sup> )	Observed minimum for the high-rate group (kg y <sup>-1</sup> )	Observed mean for the high-rate group (kg y <sup>-1</sup> )	Observed 97.5 <sup>th</sup> percentile (kg y <sup>-1</sup> )
<b>Child age group (6 – 15 years old)</b>						
Fish	9	6	6.7	4.7	6.1	6.7
Crustaceans	1	1	1.1	1.1	1.1	Not applicable
Wildfowl	2	1	0.6	0.6	0.6	0.5
Salt marsh grazed sheep meat	2	2	5.7	5.7	5.7	5.7
<b>Infant age group (0 – 5 years old)</b>						
Fish	2	1	7.5	7.5	7.5	7.3
Crustaceans	1	1	1.8	1.8	1.8	Not applicable

The predominant species of fish consumed by the individuals in the child age group were flounder, bass and cod, with smaller quantities of grey mullet, plaice, salmon, sea trout and whiting. The predominant species of fish consumed by the individuals in the infant age group were bass and Dover sole, with smaller quantities of flounder and plaice.

The only species of crustaceans consumed by the individuals in the child age group and the infant age group were brown shrimp.

The species of wildfowl consumed by the individuals in the child age group were greylag goose and mallard.

#### 4.8 Intertidal occupancy

Intertidal occupancy rates for adults are presented in Table 13 and intertidal occupancy rates for children and infants are presented in Table 14. It should be noted that there are often more than one substrate at one named location and that substrates at a given location are liable to change over time. Activities were assigned to the predominant substrate over which they were taking place.

**Adults' intertidal occupancy rates**

Table C presents a summary of the adults' intertidal occupancy rates in the aquatic survey area. The table includes the mean occupancy rates for the high-rate groups and the observed 97.5<sup>th</sup> percentile rates.

**Table C. Summary of adults' intertidal occupancy rates**

Intertidal substrate	Number of observations	Number of people in the high-rate group	Maximum of the high-rate group (h y <sup>-1</sup> )	Mean of the high-rate group (h y <sup>-1</sup> )	97.5 <sup>th</sup> percentile (h y <sup>-1</sup> )
<b>Mud</b>	16	8	360	270	356
<b>Mud and sand</b>	13	2	350	266	300
<b>Rock</b>	9	3	350	261	332
<b>Salt marsh</b>	35	4	840	508	568
<b>Sand</b>	73	8	1269	748	861
<b>Sand and stones</b>	26	6	650	414	585
<b>Stones</b>	8	4	322	207	295
<b>Boat on mud</b>	2	2	720	720	720

The activities undertaken by people in the adult high-rate groups for occupancy over the following intertidal substrates included:

- For mud: collecting mussels off Aldingham, Morecambe, Knott End, Heysham, Foulney Island and Half Moon Bay; wildfowling at Cockerham Marsh, Pilling Marsh and various marshes on Walney Island; elver fishing on the Wyre Estuary.
- For mud and sand: long-lining off Morecambe and Heysham; walking and collecting samphire between Roa Island and Rampside.
- For rock: shore angling at Jenny Brown's Point, Morecambe and Silverdale; bird watching at Red Nab.
- For salt marsh: turf cutting at Hazelslack Marsh; dog walking at Bazil Point and Sunderland Point
- For sand: tractor fishing, setting nets and leading guided walks in Morecambe Bay; lave netting on the Kent Estuary; oyster farming offshore of Roosebeck; setting nets and lave netting near Canal Foot; setting nets off Hest Bank; leading guided walks from Hest Bank to Humphrey Head; setting nets, bait digging, collecting cockles and mussels from Morecambe to Heysham.
- For sand and stones: shore angling, collecting crabs and dog walking at Fleetwood.
- For stones: shore angling and dog walking at Jenny Brown's Point and dog walking at Silverdale.
- For boat on mud: boat maintenance to the north of Jubilee Bridge on Walney Island.

**Children's and infants' intertidal occupancy rates**

Table D presents a summary of the children's and infants' intertidal occupancy rates in the aquatic survey area. The table includes the mean occupancy rates for the high-rate groups and the observed 97.5<sup>th</sup> percentile rates.

<b>Table D. Summary of children's and infants' intertidal occupancy rates</b>					
<b>Intertidal substrate</b>	<b>Number of observations</b>	<b>Number of people in the high-rate group</b>	<b>Maximum of the high-rate group (h y<sup>-1</sup>)</b>	<b>Mean of the high-rate group (h y<sup>-1</sup>)</b>	<b>97.5<sup>th</sup> percentile (h y<sup>-1</sup>)</b>
<b>Child age group (6 – 15 years old)</b>					
<b>Mud and sand</b>	1	1	54	54	Not applicable
<b>Salt marsh</b>	3	1	127	127	122
<b>Sand</b>	6	1	221	221	200
<b>Sand and stones</b>	1	1	156	156	Not applicable
<b>Stones</b>	1	1	58	58	Not applicable
<b>Infant age group (0 – 5 years old)</b>					
<b>Sand</b>	1	1	2	2	Not applicable
<b>Stones</b>	1	1	2	2	Not applicable

The activities undertaken by individuals in the child age group high-rate groups for occupancy over the following intertidal substrates included:

- For mud and sand; shore angling at Arnside.
- For salt marsh; tending livestock and dog walking at Sand Gate Marsh near Flookburgh.
- For sand; dog walking and riding in a vehicle at Sand Gate Marsh near Flookburgh.
- For sand and stones; dog walking at Half Moon Bay.
- For stones; dog walking at Silverdale.

For individuals in the infant age group, one child was identified playing on sand and on stones at Silverdale.

#### 4.9 Gamma dose rate measurements

Gamma dose rate measurements were taken over five intertidal substrates. All measurements were taken at a height of 1 metre above the substrate. The results are presented in Table 15 and are summarised below.

- One measurement taken over mud was  $0.090 \mu\text{Gy h}^{-1}$
- One measurement taken over mud and sand was  $0.085 \mu\text{Gy h}^{-1}$
- Three measurements taken over salt marsh ranged from  $0.076 \mu\text{Gy h}^{-1}$  to  $0.088 \mu\text{Gy h}^{-1}$
- Nine measurements taken over sand ranged from  $0.056 \mu\text{Gy h}^{-1}$  to  $0.076 \mu\text{Gy h}^{-1}$
- One measurement taken over stones was  $0.058 \mu\text{Gy h}^{-1}$

For comparison, natural background levels have been estimated at  $0.05 \mu\text{Gy h}^{-1}$  over sand,  $0.07 \mu\text{Gy h}^{-1}$  over mud and over salt marsh, and  $0.06 \mu\text{Gy h}^{-1}$  over other substrates (EA, FSA, NIEA and SEPA, 2011).

#### 4.10 Handling of fishing gear and sediment

Handling fishing gear that has become entrained with fine sediment particles, or handling sediment while undertaking activities such as bait digging or mollusc collecting, can potentially give rise to skin exposure from beta radiation. Doses to the skin need consideration as part of the dose limitation system (ICRP, 1991).

Fishing gear can also be a source of gamma exposure due to occupancy in the vicinity of the gear. However, this pathway is minor compared with the exposure received during occupancy over intertidal areas and it has therefore been omitted from the report. Handling of angling equipment was not considered to be a significant pathway. Therefore, as in previous surveys, data for this pathway were not collected.

Table 16 presents the adult handling rates of fishing gear and sediment recorded during the survey. No children or infants were identified handling fishing gear or sediment.

##### ***Adults' handling rates of fishing gear and sediment***

Table E presents a summary of the handling rates of fishing gear and sediment for adults. The table includes the mean handling rates for the high-rate groups and the observed 97.5<sup>th</sup> percentile rates.

**Table E. Summary of adults' handling rates of fishing gear and sediment**

Handling activity	Number of observations	Number of people in the high-rate group	Maximum of the high-rate group (h y <sup>-1</sup> )	Mean of the high-rate group (h y <sup>-1</sup> )	97.5 <sup>th</sup> percentile (h y <sup>-1</sup> )
Handling fishing gear	25	11	964	583	789
Handling sediment	45	9	840	445	546

The activities undertaken by people in the adult high-rate groups for handling included:

- For handling fishing gear: handling nets in Morecambe Bay, the Kent Estuary, the Lune Estuary and the Wyre Estuary.
- For handling sediment: collecting mussels at Aldingham, Morecambe and Knott End; collecting seaweed at Walney Channel; turf cutting at Hazelslack Marsh; oyster farming offshore of Roosebeck; wildfowling at Cockerham Marsh.

#### 4.11 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, relevant data have been collected for consideration in dose assessments. Mean occupancy rates for the high-rate groups and 97.5<sup>th</sup> percentile rates have not been calculated.

Activities where there is a high likelihood of the individual's face submerging under water have been classified as activities 'in water', as they are more likely to lead to ingestion of water. All other activities have been classified as activities 'on water'.

Occupancy rates for activities taking place 'in water' and 'on water' in the survey area for adults are presented in Table 17 and occupancy rates for activities taking place 'on water' for children are presented in Table 18. Data for members of clubs and organisations were gained through interviews with their representatives. No children were identified spending time 'in water' and no infants were identified spending time 'in water' or 'on water'.

##### **Activities in the water**

The activities identified taking place in the water in the aquatic survey area were kitesurfing, windsurfing, snorkelling, kayaking, lifeguard duties and swimming. Twenty-seven observations were recorded for adults. The highest occupancy rate for adults was 560 h y<sup>-1</sup> for an individual who was kitesurfing at Morecambe.

### ***Activities on the water***

The activities taking place on the water in the aquatic survey area were sailing, canoeing, boat dwelling, trawling, potting, boat angling, RNLI duties, boatman duties, gill netting, drift netting, push netting, wildfowling, stow netting, passenger ferry crew, tractor fishing, lave netting and haaf netting. One hundred and sixteen observations were recorded for adults and four observations were recorded for individuals in the child age group. The highest occupancy rate for adults was 5300 h y<sup>-1</sup> for two people who were living on a houseboat in Wyre Dock, Fleetwood. The highest occupancy rate for individuals in the child age group was 430 h y<sup>-1</sup> for two children who were sailing in Morecambe Bay.

## 5 TERRESTRIAL RADIATION PATHWAYS

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### 5.1 Terrestrial survey area

The terrestrial survey area (shown in Figure 2) covered all land within 5 km of the Heysham site centre (National Grid Reference: SD 401 596).

The land in the terrestrial survey area was predominantly agricultural. There were areas of salt marsh within the terrestrial survey area where farmers grazed their livestock. The main population centres are the village of Heysham and the suburbs of Morecambe, which are situated to the north-east of the site. The villages of Middleton and Overton and the small village of Sunderland are located to the south-east of the survey area.

Thirteen working farms were identified in the Heysham terrestrial survey area. Of these farms:

- One produced milk (from dairy cattle)
- Two produced milk (from dairy cattle) and beef cattle
- One produced milk (from dairy cattle) and lambs
- Two produced milk (from dairy cattle), beef cattle and lambs
- Four produced beef cattle
- Two produced beef cattle and lambs
- One produced pigs, beef cattle and lambs

Hay, silage and maize were grown for animal feed but no arable crops were produced for human consumption.

Farmers and their families were consuming milk, beef, lamb and pork produced on their own farms. Four farmers kept chickens for eggs for their own families' consumption.

One allotment site with a total of 80 plots was identified and this was located in the suburbs of Morecambe. The allotment holders grew a wide variety of fruit and vegetables and some people kept chickens for eggs on the allotment site. It was reported that one allotment holder occasionally collected a carrier bag full of seaweed for use as fertiliser on his vegetable plot.

One beekeeper was interviewed who had four hives located within the survey area at Overton and Heaton-with-Oxcliffe. The average production of honey per hive was 14 kg y<sup>-1</sup>. The honey was consumed by the beekeeper and their family. It was reported that another beekeeper kept three hives in the suburbs of Morecambe but they could not be contacted.

Blackberries, crab apples, damsons, rosehips, sloes and mushrooms were growing wild in the survey area and these were collected and consumed.

Many of the farmers allowed a small number of people to go rough shooting on their land within the survey area. No organised game shoots were identified. The shooters and their families consumed the shot pheasant and rabbit.

The consumption of groundwater by humans and livestock was identified. One household situated to the north-east of the survey area used borehole water as their sole domestic supply. Three farmers supplied their livestock with borehole water and two other farmers supplied their livestock with spring water for drinking.

### **5.2 Destination of food originating from the terrestrial survey area**

Livestock were mainly sold at Lancaster Auction. One farm had its own abattoir and sold beef, pork and lamb direct to the public through an on-line shop. Milk was sold to two national distribution chains. Honey was sold from the door and at fetes. Chicken eggs were sold from the door at one private property.

### **5.3 The transfer of contamination off-site by wildlife**

Control measures were taken against wildlife in order to limit the possibility that contamination was transferred offsite. These included the use of birds of prey to discourage birds; nets were used to prevent birds from accessing the buildings and rabbits were periodically culled. Pigeons have very occasionally gained access to buildings and have been monitored if they were found in controlled areas. Seagull's nests have been removed from the site under a Defra licence, and although this was undertaken primarily for reasons of public safety, since the birds became aggressive when nesting, it coincidentally also limited the possibility that contamination was transferred offsite by the gulls.

### **5.4 Food consumption data**

Consumption data for locally produced foodstuffs potentially affected by deposition of gaseous discharges are presented in Tables 19 to 33 for adults and Tables 34 to 45 for children and infants.

In order to provide information relevant to monitoring and assessments studies, the consumption rate data collected during the survey were analysed to indicate the percentage that each food type contributed to each food group. The data are summarised in Table 46 and the foods sampled as part of the 2009 Food Standards Agency monitoring programme (EA, FSA, NIEA and SEPA, 2010) are identified by emboldened italics in the table.

**Adults' consumption rates**

Consumption of locally produced foods was identified in the following 15 food groups: green vegetables; other vegetables; root vegetables; potato; domestic fruit; milk; cattle meat; pig meat; sheep meat; poultry; eggs; wild/free foods; rabbits/hares; honey; wild fungi. No consumption of cereals or venison was identified.

Table F presents a summary of the adults' consumption rates for the foods consumed from the terrestrial survey area. The table includes the mean consumption rates for the high-rate groups and the observed 97.5<sup>th</sup> percentile rates calculated as in Section 3.4. For comparison, the table also includes mean consumption rates and 97.5<sup>th</sup> percentile consumption rates based on national data, which are referred to as 'generic' data in this report.

**Table F. Summary of adults' consumption rates of foods from the terrestrial survey area**

Food group	Number of observations	Number of high-rate consumers	Observed maximum for the high-rate group (kg y <sup>-1</sup> or l y <sup>-1</sup> )	Observed minimum for the high-rate group (kg y <sup>-1</sup> or l y <sup>-1</sup> )	Observed mean for the high-rate group (kg y <sup>-1</sup> or l y <sup>-1</sup> )	Observed 97.5 <sup>th</sup> percentile (kg y <sup>-1</sup> or l y <sup>-1</sup> )	Generic mean (kg y <sup>-1</sup> or l y <sup>-1</sup> )	Generic 97.5 <sup>th</sup> percentile (kg y <sup>-1</sup> or l y <sup>-1</sup> )
<b>Green vegetables</b>	78	16	49.6	17.0	28.6	43.9	15.0	45.0
<b>Other vegetables</b>	84	23	55.3	20.1	27.6	37.5	20.0	50.0
<b>Root vegetables</b>	85	17	55.9	19.6	30.0	34.2	10.0	40.0
<b>Potato</b>	73	23	88.5	30.3	48.7	81.2	50.0	120.0
<b>Domestic fruit</b>	88	4	71.9	24.9	43.9	28.9	20.0	75.0
<b>Milk</b>	23	17	365.0	172.9	247.9	365.0	95.0	240.0
<b>Cattle meat</b>	4	1	56.8	56.8	56.8	53.5	15.0	45.0
<b>Pig meat</b>	3	3	26.0	26.0	26.0	26.0	15.0	40.0
<b>Sheep meat</b>	10	3	27.1	11.3	16.6	23.6	8.0	25.0
<b>Poultry</b>	7	1	1.8	1.8	1.8	1.5	10.0	30.0
<b>Eggs</b>	51	24	23.4	7.9	14.3	23.0	8.5	25.0
<b>Wild/free foods</b>	25	6	4.5	2.3	2.9	3.6	7.0	25.0
<b>Rabbits/hares</b>	6	3	6.8	2.3	3.8	6.2	6.0	15.0
<b>Honey</b>	11	2	9.1	9.1	9.1	9.1	2.5	9.5
<b>Wild fungi</b>	23	6	1.7	0.9	1.3	1.7	3.0	10.0

Two mean consumption rates for the high-rate groups were found to be greater than the generic 97.5<sup>th</sup> percentile consumption rates. These were for milk and cattle meat. Ten mean consumption rates for the high-rate groups exceeded the generic mean consumption rates. These were for green vegetables, other vegetables, root vegetables, domestic fruit, milk, cattle meat, pig meat, sheep meat, eggs and honey. Two observed 97.5<sup>th</sup> percentile consumption rates exceeded the generic 97.5<sup>th</sup> percentile consumption rates. These were for milk and cattle meat.

**Children's and infants' consumption rates**

Twenty individuals in the child age group and ten individuals in the infant age group were identified consuming foods from the terrestrial survey area. Table G presents a summary of children's and infants' consumption rates. The table includes the mean consumption rates for the high-rate groups and the observed 97.5<sup>th</sup> percentile rates. No generic data have been determined for the child or infant age groups. In the child age group, no consumption of foods from the following food groups was identified: milk; poultry; rabbits/hares; honey; venison; cereals. In the infant age group, no consumption of foods from the following food groups was identified: cattle meat; pig meat; sheep meat; poultry; rabbits/hares; honey; venison; cereals.

**Table G. Summary of children's and infants' consumption rates of foods from the terrestrial survey area**

Food group	Number of observations	Number of high-rate consumers	Observed maximum for the high-rate group (kg y <sup>-1</sup> )	Observed minimum for the high-rate group (kg y <sup>-1</sup> )	Observed mean for the high-rate group (kg y <sup>-1</sup> )	Observed 97.5 <sup>th</sup> percentile (kg y <sup>-1</sup> )
<b>Child age group (6 - 15 years old)</b>						
Green vegetables	17	11	10.3	4.3	6.2	9.8
Other vegetables	17	12	10.8	3.6	6.7	10.1
Root vegetables	15	5	16.8	6.2	9.6	14.9
Potato	13	1	44.9	44.9	44.9	35.1
Domestic fruit	18	10	11.5	4.3	7.5	11.5
Cattle meat	1	1	13.0	13.0	13.0	NA
Pig meat	1	1	26.0	26.0	26.0	NA
Sheep meat	3	3	6.5	2.8	4.1	6.3
Eggs	9	4	8.9	3.0	5.7	8.7
Wild/free foods	1	1	1.4	1.4	1.4	NA
Wild fungi	1	1	1.7	1.7	1.7	NA
<b>Infant age group (0 - 5 years old)</b>						
Green vegetables	6	1	10.3	10.3	10.3	9.2
Other vegetables	7	2	7.2	5.4	6.3	6.9
Root vegetables	7	1	16.8	16.8	16.8	14.6
Potato	6	3	12.1	4.4	7.6	11.4
Domestic fruit	9	4	5.1	2.2	3.2	4.7
Milk	1	1	207.4	207.4	207.4	NA
Eggs	5	1	7.9	7.9	7.9	7.2
Wild/free foods	1	1	0.2	0.2	0.2	NA
Wild fungi	1	1	0.1	0.1	0.1	NA

**Notes**

NA - Not applicable

## 6 DIRECT RADIATION PATHWAYS

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### 6.1 Direct radiation survey area

The direct radiation survey area (shown in Figure 2) covered all land and sea within 1 km of the Heysham nuclear licensed site boundary. There are two separate nuclear power stations, Heysham 1 and Heysham 2, which are situated directly adjacent to each other. For the purpose of this survey the two power stations are considered together as a single site. The occupancy data collected from the direct radiation area is also applicable to the direct exposure arising from gaseous releases from the site.

The land within the direct radiation survey area was a mix of residential areas, industrial areas, a nature reserve, a caravan park and a golf course. The shore and waters of Morecambe Bay covered part of the survey area to the north and south of the Heysham power stations and all of the area to the west.

The Port of Heysham, which included a ferry terminal and various industrial units, was located adjacent to the north of the power stations. A road ran along the sea wall, directly to the north of the port, which was used regularly by anglers who fished from the wall. The sea wall was steep and access to the shore was possible via a ladder attached to the wall or by walking along the shore at low tide from the beach at Half Moon Bay. Heysham Sands covered a large area in the northern part of the survey area at low tide.

Most of the residential properties within the survey area were located to the north-east of the Heysham power stations in the village of Higher Heysham, along with a nursery school and a primary school. Two industrial estates were also located in this area.

The Heysham Nature Reserve was located immediately to the east of the Heysham power stations. A golf course occupied a large area of land beyond the nature reserve. A small number of residential mobile homes and an industrial estate were located near the outer limit of the survey area to the east.

A caravan park was located immediately to the south-east of the Heysham power stations. Further to the south-east was an area of unused land and part of a sewage treatment works fell within the outer limit of the survey area.

The western side of the power stations was located adjacent to the shore of Morecambe Bay. Public access to the shore was possible to the south at Red Nab via the Heysham Nature Reserve trails. The shore could also be accessed from the caravan park by residents only. A sea wall which ran along the western side of the power stations could be accessed at the southern end via trails through

the nature reserve. This was used by members of the public. A large area of sandflats called Middleton Sands was exposed at low tide.

The proposed area for the new nuclear site at Heysham includes land in the direct radiation survey area, mainly to the east and south-east of the existing site, with a small area to the north. At the time of the survey most of this land was occupied by a nature reserve, a golf course and a caravan park.

### **6.2 Residential activities**

The closest residences to the Heysham power stations were located in the caravan park to the south-east of the survey area in the 0 – 0.25 km zone and the >0.25 – 0.5 km zone. There were approximately 700 pitches for caravans on the site, of which around 640 pitches accommodated privately owned caravans. The site was closed for six weeks per year. Members of staff were identified who lived in their static caravans all year round. The main area of permanent residential properties was to the north-east of the survey area in Higher Heysham. Most of the properties were in the >0.5 – 1.0 km zone but eight properties were in the >0.25 – 0.5 km zone. One mobile home park with 35 permanent residential homes was located in the east of the survey area in the >0.5 – 1.0 km zone.

Interviews were conducted at 13 residences, five of which were families with children. Eleven of these were permanent residences and two were mobile homes. One residence was within the 0 – 0.25 km zone, four residences were within the >0.25 – 0.5 km zone and eight residences were within the >0.5 – 1.0 km zone.

### **6.3 Leisure activities**

Angling occurred at various places along the sea wall near to the Heysham power station outfalls and to the north of the port. Set nets were observed near the outfall at low tide. The shore at Red Nab Bay was popular with people who were angling, bait digging and bird watching. A small area of Half Moon Bay fell within the direct radiation survey area and was popular with people dog walking, nature watching and bait digging. One person was observed push netting for shrimps in Half Moon Bay. Bird watchers, walkers and dog walkers used the footpaths in the Heysham Nature Reserve. The golf course covered a large area to the east of the survey area and the golf club had approximately 600 members.

## 6.4 Commercial activities

Many businesses were located within the direct radiation survey area. The Port of Heysham, located immediately to the north of the Heysham power stations, included a ferry terminal and several businesses. Occupancy data were obtained for 28 employees from two businesses at the port. The Port of Heysham Industrial Estate was located to the north-east of the survey area and contained six businesses. Occupancy data were obtained for 175 employees from five businesses at the industrial estate. Another two industrial estates were located to the north-east and east of the survey area where there were 11 businesses in total.

Sixty people worked at the caravan park which was situated immediately to the south-east of the Heysham power stations, seven of whom predominantly worked outdoors. Two of the employees also lived at the caravan park all year. Nineteen employees worked at the golf club, four of whom predominantly worked outdoors. Three wardens worked at the Heysham Nature Reserve to the east of the Heysham power stations.

The activities of Heysham site employees and contractors while at work were not considered in the direct radiation survey, as radiation workers are subject to different radiation protection criteria.

## 6.5 Educational activities

One nursery school was identified in Higher Heysham in the north-eastern part of the survey area. Fourteen staff and 73 children attended the nursery school. A representative number of children were included in the data analysis. A primary school in Higher Heysham straddled the outer limit of the survey area and a small part of the ground area of the school was included in the >0.5 – 1.0 km zone. Approximately 250 children, aged from 3 years old to 11 years old, attend the school. Occupancy rates were obtained for two pupils who also lived in the direct radiation survey area.

## 6.6 Occupancy rates

Table 47 presents indoor, outdoor and total occupancy data for adults, children and infants. An analysis of the data by distance zones and occupancy rates is shown in Table 48. A summary of occupancy rates in the direct radiation survey area is presented in Table H.

**Table H. Summary of direct radiation occupancy rates**

Zone	Number of observations	Highest indoor occupancy (h y <sup>-1</sup> )	Highest outdoor occupancy (h y <sup>-1</sup> )	Highest total occupancy (h y <sup>-1</sup> )
<b>0 - 0.25 km</b>	48	6624	2544	8524
<b>&gt;0.25 - 0.5 km</b>	96	8052	2099	8241
<b>&gt;0.5 - 1.0 km</b>	252	7954	1706	8240

***0 - 0.25 km from the nuclear licensed site boundary***

Occupancy data were collected for 48 individuals in the 0 - 0.25 km zone. The observations were for two residents, who also worked in the area, 14 employees, four people undertaking nature conservation duties, 13 anglers, eight bird watchers, three people who were crabbing, one bait digger and three dog walkers. The highest indoor occupancy rate was for one resident and the highest outdoor and highest total occupancy rates were for the other resident, both of whom also worked in the area.

***>0.25 - 0.5 km from the nuclear licensed site boundary***

Occupancy data was collected for 96 individuals in the >0.25 - 0.5 km zone. The observations were for eight residents, three of whom also worked in the area, 73 employees and 15 anglers. The highest indoor occupancy rate was for a resident and the highest outdoor and highest total occupancy rates were for another resident. Both residents also worked in the area.

***>0.5 - 1.0 km from the nuclear licensed site boundary***

Occupancy data were collected for 252 people in the >0.5 - 1.0 km zone. The observations were for 28 residents, one of whom also worked in the area and two of whom attended school in the area, 207 employees, 12 children attending nursery school, three dog walkers and two bait diggers, one of whom also collected shellfish. Six of the residents were living in the area part-time. Two residents had the same highest indoor and total occupancy rates and four employees had the same highest outdoor occupancy rate.

## 6.7 Gamma dose rate measurements

Gamma dose rate measurements were taken indoors and outdoors at most properties where interviews were conducted in the Heysham direct radiation survey area. Where possible outdoor measurements were taken approximately 5 to 10 metres from the nearest building, but owing to the nature of the direct radiation survey area this was not always feasible and many measurements were taken at distances less than 5 metres from buildings. Gamma dose rate measurements over rough grass were taken at locations at distances further than 5 km from the site centre to obtain background dose rates. All measurements were taken at a height of 1 metre above the substrate. It should be noted that the indoor and outdoor measurements have not been adjusted for background dose rates. The results are presented in Table 49 and are summarised below.

### **Indoor measurements**

- Two measurements taken over wood ranged from 0.054  $\mu\text{Gy h}^{-1}$  to 0.097  $\mu\text{Gy h}^{-1}$
- Eleven measurements taken over concrete ranged from 0.057  $\mu\text{Gy h}^{-1}$  to 0.133  $\mu\text{Gy h}^{-1}$

### **Outdoor measurements**

- Five measurements taken over grass ranged from 0.058  $\mu\text{Gy h}^{-1}$  to 0.097  $\mu\text{Gy h}^{-1}$
- Two measurements taken over soil ranged from 0.073  $\mu\text{Gy h}^{-1}$  to 0.078  $\mu\text{Gy h}^{-1}$
- Seven measurements taken over concrete ranged from 0.071  $\mu\text{Gy h}^{-1}$  to 0.107  $\mu\text{Gy h}^{-1}$

### **Background measurements**

- Five measurements taken over grass ranged from 0.069  $\mu\text{Gy h}^{-1}$  to 0.088  $\mu\text{Gy h}^{-1}$

Comprehensive studies of background radiation have been carried out on a national scale by the Radiation Protection Division of the Health Protection Agency (previously the National Radiological Protection Board), the most recent of these being a review conducted in 2005 (Watson *et al*, 2005). The results from the 2005 review could be used for comparison with the data collected during this survey.

## **7 USES OF HABITS DATA FOR DOSE ASSESSMENTS**

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### **7.1 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 Annex 1 and Annex 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. The rates for individuals in the high-rate groups are emboldened. 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 high-rate groups.

The most extensive combinations of pathways for adult dose assessment are shown in Table 50. Each of the 36 combinations shown in Table 50 represents an actual individual (or individuals) from Annex 1 who has positive data (irrespective of the magnitude), for each pathway marked with a cross. It should be noted that combination numbers in Table 50 do not correlate directly with observation numbers in Annex 1. Other individuals from Annex 1 have combinations that are not listed in Table 50 because they have fewer pathways and a dose assessment for them would be adequately covered by one of the 36 listed combinations.

### **7.2 Foetal dose assessment**

Dose assessment of the foetus was introduced routinely for the first time in the Radioactivity in Food and the Environment report for 2005 (EA, EHS, FSA and SEPA, 2005), following the publication of recommendations by the Radiation Protection Division of the Health Protection Agency (National Radiological Protection Board, 2005). The adopted approach is to use the consumption and occupancy data for women of childbearing age in order to calculate the potential dose to the foetus. Therefore, consumption and occupancy data collected during the Heysham habits survey for females of childbearing age are presented in Annex 5. The Office of National Statistics classifies women to be of childbearing age if they are between 15 – 44 years old ([www.statistics.gov.uk](http://www.statistics.gov.uk)); this age range has been used in Annex 5. It was not possible to collect ages for all female observations during the habits survey. However, these females with unknown ages have been included in Annex 5 as they might be women of childbearing age.

### **7.3 Total dose assessment**

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 Heysham adults' profiled habits data is shown in Annex 6. 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 Heysham are made using these profiles and reported in the Radioactivity in Food and the Environment reports (e.g. EA, FSA, NIEA and SEPA, 2010). Additionally, profiles have been created for the child and infant age groups, and for women of childbearing age. These are shown in Annexes 7, 8, and 9 respectively. They are not currently used in the Radioactivity in Food and the Environment reports.

## 8 COMPARISONS WITH THE PREVIOUS SURVEY

The results from this 2011 survey can be compared with results from the last combined habits survey undertaken in 2006. The aquatic, terrestrial and direct radiation survey areas in the 2011 survey were the same as those in the 2006 survey. All comparisons for consumption, intertidal occupancy, handling and occupancy rates in the direct radiation area are for adults only.

### 8.1 Aquatic survey area

The main species of fish consumed by the adult high-rate group in 2006 were flounder, plaice, cod, bass and salmon, and in 2011 the main species were bass, flounder and plaice. In 2006, the species of crustaceans consumed by the adult high-rate group were brown shrimp, and in 2011 the species were brown shrimp and common lobster. In 2006, the main species of molluscs consumed by the adult high-rate group were cockles, mussels and whelks and in 2011 the species were cockles and mussels. The main species of wildfowl consumed by the adult high-rate group in 2006 were goose (unspecified species), mallard, wigeon, teal, pintail duck and shoveler and in 2011 were pink-footed goose, greylag goose and mallard. In 2006 and 2011, the only species of marine plants/algae consumed by adults was samphire. The consumption of salt marsh grazed sheep meat was identified in 2006 and 2011.

A comparison between the 2006 and 2011 data for the consumption of aquatic foods is presented in Table I.

**Table I. Comparison between 2006 and 2011 consumption rates of aquatic food groups for adults**

Food group	2006			2011		
	Number in high-rate group	Maximum consumption rate (kg y <sup>-1</sup> )	Mean consumption rate for the high-rate group (kg y <sup>-1</sup> )	Number in high-rate group	Maximum consumption rate (kg y <sup>-1</sup> )	Mean consumption rate for the high-rate group (kg y <sup>-1</sup> )
<b>Fish</b>	22	47.2	25.2	23	49.4	27.2
<b>Crustaceans</b>	5	23.6	15.9	8	12.9	10.6
<b>Molluscs</b>	10	7.3	4.5	2	9.0	6.7
<b>Wildfowl</b>	24	19.2	11.1	6	21.7	12.8
<b>Marine plants/algae</b>	7	3.3	2.4	7	2.3	1.6
<b>Salt marsh grazed sheep meat</b>	11	8.5	5.4	19	17.0	8.6

In 2011 compared with 2006, there were increases in the mean consumption rates for the adult high-rate groups for fish, from 25 kg y<sup>-1</sup> to 27 kg y<sup>-1</sup>, for molluscs, from 4.5 kg y<sup>-1</sup> to 6.7 kg y<sup>-1</sup>, for wildfowl, from 11 kg y<sup>-1</sup> to 13 kg y<sup>-1</sup>, and for salt marsh grazed sheep meat, from 5.4 kg y<sup>-1</sup> to 8.6 kg y<sup>-1</sup>. In 2011 compared with 2006, there were decreases in the mean consumption rates for the adult high-rate groups for crustaceans, from 16 kg y<sup>-1</sup> to 11 kg y<sup>-1</sup> and for marine plants/algae, from 2.4 kg y<sup>-1</sup> to 1.6 kg y<sup>-1</sup>. No specific reasons were identified for the changes in consumption rates.

For intertidal occupancy in 2006, activities were recorded over the following six substrates: mud; mud and sand; rock; salt marsh; sand; sand and stones. In 2011, activities were recorded over the same substrates with the addition of occupancy over stones and occupancy on a boat resting on mud at low tide.

The following activities were undertaken by the individuals in the high-rate groups for intertidal substrates:

- In 2006; oyster farming, shore angling, bait digging, collecting crabs, collecting cockles, collecting mussels, turf cutting, walking, dog walking, tending livestock, setting nets and sea defence work.
- In 2011; oyster farming, shore angling, bait digging, collecting crabs, collecting cockles, collecting mussels, turf cutting, walking, dog walking, setting nets, elver fishing, collecting samphire, lave netting, wildfowling, tractor fishing, boat maintenance, long-lining, bird watching and leading guided walks.

The following activities were undertaken by the individuals in the high-rate groups for handling fishing gear:

- In 2006; handling unspecified gear.
- In 2011; handling nets.

The following activities were undertaken by the individuals in the high-rate groups for handling sediment:

- In 2006; collecting cockles and mussels, oyster farming and bait digging.
- In 2011; collecting mussels, collecting seaweed, turf cutting, oyster farming and wildfowling.

A comparison between the 2006 and 2011 data for occupancy over intertidal substrates, handling fishing gear and handling sediment is shown in Table J.

**Table J. Comparison between 2006 and 2011 intertidal occupancy rates and handling rates of fishing gear and sediment for adults<sup>a</sup>**

Intertidal substrate or handling pathway	2006			2011		
	Number in high-rate group	Maximum occupancy or handling rate (h y <sup>-1</sup> )	Mean occupancy or handling rate for the high-rate group (h y <sup>-1</sup> )	Number in high-rate group	Maximum occupancy or handling rate (h y <sup>-1</sup> )	Mean occupancy or handling rate for the high-rate group (h y <sup>-1</sup> )
<b>Mud</b>	1	1288	1288	8	360	270
<b>Mud and sand</b>	13	960	700	2	350	266
<b>Rock</b>	6	312	172	3	350	261
<b>Salt marsh</b>	4	840	490	4	840	508
<b>Sand</b>	33	2400	2293	8	1269	748
<b>Sand and stones</b>	1	1000	1000	6	650	414
<b>Stones</b>	Not observed			4	322	207
<b>Boat on mud</b>	Not observed			2	720	720
<b>Handling fishing gear</b>	10	1288	803	11	964	583
<b>Handling sediment</b>	13	1560	809	9	840	445

<sup>a</sup>In the 2006 habits survey report the data for intertidal occupancy and handling were presented for adults and children combined. However, all the individuals in the high-rate groups were adults so the data presented here is the same as in the 2006 survey report.

The most significant changes in the intertidal occupancy rates were for activities over mud, over mud and sand, over sand, and over sand and stones, which decreased significantly in 2011 compared to 2006. Also, in 2011, activities were recorded over stones and on board a boat resting on mud at low tide, but were not recorded over these substrates in 2006. The mean intertidal occupancy rate for the high-rate group for rock and salt marsh in 2011 increased slightly compared to that in 2006.

The decreases in occupancy rates over mud, over mud and sand, over sand and over sand and stones were attributed partly to changes in the substrates over which activities were recorded owing to the shifting sediments in the bay. There was also a general decline in many intertidal fishing activities. Commercial bait digging was identified in 2006 but not in 2011 and this partly accounted for

the decline in occupancy over mud and sand. The decrease in occupancy over sand was attributed to the completion of the major sea defence works around Morecambe, a reduction in cockle collecting since the cockle beds had been partially open to commercial collectors in 2006 but were totally closed to commercial collectors in 2011, and a decrease in commercial mussel collection owing to lack of market demand.

Occupancy over stones was recorded in 2011 but not in 2006 owing to angling being identified at new locations in 2011. Occupancy on board a boat was recorded in 2011 but not in 2006 owing to a newly identified activity in 2011 of boat maintenance being carried out on board a boat resting on mud at low tide.

The handling rates for fishing gear and for sediment decreased significantly in 2011 compared with 2006. The decrease in the handling rate for fishing gear was attributed to the general decline in fishing within the bay and the decrease in the handling rate for sediment was attributed to the decline in cockle and mussel collection.

## **8.2 Terrestrial survey area**

Activities in the terrestrial survey area in 2011 were broadly similar to those in 2006 except that in 2011 one farmer no longer sold eggs from the farm. The principal types of farm produce continued to be a mix of milk (from dairy cattle), beef cattle, lambs and pigs. In both surveys, one allotment site was identified and several allotment holders kept chickens for chicken eggs at their allotment plots. In 2006 allotments holders also kept ducks for eggs but this was not identified in 2011.

The mean consumption rates for the adult high-rate group for terrestrial food groups from the 2006 and 2011 surveys are shown in Table K.

**Table K. Comparison between 2006 and 2011 mean consumption rates for the adult high-rate groups for terrestrial food groups (kg y<sup>-1</sup> or l y<sup>-1</sup>)**

<b>Food group</b>	<b>2006</b>	<b>2011</b>
<b>Green vegetables</b>	32.4	28.6
<b>Other vegetables</b>	24.5	27.6
<b>Root vegetables</b>	32.9	30.0
<b>Potato</b>	62.6	48.7
<b>Domestic fruit</b>	85.5	43.9
<b>Milk</b>	195.2	247.9
<b>Cattle meat</b>	10.4	56.8
<b>Pig meat</b>	Not observed	26.0
<b>Sheep meat</b>	13.5	16.6
<b>Poultry</b>	2.8	1.8
<b>Eggs</b>	12.5	14.3
<b>Wild/free foods</b>	3.8	2.9
<b>Rabbits/hares</b>	5.6	3.8
<b>Honey</b>	11.3	9.1
<b>Wild fungi</b>	4.5	1.3

Consumption rates increased in 2011 in the following five food groups: other vegetables; milk; cattle meat; sheep meat; eggs. Consumption rates decreased in 2011 in the following nine food groups: green vegetables; root vegetables; potato; domestic fruit; poultry; wild/free foods; rabbits/hares; honey; wild fungi.

There were relatively large increases in the consumption rates for milk and cattle meat and relatively large decreases in the consumption rates for potato, domestic fruit and wild fungi. The consumption of pig meat was identified in 2011 but was not identified in 2006. No consumption of cereals or venison was identified in either 2006 or 2011.

The decrease in the mean consumption rate for the high-rate group for wild fungi was attributed to the lack of availability of mushrooms due to unsuitable weather conditions. No specific reasons were identified for the other changes in consumption rates.

The consumption of borehole water by humans and livestock was identified in the 2006 and the 2011 surveys. Livestock were also supplied with spring water in 2011 but this was not identified in 2006.

### 8.3 Direct radiation survey area

Activities identified in the direct radiation survey area in 2006 and 2011 were similar and included people residing, working, carrying out nature conservation duties, dog walking and angling. Additionally in 2011, crabbing, bait digging, attending school, bird watching and collecting shellfish were also identified.

A comparison between the 2006 and 2011 direct radiation occupancy rates, by zone, is presented in Table L.

**Table L. Comparison between 2006 and 2011 direct radiation occupancy rates ( $h\ y^{-1}$ )**

	2006	2011
<b>0 - 0.25 km zone</b>		
Highest indoor	4847	6624
Highest outdoor	2016	2544
Highest total	5687	8524
<b>&gt;0.25 - 0.5 km zone</b>		
Highest indoor	7474	8052
Highest outdoor	2530	2099
Highest total	7974	8241
<b>&gt;0.5 - 1 km zone</b>		
Highest indoor	7947	7954
Highest outdoor	1582	1706
Highest total	8182	8240

In 2006, the highest indoor and total rates in the 0 - 0.25 km zone and the >0.25 – 0.5 km zone were for residents, the highest outdoor rates in these zones were for workers. In 2006, the highest indoor, outdoor and total rates in the >0.5 – 1.0 km zone were for residents. In 2011 the highest indoor, outdoor and total rates were for residents with the exception of the outdoor rate in the >0.5 – 1.0 km zone, which was for four workers.

In the Heysham direct radiation survey area, two sets of gamma dose measurements taken in 2011 can be compared with those taken at the same properties in 2006. These data are shown in Table M.

**Table M. Comparison between 2006 and 2011 gamma dose rates ( $\mu Gy\ h^{-1}$ )**

Location	Indoor		Outdoor	
	2006	2011	2006	2011
Business 1	0.058	0.054	0.077	0.058
Business 4	Not taken	0.097	0.082	0.061

**Notes**

These measurements have not been adjusted for background dose rates.  
The locations correspond to those in Table 49.

### 9 MAIN FINDINGS

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

- Discharges of liquid radioactive waste to the Morecambe Bay
- Discharges of gaseous radioactive waste to the atmosphere
- Emissions of direct radiation

Data were collected for 851 individuals including, for example, commercial and hobby fishermen, anglers, people spending time on intertidal substrates, farmers, allotment holders, gardeners, beekeepers and people spending time within the direct radiation survey area. 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 are only for foods produced, collected or caught from within the aquatic and terrestrial survey areas as defined in Section 2.3.

#### 9.1 Aquatic survey area

The mean consumption rate for the adult high-rate group (as defined in Section 3.4) for the separate aquatic consumption pathways for foods potentially affected by liquid discharges were:

- 27 kg y<sup>-1</sup> for fish
- 11 kg y<sup>-1</sup> for crustaceans
- 6.7 kg y<sup>-1</sup> for molluscs
- 13 kg y<sup>-1</sup> for wildfowl
- 1.6 kg y<sup>-1</sup> for marine plants/algae
- 8.6 kg y<sup>-1</sup> for salt marsh grazed sheep meat

The predominant foods consumed by the high-rate groups were:

- For fish; bass, flounder and plaice
- For crustaceans; brown shrimp and common lobster
- For molluscs; cockles and mussels
- For wildfowl; pink-footed goose, greylag goose and mallard
- For marine plants/algae; samphire
- For salt marsh grazed sheep meat; salt marsh grazed lamb.

It was reported that seaweed was used as fertiliser on an allotment plot. The use of seaweed as an animal feed was not identified.

The mean occupancy rates for adult high-rate groups over the separate intertidal substrates were:

- 270 h y<sup>-1</sup> for mud
- 270 h y<sup>-1</sup> for mud and sand
- 260 h y<sup>-1</sup> for rock
- 510 h y<sup>-1</sup> for salt marsh
- 750 h y<sup>-1</sup> for sand
- 410 h y<sup>-1</sup> for sand and stones
- 210 h y<sup>-1</sup> for stones
- 720 h y<sup>-1</sup> for a boat on mud

The mean handling rate for the adult high-rate groups for handling were:

- 580 h y<sup>-1</sup> for handling fishing gear
- 450 h y<sup>-1</sup> for handling sediment

The adult maximum occupancy rates for water based activities were:

- 560 h y<sup>-1</sup> for 'in water'
- 5300 h y<sup>-1</sup> for 'on water'

## 9.2 Terrestrial survey area

The mean consumption rates for the adult high-rate groups for the separate consumption pathways for foods potentially affected by gaseous discharges were:

- 29 kg y<sup>-1</sup> for green vegetables
- 28 kg y<sup>-1</sup> for other vegetables
- 30 kg y<sup>-1</sup> for root vegetables
- 49 kg y<sup>-1</sup> for potato
- 44 kg y<sup>-1</sup> for domestic fruit
- 250 l y<sup>-1</sup> for milk
- 57 kg y<sup>-1</sup> for cattle meat
- 26 kg y<sup>-1</sup> for pig meat
- 17 kg y<sup>-1</sup> for sheep meat
- 1.8 kg y<sup>-1</sup> for poultry
- 14 kg y<sup>-1</sup> for eggs
- 2.9 kg y<sup>-1</sup> for wild/free foods
- 3.8 kg y<sup>-1</sup> for rabbits/hares
- 9.1 kg y<sup>-1</sup> for honey
- 1.3 kg y<sup>-1</sup> for wild fungi

No consumption of cereals or venison was identified from the survey area. The consumption of foodstuffs by children (child and infant age groups) was also recorded.

The consumption of groundwater by humans and livestock was identified. One household used borehole water as their sole domestic supply. Three farmers supplied their livestock with borehole water and two other farmers supplied their livestock with spring water for drinking.

Control measures taken against wildlife in order to limit the possibility that contamination is transferred off-site included using a falconer to discourage birds, using nets to prevent birds from accessing the buildings and periodically culling rabbits.

### 9.3 Direct radiation survey area

With the exception of the highest outdoor occupancy rate in the >0.5 – 1 km zone, which was for four employees, the highest indoor, outdoor and total occupancy rates in the zones of the direct radiation survey area were for residents, two of whom also worked in the survey area. The highest indoor, outdoor and total occupancy rates recorded for all zones were:

#### **0 - 0.25 km zone**

- 6600 h y<sup>-1</sup> for the indoor occupancy rate
- 2500 h y<sup>-1</sup> for the outdoor occupancy rate
- 8500 h y<sup>-1</sup> for the total occupancy rate

#### **>0.25 - 0.5 km zone**

- 8100 h y<sup>-1</sup> for the indoor occupancy rate
- 2100 h y<sup>-1</sup> for the outdoor occupancy rate
- 8200 h y<sup>-1</sup> for the total occupancy rate

#### **>0.5 - 1 km zone**

- 8000 h y<sup>-1</sup> for the indoor occupancy rate
- 1700 h y<sup>-1</sup> for the outdoor occupancy rate
- 8200 h y<sup>-1</sup> for the total occupancy rate

## 10 RECOMMENDATIONS FOR CHANGES TO THE MONITORING PROGRAMME

The information collected during the 2011 Heysham habits survey can be used to make recommendations for changes to the current monitoring programmes.

### 10.1 Summary of current environmental monitoring programmes

The 2010 monitoring programmes for Heysham operated by the Environment Agency and the Food Standards Agency, and published in the RIFE report (EA, FSA, NIEA and SEPA, 2011), included the samples and measurements listed below. The location names, foods and substrate classifications are taken directly from that publication. Some of the samples and measurements taken for the monitoring programmes may be from outside the survey areas used for the 2011 Heysham habits survey.

#### ***Aquatic monitoring***

##### ***Aquatic samples***

<b>Sample</b>	<b>Location</b>
Flounder	Flookburgh
Flounder	Morecambe
Whiting	Morecambe
Bass	Morecambe
Whitebait	Sunderland Point
Shrimps	Flookburgh
Shrimps	Morecambe
Cockles	Middleton Sands
Cockles	Flookburgh
Winkles	Red Nab Point
Mussels	Morecambe
Wild fowl	Morecambe
Samphire	Cockerham Marsh
Seaweed	Half Moon Bay
Sediment	Half Moon Bay
Sediment	Pott's Corner
Sediment	Morecambe Central Pier
Sediment	Red Nab Point
Sediment	Sunderland Point
Sediment	Conder Green
Sediment	Sand Gate Marsh
Seawater	Heysham Harbour

***Gamma dose rate measurements***

<b><i>Substrate</i></b>	<b><i>Location</i></b>
Grass	Greenodd Salt Marsh
Grass	Sand Gate Marsh
Grass and mud	High Foulshaw
Grass	High Foulshaw
Mud	Arnside 1
Mud and sand	Arnside 1
Grass	Arnside 2
Sand	Morecambe Central Pier
Pebbles and sand	Morecambe Central Pier
Sand	Half Moon Bay
Sand and stones	Half Moon Bay
Sand	Red Nab Point
Sand	Middleton Sands
Salt marsh	Sunderland
Mud	Sunderland Point
Salt marsh	Colloway Marsh
Grass	Colloway Marsh
Grass	Lancaster
Grass and mud	Aldcliffe Marsh
Grass and salt marsh	Aldcliffe Marsh
Grass	Aldcliffe Marsh
Mud	Conder Green
Grass and mud	Conder Green
Grass	Conder Green

***Terrestrial monitoring***

- Milk
- Apples
- Barley
- Beetroot
- Blackberries
- Cabbage
- Honey
- Potatoes
- Sprouts
- Freshwater

## 10.2 Recommendations

Recommendations for changes to the current environmental monitoring programmes are made below. They are based on the findings of this survey and also take into account the potential radiological significance of the various pathways that were identified.

It is recommended that the samples and gamma dose rate measurements currently taken, which are not listed below, remain unchanged in the monitoring programmes.

### ***Environment Agency monitoring***

The current environmental monitoring programme adequately covers the Heysham area and no changes to this are suggested.

### ***Food Standards Agency monitoring***

- Within the 'green vegetables' food group, the sample of Brussels sprouts currently collected could be stopped since this food group is adequately covered by the sample of cabbage.
- A one-off sample of beef or lamb could be taken since both these were consumed at high rates and no meat samples are currently taken. Alternatively, a sample of beef cattle or sheep faeces could be taken as a more economic option. If a sample of lamb (meat or faeces) were taken, then consideration should be given to taking it from sheep that have grazed on salt marsh within the terrestrial survey area, since this would cover the 'worst case scenario' by identifying possible contamination from both gaseous and liquid discharges.

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**Table 1. Survey coverage**

Group	Criteria	Estimate of complete coverage	Number for whom positive data was obtained	Coverage for positive observations	Notes
<b>SUMMARY OF ALL PATHWAYS</b>					
All potential interviewees in the Heysham aquatic, terrestrial and direct radiation survey areas.	Number of people resident in the terrestrial survey area (excluding those resident in the direct radiation survey area) (See <b>(B) TERRESTRIAL PATHWAYS</b> )	28500 <sup>a</sup>	145 <sup>c</sup>	0.5%	The survey targeted individuals who were potentially the most exposed, mostly producers of local foods such as farmers and allotment holders.
	Number of people resident in the direct radiation survey area (See <b>(C) DIRECT RADIATION PATHWAYS</b> )	900 <sup>b</sup>	38 <sup>c</sup>	4%	Interviews were conducted at 13 permanent residences out of an estimated total of 310 permanent residences. Not including approximately 640 caravans, which could be occupied for 46 weeks per year.
	Number of people employed but not resident in the direct radiation survey area (See <b>(C) DIRECT RADIATION PATHWAYS</b> )	U	295 <sup>c</sup>	U	Excluding employees and contractors of EDF Energy Nuclear Generation Ltd.
	Number of people visiting the direct radiation survey area (See <b>(C) DIRECT RADIATION PATHWAYS</b> )	U	60 <sup>c</sup>	U	
	Number of people effected by liquid discharges (excluding those assigned to other categories above) (See <b>(A) AQUATIC PATHWAYS</b> )	U	313 <sup>c</sup>	U	Where an individual visited the direct radiation survey area as well as being potentially affected by liquid discharges (e.g. dog walkers and anglers) they have been allocated to the direct radiation pathway above.
	Total for aquatic, terrestrial and direct radiation survey areas	U	851 <sup>c</sup>	U	

**Table 1. Survey coverage**

Group	Criteria	Estimate of complete coverage	Number for whom positive data was obtained	Coverage for positive observations	Notes
<b>(A) AQUATIC PATHWAYS</b>					
Commercial fishermen	Number of commercial fishermen based in the aquatic survey area	30	20	67%	Includes part-time and full-time commercial fishermen.
Boat anglers and hobby fishermen	Number of boat anglers and hobby fishermen fishing in the aquatic survey area	U	27	U	
People undertaking activities in or on water (e.g. swimming, sailing and lifeboat duties)	Number of people undertaking activities in or on water in the aquatic survey area	U	141	U	Includes commercial fishermen, boat anglers etc.
People using the shore including anglers, dog walkers and people playing etc.	Number of people undertaking intertidal activities in the aquatic survey area	U	155	U	
Fish consumers	Number of people consuming fish from the aquatic survey area	U	143	U	
Crustacean consumers	Number of people consuming crustaceans from the aquatic survey area	U	34	U	
Mollusc consumers	Number of people consuming molluscs from the aquatic survey area	U	22	U	
Wildfowl consumers	Number of people consuming wildfowl from the aquatic survey area	U	29	U	
Marine plant consumers	Number of people consuming marine plants from the aquatic survey area	U	15	U	
<b>(B) TERRESTRIAL PATHWAYS</b>					
Farmers	Number of farmers and their family members consuming food from the terrestrial survey area	38	38	100%	Interviews were conducted at all 13 farms identified within the survey area.
Allotment holders and gardeners	Number of allotment holders and gardeners and their family members consuming food from the terrestrial survey area	U	127	U	Interviews were conducted with 17 allotment holders from an estimated total of 80 allotment holders.
Beekeepers	Number of people consuming honey produced by beekeepers in the terrestrial survey area	U	11	U	1 beekeeper was interviewed.

**Table 1. Survey coverage**

Group	Criteria	Estimate of complete coverage	Number for whom positive data was obtained	Coverage for positive observations	Notes
<b>(C) DIRECT RADIATION PATHWAYS</b>					
Residents	Number of residents in the survey area	900	38	4%	Interviews were conducted at 13 permanent residences out of an estimated total of 310 permanent residences. Not including approximately 640 caravans, which could be occupied for 46 weeks per year.
Employees	Number of people employed in the survey area	U	297	U	Excluding people living in the direct radiation survey area and employees and contractors of EDF Energy Nuclear Generation Ltd.
Visitors	Number of visitors to the survey area	U	61	U	Mainly individuals undertaking recreational activities within the direct radiation survey area, including those also affected by aquatic discharges, such as intertidal dog walkers etc. Including a representative number of 12 children attending nursery school.
<b>BREAKDOWN OF AGE GROUPS FOR PEOPLE RESIDENT IN THE 5 KM TERRESTRIAL SURVEY AREA</b>					
Adult	16-year-old and over	22500 <sup>a</sup>	779	3.5%	
Child	6-year-old to 15-year-old	3900 <sup>a</sup>	43	1.1%	
Infant	0 to 5-year-old	2100 <sup>a</sup>	29	1.4%	

**Notes**

<sup>a</sup> Estimate of the number of people resident in the 5 km terrestrial survey area based on data from [www.statistics.gov.uk](http://www.statistics.gov.uk).

<sup>b</sup> Estimate of the number of people resident in the 1 km direct radiation survey area based on data from [www.statistics.gov.uk](http://www.statistics.gov.uk).

<sup>c</sup> The number of people for whom positive data was obtained for pathways (A) and (B) and (C) will usually not equal the relevant totals in the summary of all pathways. This is because in sections (A), (B) and (C) some individuals may be counted two or more times, for example someone who goes shore angling and consumes the catch.

U - Unknown

**Table 2. Typical food groups used in habits surveys**

Food group	Examples of foods within the group
Green vegetables	Asparagus, broccoli, Brussels sprout, cabbage, calabrese, cauliflower, chard, courgette, cucumber, gherkin, globe artichoke, herbs, kale, leaf beet, lettuce, marrow, spinach
Other vegetables	Aubergine, broad bean, chilli pepper, French bean, kohlrabi, mangetout, pea, pepper, pumpkin, runner bean, sweetcorn, tomato
Root vegetables	Beetroot, carrot, celeriac, celery, chicory, fennel, garlic, Jerusalem artichoke, leek, onion, parsnip, radish, shallot, spring onion, swede, turnip
Potato	Potato
Domestic fruit	Apple, apricot, blackberry, blackcurrant, boysenberry, cherry, damson, fig, gooseberry, grape, greengage, huckleberry, loganberry, melon, nectarine, peach, pear, plum, raspberry, redcurrant, rhubarb, rowanberry, strawberry, tayberry, whitecurrant
Milk	Cows' milk, cream, goats' milk, yoghurt
Cattle meat <sup>a</sup>	Beef
Pig meat <sup>a</sup>	Pork
Sheep meat <sup>a</sup>	Lamb, mutton
Poultry <sup>b</sup>	Chicken, duck, goose, grouse, guinea fowl, partridge, pheasant, pigeon, turkey, woodcock
Eggs	Chicken egg, duck egg, goose egg
Wild/free foods	Blackberry, chestnut, crab apple, damson, dandelion root, elderberry, nettle, rowanberry, sloe
Honey	Honey
Wild Fungi	Mushrooms, other edible fungi
Rabbits/Hares	Hare, rabbit
Venison <sup>a</sup>	Venison
Fish (sea)	Bass, brill, cod, common ling, dab, Dover sole, flounder, gurnard, haddock, hake, herring, lemon sole, mackerel, monkfish, mullet, plaice, pollack, rays, saithe, salmon, sea trout, sprat, turbot, whitebait, whiting, witch, cuttlefish <sup>c</sup> , squid <sup>c</sup>
Fish (freshwater)	Brown trout, eel (river), perch, pike, rainbow trout, salmon (river)
Crustaceans	Brown crab, common lobster, crawfish, <i>Nephrops</i> , prawn, shrimp, spider crab, squat lobster, velvet swimming crab
Molluscs	Cockles, limpets, mussels, oysters, razor clam, scallops, whelks, winkles
Wildfowl <sup>b</sup>	Canada goose, greylag goose, mallard, pink-footed goose, pintail, shoveler, teal, wigeon

**Notes**

<sup>a</sup> Including offal

<sup>b</sup> Domesticated ducks and geese are classified as poultry. Wild ducks and geese are classified as wildfowl.

<sup>c</sup> Although squid and cuttlefish are molluscs, radiologically they are more akin to fish.



**Table 3. Adults' consumption rates of fish from the Heysham aquatic survey area (kg y<sup>-1</sup>)**

Observation number	Bass	Cod	Dab	Dover sole	Eel	Flounder	Grey mullet	Mackerel	Plaice	Salmon	Sea trout	Thornback ray	Whitebait	Whiting	Total
121	4.9	-	-	-	-	4.4	-	-	-	-	-	-	-	-	9.3
122	4.9	-	-	-	-	4.4	-	-	-	-	-	-	-	-	9.3
123	4.9	-	-	-	-	4.4	-	-	-	-	-	-	-	-	9.3
383	-	-	-	-	-	-	-	-	-	2.9	6.3	-	-	-	9.2
327	3.2	6.0	-	-	-	-	-	-	-	-	-	-	-	-	9.2
278	9.0	-	-	-	-	-	-	-	-	-	-	-	-	-	9.0
279	9.0	-	-	-	-	-	-	-	-	-	-	-	-	-	9.0
280	9.0	-	-	-	-	-	-	-	-	-	-	-	-	-	9.0
281	9.0	-	-	-	-	-	-	-	-	-	-	-	-	-	9.0
349	1.8	3.4	-	-	-	1.7	-	-	1.1	-	-	-	-	0.7	8.9
350	1.8	3.4	-	-	-	1.7	-	-	1.1	-	-	-	-	0.7	8.9
533	-	-	-	-	-	4.1	-	-	4.0	-	-	-	-	-	8.0
535	-	-	-	-	-	4.1	-	-	4.0	-	-	-	-	-	8.0
792	-	-	-	-	-	7.7	-	-	-	-	-	-	-	-	7.7
793	-	-	-	-	-	7.7	-	-	-	-	-	-	-	-	7.7
794	-	-	-	-	-	7.7	-	-	-	-	-	-	-	-	7.7
795	-	-	-	-	-	7.7	-	-	-	-	-	-	-	-	7.7
87	2.0	2.0	1.0	-	-	-	-	-	1.3	-	-	-	-	0.9	7.2
90	2.0	2.0	1.0	-	-	-	-	-	1.3	-	-	-	-	0.9	7.2
115	1.3	-	-	-	-	5.4	-	-	-	-	-	-	-	-	6.7
116	1.3	-	-	-	-	5.4	-	-	-	-	-	-	-	-	6.7
788	-	-	-	-	-	6.6	-	-	-	-	-	-	-	-	6.6
599	-	-	-	-	-	-	4.2	-	2.0	-	-	-	-	-	6.2
600	-	-	-	-	-	-	4.2	-	2.0	-	-	-	-	-	6.2
601	-	-	-	-	-	-	4.2	-	2.0	-	-	-	-	-	6.2
803	-	-	-	1.1	-	1.5	-	-	1.5	-	-	-	-	1.9	6.0
804	-	-	-	1.1	-	1.5	-	-	1.5	-	-	-	-	1.9	6.0
91	1.0	1.0	1.0	-	-	-	-	-	1.3	-	-	-	-	0.9	5.2
92	1.0	1.0	1.0	-	-	-	-	-	1.3	-	-	-	-	0.9	5.2
496	-	-	-	-	-	1.7	-	-	0.8	2.0	0.5	-	-	-	4.9
497	-	-	-	-	-	1.7	-	-	0.8	2.0	0.5	-	-	-	4.9
442	0.9	-	-	-	-	-	0.7	-	-	2.6	0.6	-	-	-	4.9
443	0.9	-	-	-	-	-	0.7	-	-	2.6	0.6	-	-	-	4.9
444	0.9	-	-	-	-	-	0.7	-	-	2.6	0.6	-	-	-	4.9
846	-	-	-	-	-	-	-	-	1.6	1.6	1.6	-	-	-	4.8
847	-	-	-	-	-	-	-	-	1.6	1.6	1.6	-	-	-	4.8
527	0.5	-	-	-	-	4.1	-	-	0.2	-	-	-	-	-	4.7
528	0.5	-	-	-	-	4.1	-	-	0.2	-	-	-	-	-	4.7
529	0.5	-	-	-	-	4.1	-	-	0.2	-	-	-	-	-	4.7
107	-	-	-	-	-	2.4	-	-	2.3	-	-	-	-	-	4.7

**Table 3. Adults' consumption rates of fish from the Heysham aquatic survey area (kg y<sup>-1</sup>)**

Observation number	Bass	Cod	Dab	Dover sole	Eel	Flounder	Grey mullet	Mackerel	Plaice	Salmon	Sea trout	Thornback ray	Whitebait	Whiting	Total
108	-	-	-	-	-	2.4	-	-	2.3	-	-	-	-	-	4.7
109	-	-	-	-	-	2.4	-	-	2.3	-	-	-	-	-	4.7
110	-	-	-	-	-	2.4	-	-	2.3	-	-	-	-	-	4.7
111	-	-	-	-	-	2.4	-	-	2.3	-	-	-	-	-	4.7
112	-	-	-	-	-	2.4	-	-	2.3	-	-	-	-	-	4.7
113	-	-	-	-	-	2.4	-	-	2.3	-	-	-	-	-	4.7
114	-	-	-	-	-	2.4	-	-	2.3	-	-	-	-	-	4.7
493	-	-	-	-	-	-	-	4.6	-	-	-	-	-	-	4.6
519	2.8	-	-	-	-	-	-	-	1.0	-	-	-	-	-	3.8
20	-	-	-	-	-	-	-	-	3.6	-	-	-	-	-	3.6
500	-	-	-	-	-	-	-	3.4	-	-	-	-	-	-	3.4
501	-	-	-	-	-	-	-	3.4	-	-	-	-	-	-	3.4
379	-	-	-	-	-	-	-	-	-	3.3	-	-	-	-	3.3
380	-	-	-	-	-	-	-	-	-	3.3	-	-	-	-	3.3
381	-	-	-	-	-	-	-	-	-	3.3	-	-	-	-	3.3
382	-	-	-	-	-	-	-	-	-	3.3	-	-	-	-	3.3
347	0.9	1.2	-	-	-	0.4	-	-	-	-	-	-	-	0.5	3.0
348	0.9	1.2	-	-	-	0.4	-	-	-	-	-	-	-	0.5	3.0
462	-	-	-	-	-	2.7	-	-	-	-	-	-	-	-	2.7
789	-	-	-	-	-	2.6	-	-	-	-	-	-	-	-	2.6
790	-	-	-	-	-	2.6	-	-	-	-	-	-	-	-	2.6
77	1.5	-	-	-	-	1.0	-	-	-	-	-	-	-	-	2.5
78	1.5	-	-	-	-	1.0	-	-	-	-	-	-	-	-	2.5
132	-	-	-	-	-	1.2	-	-	1.2	-	-	-	-	-	2.3
133	-	-	-	-	-	1.2	-	-	1.2	-	-	-	-	-	2.3
509	-	-	-	-	-	-	-	2.3	-	-	-	-	-	-	2.3
272	-	-	-	-	-	2.0	-	-	-	-	-	-	-	-	2.0
498	-	-	-	-	-	2.0	-	-	-	-	-	-	-	-	2.0
499	-	-	-	-	-	2.0	-	-	-	-	-	-	-	-	2.0
269	-	-	-	-	-	-	-	-	2.0	-	-	-	-	-	2.0
270	-	-	-	-	-	-	-	-	2.0	-	-	-	-	-	2.0
271	-	-	-	-	-	-	-	-	2.0	-	-	-	-	-	2.0
808	-	-	0.6	-	0.6	0.5	-	-	-	-	-	-	-	-	1.7
459	0.8	-	-	-	-	0.8	-	-	-	-	-	-	-	-	1.6
460	0.8	-	-	-	-	0.8	-	-	-	-	-	-	-	-	1.6
796	0.8	-	-	-	-	0.8	-	-	-	-	-	-	-	-	1.6
797	0.8	-	-	-	-	0.8	-	-	-	-	-	-	-	-	1.6
780	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	1.5
782	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	1.5
798	1.2	-	-	-	-	0.1	-	-	0.1	-	-	-	-	-	1.4

**Table 3. Adults' consumption rates of fish from the Heysham aquatic survey area (kg y<sup>-1</sup>)**

Observation number	Bass	Cod	Dab	Dover sole	Eel	Flounder	Grey mullet	Mackerel	Plaice	Salmon	Sea trout	Thornback ray	Whitebait	Whiting	Total
799	1.2	-	-	-	-	0.1	-	-	0.1	-	-	-	-	-	1.4
448	-	-	-	-	-	-	-	1.3	-	-	-	-	-	-	1.3
449	-	-	-	-	-	-	-	1.3	-	-	-	-	-	-	1.3
807	-	-	-	-	-	0.5	-	-	0.5	-	-	-	-	-	1.0
231	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	0.7
232	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	0.7
233	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	0.7
234	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	0.7
225	-	-	0.3	-	-	-	-	-	-	-	-	-	-	-	0.3
800	-	-	-	-	-	0.3	-	-	-	-	-	-	-	-	0.3
801	-	-	-	-	-	0.3	-	-	-	-	-	-	-	-	0.3
787	-	-	-	-	-	0.3	-	-	-	-	-	-	-	-	0.3

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of fish based on the 23 high-rate adult consumers is 27.2 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 132 observations is 42.3 kg y<sup>-1</sup>

**Table 4. Adults' consumption rates of crustaceans from the Heysham aquatic survey area (kg y<sup>-1</sup>)**

Observation number	Brown shrimp	Common lobster	Total
<b>413</b>	<b>11.6</b>	<b>1.3</b>	<b>12.9</b>
<b>414</b>	<b>11.6</b>	<b>1.3</b>	<b>12.9</b>
<b>415</b>	<b>11.6</b>	<b>1.3</b>	<b>12.9</b>
<b>302</b>	<b>12.7</b>	-	<b>12.7</b>
<b>533</b>	<b>10.9</b>	-	<b>10.9</b>
<b>535</b>	<b>10.9</b>	-	<b>10.9</b>
<b>19</b>	<b>6.1</b>	-	<b>6.1</b>
<b>519</b>	<b>5.6</b>	-	<b>5.6</b>
516	3.6	-	3.6
517	3.6	-	3.6
849	3.3	-	3.3
850	3.3	-	3.3
851	3.3	-	3.3
521	3.3	-	3.3
20	2.7	-	2.7
303	2.7	-	2.7
422	2.0	-	2.0
423	2.0	-	2.0
500	1.6	0.2	1.8
431	1.7	-	1.7
432	1.7	-	1.7
420	1.6	-	1.6
421	1.6	-	1.6
501	1.6	-	1.6
527	1.1	-	1.1
528	1.1	-	1.1
529	1.1	-	1.1
846	0.5	-	0.5
847	0.5	-	0.5
515	-	0.4	0.4
427	0.1	-	0.1
428	0.1	-	0.1

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of crustaceans based on the 8 high-rate adult consumers is 10.6 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 32 observations is 12.9 kg y<sup>-1</sup>

**Table 5. Adults' consumption rates of molluscs from the Heysham aquatic survey area (kg y<sup>-1</sup>)**

Observation number	Cockle	Mussel	Pacific oyster	Whelk	Winkle	Total
<b>19</b>	<b>4.8</b>	<b>4.2</b>	-	-	-	<b>9.0</b>
<b>521</b>	<b>3.1</b>	<b>1.3</b>	-	-	-	<b>4.4</b>
849	-	2.6	-	-	-	2.6
850	-	2.6	-	-	-	2.6
851	-	2.6	-	-	-	2.6
20	2.4	-	-	-	-	2.4
280	1.7	0.3	-	-	0.4	2.4
281	1.7	0.3	-	-	0.4	2.4
420	-	2.0	-	-	-	2.0
421	-	2.0	-	-	-	2.0
422	-	1.4	-	-	-	1.4
423	-	1.4	-	-	-	1.4
500	-	0.8	-	-	-	0.8
501	-	0.8	-	-	-	0.8
511	0.5	-	-	-	-	0.5
512	0.5	-	-	-	-	0.5
513	0.5	-	-	-	-	0.5
514	0.5	-	-	-	-	0.5
515	-	-	-	0.4	-	0.4
284	-	0.4	-	-	-	0.4
533	-	-	0.2	-	-	0.2
535	-	-	0.2	-	-	0.2

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of molluscs based on the 2 high-rate adult consumers is 6.7 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 22 observations is 6.6 kg y<sup>-1</sup>

**Table 6. Adults' consumption rates of wildfowl from the Heysham aquatic survey area (kg y<sup>-1</sup>)**

Observation number	Canada goose	Greylag goose	Mallard	Pink-footed goose	Pintail	Shoveler	Snipe	Teal	Wigeon	Total
<b>301</b>	<b>2.8</b>	<b>4.4</b>	<b>3.6</b>	<b>6.8</b>	-	-	-	<b>1.3</b>	<b>2.8</b>	<b>21.7</b>
<b>383</b>	-	-	<b>2.7</b>	<b>6.8</b>	-	-	-	<b>1.0</b>	<b>2.1</b>	<b>12.6</b>
<b>846</b>	-	<b>5.5</b>	<b>0.9</b>	<b>4.3</b>	-	-	-	<b>0.2</b>	<b>0.5</b>	<b>11.4</b>
<b>847</b>	-	<b>5.5</b>	<b>0.9</b>	<b>4.3</b>	-	-	-	<b>0.2</b>	<b>0.5</b>	<b>11.4</b>
<b>509</b>	-	-	<b>5.6</b>	-	<b>4.4</b>	-	-	-	-	<b>10.0</b>
<b>510</b>	-	-	<b>5.6</b>	-	<b>4.4</b>	-	-	-	-	<b>10.0</b>
422	-	-	1.1	4.3	0.9	-	-	0.4	-	6.7
423	-	-	1.1	4.3	0.9	-	-	0.4	-	6.7
849	-	4.4	1.8	-	-	-	-	-	-	6.2
850	-	4.4	1.8	-	-	-	-	-	-	6.2
851	-	4.4	1.8	-	-	-	-	-	-	6.2
379	-	-	-	2.6	-	-	-	0.8	1.8	5.1
380	-	-	-	2.6	-	-	-	0.8	1.8	5.1
381	-	-	-	2.6	-	-	-	0.8	1.8	5.1
382	-	-	-	2.6	-	-	-	0.8	1.8	5.1
295	0.5	0.7	0.9	1.1	-	0.1	0.1	0.3	0.6	4.3
296	0.5	0.7	0.9	1.1	-	0.1	0.1	0.3	0.6	4.3
297	0.5	0.7	0.9	1.1	-	0.1	0.1	0.3	0.6	4.3
298	0.5	0.7	0.9	1.1	-	0.1	0.1	0.3	0.6	4.3
299	0.5	0.7	0.9	1.1	-	0.1	0.1	0.3	0.6	4.3
300	0.5	0.7	0.9	1.1	-	0.1	0.1	0.3	0.6	4.3
442	-	0.6	-	-	-	-	-	-	-	0.6
443	-	0.6	-	-	-	-	-	-	-	0.6
444	-	0.6	-	-	-	-	-	-	-	0.6
527	-	-	0.1	-	-	-	-	-	-	0.1
528	-	-	0.1	-	-	-	-	-	-	0.1
529	-	-	0.1	-	-	-	-	-	-	0.1

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of wildfowl based on the 6 high-rate adult consumers is 12.8 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 27 observations is 15.8 kg y<sup>-1</sup>

**Table 7. Adults' consumption rates of marine plants/algae from the Heysham aquatic survey area (kg y<sup>-1</sup>)**

<b>Observation number</b>	<b>Samphire</b>
<b>841</b>	<b>2.3</b>
<b>842</b>	<b>2.3</b>
<b>849</b>	<b>1.7</b>
<b>850</b>	<b>1.7</b>
<b>851</b>	<b>1.7</b>
<b>494</b>	<b>0.8</b>
<b>495</b>	<b>0.8</b>
521	0.6
413	0.5
379	0.4
374	0.3
375	0.3
427	0.3
428	0.3
493	0.2

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of marine plants/algae based on the 7 high-rate adult consumers is 1.6 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 15 observations is 2.3 kg y<sup>-1</sup>

**Table 8. Adults' consumption rates of salt marsh grazed sheep meat from the Heysham aquatic survey area (kg y<sup>-1</sup>)**

<b>Observation number</b>	<b>Salt marsh grazed lamb</b>
<b>379</b>	<b>17.0</b>
<b>380</b>	<b>17.0</b>
<b>381</b>	<b>17.0</b>
<b>382</b>	<b>17.0</b>
<b>431</b>	<b>8.5</b>
<b>432</b>	<b>8.5</b>
<b>374</b>	<b>6.8</b>
<b>375</b>	<b>6.8</b>
<b>376</b>	<b>6.8</b>
<b>377</b>	<b>6.8</b>
<b>378</b>	<b>6.8</b>
<b>368</b>	<b>5.7</b>
<b>369</b>	<b>5.7</b>
<b>370</b>	<b>5.7</b>
<b>371</b>	<b>5.7</b>
<b>372</b>	<b>5.7</b>
<b>373</b>	<b>5.7</b>
<b>522</b>	<b>5.7</b>
<b>524</b>	<b>5.7</b>
427	2.8
428	2.8

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of salt marsh grazed sheep based on the 19 high-rate adult consumers is 8.6 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 21 observations is 17.0 kg y<sup>-1</sup>

**Table 9. Children's and infants' consumption rates of fish from the Heysham aquatic survey area (kg y<sup>-1</sup>)**

**Child age group (6 - 15 years old)**

Observation number	Age	Bass	Cod	Dover sole	Flounder	Grey mullet	Plaice	Salmon	Sea trout	Whiting	Total
<b>117</b>	<b>8</b>	<b>1.3</b>	-	-	<b>5.4</b>	-	-	-	-	-	<b>6.7</b>
<b>118</b>	<b>6</b>	<b>1.3</b>	-	-	<b>5.4</b>	-	-	-	-	-	<b>6.7</b>
<b>351</b>	<b>9</b>	<b>1.4</b>	<b>2.6</b>	-	<b>1.3</b>	-	<b>0.9</b>	-	-	<b>0.6</b>	<b>6.7</b>
<b>352</b>	<b>6</b>	<b>1.4</b>	<b>2.6</b>	-	<b>1.3</b>	-	<b>0.9</b>	-	-	<b>0.6</b>	<b>6.7</b>
<b>445</b>	<b>15</b>	<b>0.9</b>	-	-	-	<b>0.7</b>	-	<b>2.6</b>	<b>0.6</b>	-	<b>4.9</b>
<b>530</b>	<b>12</b>	<b>0.5</b>	-	-	<b>4.1</b>	-	<b>0.2</b>	-	-	-	<b>4.7</b>
461	12	0.8	-	-	0.8	-	-	-	-	-	1.6
235	15	0.7	-	-	-	-	-	-	-	-	0.7
236	7	0.5	-	-	-	-	-	-	-	-	0.5

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of fish for the child age group based upon the 6 high-rate consumers is 6.1 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 9 observations is 6.7 kg y<sup>-1</sup>

**Infant age group (0 - 5 years old)**

Observation number	Age	Bass	Cod	Dover sole	Flounder	Grey mullet	Plaice	Salmon	Sea trout	Whiting	Total
<b>518</b>	<b>3</b>	<b>3.4</b>	-	<b>1.7</b>	<b>1.2</b>	-	<b>1.2</b>	-	-	-	<b>7.5</b>
802	2	-	-	-	0.1	-	-	-	-	-	0.1

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of fish for the infant age group based upon the only high-rate consumer is 7.5 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 2 observations is 7.3 kg y<sup>-1</sup>

**Table 10. Children's and infants' consumption rates of crustaceans from the Heysham aquatic survey area (kg y<sup>-1</sup>)**

**Child age group (6 - 15 years old)**

<b>Observation number</b>	<b>Age</b>	<b>Brown shrimp</b>
<b>530</b>	<b>12</b>	<b>1.1</b>

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of crustaceans for the child age group based upon the only high-rate consumer is 1.1 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate is not applicable for 1 observation

**Infant age group (0 - 5 years old)**

<b>Observation number</b>	<b>Age</b>	<b>Brown shrimp</b>
<b>518</b>	<b>3</b>	<b>1.8</b>

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of crustaceans for the infant age group based upon the only high-rate consumer is 1.8 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate is not applicable for 1 observation

**Table 11. Children's consumption rates of wildfowl from the Heysham aquatic survey area (kg y<sup>-1</sup>)**

**Child age group (6 - 15 years old)**

<b>Observation number</b>	<b>Age</b>	<b>Greylag goose</b>	<b>Mallard</b>	<b>Total</b>
<b>445</b>	<b>15</b>	<b>0.6</b>	-	<b>0.6</b>
530	12	-	0.1	0.1

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of wildfowl for the child age group based upon the only high-rate consumer is 0.6 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 2 observations is 0.5 kg y<sup>-1</sup>

**Table 12. Children's consumption rates of salt marsh grazed sheep meat from the Heysham aquatic survey area (kg y<sup>-1</sup>)**

**Child age group (6 - 15 years old)**

<b>Observation number</b>	<b>Age</b>	<b>Salt marsh grazed lamb</b>
<b>523</b>	<b>12</b>	<b>5.7</b>
<b>525</b>	<b>14</b>	<b>5.7</b>

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of saltmarsh grazed sheep for the child age group based upon the 2 high-rate consumers is 5.7 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 2 observations is 5.7 kg y<sup>-1</sup>

**Table 13. Adults' intertidal occupancy rates in the Heysham aquatic survey area (h y<sup>-1</sup>)**

Observation number	Location	Activity	Mud	Mud and sand	Rock	Salt marsh	Sand	Sand and stones	Stones	Boat on mud
516	Aldingham, Morecambe and Knott End	Collecting mussels	360	-	-	-	-	-	-	-
	Morecambe Bay	Setting nets	-	-	-	-	759	-	-	-
	Kent Estuary	Lave netting	-	-	-	-	-	-	-	-
293	Walney Channel	Collecting seaweed	-	-	-	-	-	15	-	-
291	Cockerham Marsh	Wildfowling	348	-	-	-	-	-	-	-
292	Cockerham Marsh	Wildfowling	340	-	-	-	-	-	-	-
422	Cockerham Marsh	Wildfowling	340	-	-	-	-	-	-	-
	Heysham	Collecting mussels	-	-	-	-	-	-	-	-
	Cockerham Marsh and Pilling Marsh	Wildfowling	224	-	-	-	-	-	-	-
521	Wyre Estuary	Elver fishing	-	-	-	-	-	-	-	-
	Foulney Island and Half Moon Bay	Collecting mussels	210	-	-	-	-	-	-	-
	Morecambe Bay	Tractor fishing	-	-	-	-	178	-	-	-
509	Kent Estuary	Lave netting and collecting samphire	-	-	-	-	-	-	-	-
301	Various marshes on Walney Island	Wildfowling	200	-	-	-	-	-	-	-
295	Cockerham Marsh	Wildfowling	138	-	-	-	-	-	-	-
519	Cockerham Marsh	Wildfowling	100	-	-	-	-	-	-	-
	Morecambe and near Foulney Island	Collecting mussels	98	-	-	-	-	-	-	-
	Morecambe Bay	Tractor fishing and setting nets	-	-	-	-	1269	-	-	-
520	Kent Estuary	Lave netting	-	-	-	-	-	-	-	-
	Morecambe and near Foulney Island	Collecting mussels	98	-	-	-	-	-	-	-
	Morecambe Bay	Tractor fishing and setting nets	-	-	-	-	1269	-	-	-
446	Kent Estuary	Lave netting	-	-	-	-	-	-	-	-
447	North of Jubilee Bridge, Walney Island	Boat maintenance	80	-	-	-	-	-	-	720
294	North of Jubilee Bridge, Walney Island	Boat maintenance	80	-	-	-	-	-	-	720
533	Cockerham Marsh	Wildfowling	48	-	-	-	-	-	-	-
534	Foulney Island	Collecting mussels	27	-	-	-	-	-	-	-
	Morecambe Bay	Tractor fishing and setting nets	-	-	-	-	126	-	-	-
231	Foulney Island	Collecting mussels	27	-	-	-	-	-	-	-
	Morecambe Bay	Tractor fishing and setting nets	-	-	-	-	126	-	-	-
493	Morecambe and Heysham	Long-lining	-	350	-	-	-	-	-	-
302	Between Roa Island and Rampside	Walking and collecting samphire	-	182	-	-	-	-	-	-
459	Morecambe	Boat maintenance and walking	-	104	-	-	-	-	-	-
460	Arnside	Shore angling	-	54	-	-	-	-	-	-
	Red Nab	Shore angling	-	-	-	-	54	-	-	-
526	Arnside	Shore angling	-	54	-	-	-	-	-	-
	Red Nab	Shore angling	-	-	-	-	54	-	-	-
269	Walney Channel	Bait digging	-	36	-	-	-	-	-	-
271	Arnside	Shore angling	-	26	-	-	-	-	-	-
21	Arnside	Shore angling	-	26	-	-	-	-	-	-
	Arnside	Metal detecting	-	20	-	-	-	-	-	-
420	Morecambe	Metal detecting	-	-	-	-	40	-	-	-
	Heysham	Collecting mussels and winkles	-	16	-	-	-	-	-	-
421	Middleton Sands	Collecting cockles	-	-	-	-	-	-	-	-
	Heysham	Collecting mussels and winkles	-	16	-	-	-	-	-	-
124	Middleton Sands	Collecting cockles	-	-	-	-	-	-	-	-
	Arnside	Shore angling	-	12	-	-	-	-	-	-

**Table 13. Adults' intertidal occupancy rates in the Heysham aquatic survey area (h y<sup>-1</sup>)**

Observation number	Location	Activity	Mud	Mud and sand	Rock	Salt marsh	Sand	Sand and stones	Stones	Boat on mud
849	Heysham	Collecting mussels	-	10	-	-	-	-	-	-
	Lune Estuary	Haaf netting and collecting samphire	-	-	-	-	30	-	-	-
	<b>Jenny Brown's Point and Silverdale</b>	<b>Shore angling</b>	-	-	<b>350</b>	-	-	-	-	-
<b>780</b>	Silverdale	Shore angling	-	-	-	-	90	-	-	-
		Shore angling	-	-	-	-	-	-	90	-
<b>77</b>	<b>Morecambe</b>	<b>Shore angling</b>	-	-	<b>260</b>	-	-	-	-	-
		Bait digging	-	-	-	-	52	-	-	-
<b>136</b>	<b>Red Nab</b>	<b>Bird watching</b>	-	-	<b>173</b>	-	-	-	-	-
137	Red Nab	Bird watching	-	-	35	-	-	-	-	-
138	Red Nab	Bird watching	-	-	35	-	-	-	-	-
139	Red Nab	Bird watching	-	-	35	-	-	-	-	-
140	Red Nab	Bird watching	-	-	35	-	-	-	-	-
141	Red Nab	Bird watching	-	-	35	-	-	-	-	-
142	Red Nab	Bird watching	-	-	35	-	-	-	-	-
<b>832</b>	<b>Hazelslack Marsh</b>	<b>Turf cutting</b>	-	-	-	<b>840</b>	-	-	-	-
	<b>Bazil Point and Sunderland Point</b>	<b>Dog walking</b>	-	-	-	<b>520</b>	-	-	-	-
<b>846</b>	Lune Estuary	Haaf netting	-	-	-	-	48	-	-	-
	Morecambe Bay near Lune Estuary	Fyke netting	-	-	-	-	-	-	-	-
<b>833</b>	<b>Hazelslack Marsh</b>	<b>Turf cutting</b>	-	-	-	<b>336</b>	-	-	-	-
<b>834</b>	<b>Hazelslack Marsh</b>	<b>Turf cutting</b>	-	-	-	<b>336</b>	-	-	-	-
368	Pilling Marsh	Tending livestock	-	-	-	238	-	-	-	-
370	Pilling Marsh	Tending livestock	-	-	-	200	-	-	-	-
16	Hest Bank	Dog walking	-	-	-	156	-	-	-	-
522	Sand Gate Marsh near Flookburgh	Tending livestock and dog walking	-	-	-	127	-	-	-	-
		Dog walking and riding in a vehicle	-	-	-	-	221	-	-	-
381	Glasson Marsh	Tending livestock	-	-	-	110	-	-	-	-
374	Cockerham Marsh	Tending livestock and collecting samphire	-	-	-	92	-	-	-	-
798	Silverdale	Shore angling	-	-	-	64	-	-	-	-
831	Marsh near Bolton-le-Sands	Tending livestock	-	-	-	60	-	-	-	-
431	Aldcliffe Marsh and Colloway Marsh	Tending livestock	-	-	-	52	-	-	-	-
433	Aldcliffe Marsh and Colloway Marsh	Tending livestock	-	-	-	52	-	-	-	-
434	Aldcliffe Marsh and Colloway Marsh	Tending livestock	-	-	-	52	-	-	-	-
10	Heaton Marsh	Tending livestock	-	-	-	46	-	-	-	-
11	Heaton Marsh	Tending livestock	-	-	-	46	-	-	-	-
12	Heaton Marsh	Tending livestock	-	-	-	46	-	-	-	-
13	Heaton Marsh	Tending livestock	-	-	-	46	-	-	-	-
524	Sand Gate Marsh near Flookburgh	Dog walking	-	-	-	30	-	-	-	-
		Dog walking	-	-	-	-	30	-	-	-
427	Bolton-le-Sands	Dog walking and collecting samphire	-	-	-	26	-	-	-	-
		Dog walking	-	-	-	-	26	-	-	-
428	Bolton-le-Sands	Dog walking and collecting samphire	-	-	-	26	-	-	-	-
		Dog walking	-	-	-	-	26	-	-	-

**Table 13. Adults' intertidal occupancy rates in the Heysham aquatic survey area (h y<sup>-1</sup>)**

Observation number	Location	Activity	Mud	Mud and sand	Rock	Salt marsh	Sand	Sand and stones	Stones	Boat on mud
841	Grange-over-Sands	Leading guided walks and collecting samphire	-	-	-	25	-	-	-	-
	Grange-over-Sands	Setting nets	-	-	-	-	179	-	-	-
	Morecambe Bay	Leading guided walks	-	-	-	-	-	-	-	-
845	Grange-over-Sands	Leading guided walks	-	-	-	25	-	-	-	-
	Morecambe Bay	Leading guided walks	-	-	-	-	75	-	-	-
792	Sand Gate Marsh near Flookburgh	Shore angling	-	-	-	21	-	-	-	-
	Jenny Brown's Point	Shore angling	-	-	-	-	10	-	-	-
		Shore angling	-	-	-	-	-	-	50	-
287	Lune Estuary	Tending livestock	-	-	-	18	-	-	-	-
289	Lune Estuary	Tending livestock	-	-	-	18	-	-	-	-
843	Grange-over-Sands	Leading guided walks	-	-	-	13	-	-	-	-
	Morecambe Bay	Leading guided walks	-	-	-	-	38	-	-	-
844	Grange-over-Sands	Leading guided walks	-	-	-	13	-	-	-	-
	Morecambe Bay	Leading guided walks	-	-	-	-	38	-	-	-
800	Silverdale	Shore angling	-	-	-	12	-	-	-	-
14	Hest Bank	Playing	-	-	-	10	-	-	-	-
17	Hest Bank and Bolton-le-Sands	Dog walking	-	-	-	5	-	-	-	-
	Morecambe	Dog walking	-	-	-	-	5	-	-	-
18	Hest Bank and Bolton-le-Sands	Dog walking	-	-	-	5	-	-	-	-
	Morecambe	Dog walking	-	-	-	-	5	-	-	-
379	Glasson Marsh	Collecting samphire	-	-	-	4	-	-	-	-
413	Wyre Estuary	Collecting samphire	-	-	-	2	-	-	-	-
	Wyre Light	Bait digging	-	-	-	-	34	-	-	-
	Fleetwood	Shore angling	-	-	-	-	-	60	-	-
<b>531</b>	<b>Offshore of Roosebeck</b>	<b>Oyster farming</b>	-	-	-	-	<b>637</b>	-	-	-
<b>532</b>	<b>Offshore of Roosebeck</b>	<b>Oyster farming</b>	-	-	-	-	<b>637</b>	-	-	-
<b>527</b>	<b>Morecambe Bay</b>	<b>Tractor fishing and leading guided walks</b>	-	-	-	-	<b>532</b>	-	-	-
	<b>Near Canal Foot</b>	<b>Setting nets and lave netting</b>	-	-	-	-	-	-	-	-
<b>599</b>	<b>Off Hest Bank</b>	<b>Setting nets</b>	-	-	-	-	<b>456</b>	-	-	-
	<b>Hest Bank to Humphrey Head</b>	<b>Leading guided walks</b>	-	-	-	-	-	-	-	-
<b>19</b>	<b>Morecambe to Heysham</b>	<b>Setting nets, bait digging, collecting cockles and mussels</b>	-	-	-	-	<b>423</b>	-	-	-
454	Between Rampside and Roosebeck	Dog walking	-	-	-	-	365	-	-	-
455	Between Rampside and Roosebeck	Dog walking	-	-	-	-	365	-	-	-
329	Fleetwood and Knott End	Kite-buggying	-	-	-	-	312	-	-	-
330	Fleetwood and Knott End	Kite-buggying	-	-	-	-	260	-	-	-
331	Fleetwood and Knott End	Kite-buggying	-	-	-	-	260	-	-	-
353	Knott End	Dog walking	-	-	-	-	182	-	-	-
<b>327</b>	Wyre Light	Bait digging	-	-	-	-	175	-	-	-
	<b>Fleetwood</b>	<b>Shore angling and collecting peeler crabs</b>	-	-	-	-	-	<b>650</b>	-	-
<b>349</b>	Knott End	Bait digging	-	-	-	-	150	-	-	-
	<b>Fleetwood</b>	<b>Shore angling</b>	-	-	-	-	-	<b>400</b>	-	-
453	Roa Island Causeway	Dog walking	-	-	-	-	110	-	-	-
452	Rampside	Dog walking	-	-	-	-	104	-	-	-
<b>326</b>	Wyre Light	Bait digging	-	-	-	-	100	-	-	-
	<b>Fleetwood</b>	<b>Shore angling</b>	-	-	-	-	-	<b>280</b>	-	-
809	Half Moon Bay	Dog walking	-	-	-	-	81	-	-	-

**Table 13. Adults' intertidal occupancy rates in the Heysham aquatic survey area (h y<sup>-1</sup>)**

Observation number	Location	Activity	Mud	Mud and sand	Rock	Salt marsh	Sand	Sand and stones	Stones	Boat on mud
810	Half Moon Bay	Dog walking	-	-	-	-	81	-	-	-
354	Knott End	Dog walking	-	-	-	-	75	-	-	-
355	Knott End	Dog walking	-	-	-	-	75	-	-	-
457	Newbiggin	Bait digging	-	-	-	-	72	-	-	-
458	Newbiggin	Bait digging	-	-	-	-	72	-	-	-
20	Morecambe	Setting nets and collecting cockles	-	-	-	-	66	-	-	-
818	Red Nab	Bait digging	-	-	-	-	54	-	-	-
383	Lune Estuary	Haaf netting	-	-	-	-	40	-	-	-
89	Morecambe	Dog walking	-	-	-	-	36	-	-	-
73	Morecambe	Shore angling and bait digging	-	-	-	-	30	-	-	-
109	Morecambe	Bait digging	-	-	-	-	28	-	-	-
93	Half Moon Bay	Bait digging and collecting cockles	-	-	-	-	24	-	-	-
	Morecambe	Maintaining boat launching track	-	-	-	-	-	-	-	-
70	Morecambe	Sitting on the beach and playing	-	-	-	-	24	-	-	-
345	Knott End	Bait digging	-	-	-	-	24	-	-	-
346	Knott End	Bait digging	-	-	-	-	24	-	-	-
456	Newbiggin	Bait digging	-	-	-	-	21	-	-	-
94	Half Moon Bay	Bait digging	-	-	-	-	18	-	-	-
	Morecambe	Maintaining boat launching track	-	-	-	-	-	-	-	-
1	Half Moon Bay	Dog walking	-	-	-	-	15	-	-	-
2	Half Moon Bay	Dog walking	-	-	-	-	15	-	-	-
817	Half Moon Bay	Nature watching	-	-	-	-	12	-	-	-
67	Morecambe	Walking	-	-	-	-	8	-	-	-
68	Morecambe	Walking	-	-	-	-	8	-	-	-
511	Near Piel Island	Collecting cockles	-	-	-	-	5	-	-	-
512	Near Piel Island	Collecting cockles	-	-	-	-	5	-	-	-
513	Near Piel Island	Collecting cockles	-	-	-	-	5	-	-	-
514	Near Piel Island	Collecting cockles	-	-	-	-	5	-	-	-
785	Arnside	Shore angling	-	-	-	-	4	-	-	-
786	Arnside	Shore angling	-	-	-	-	4	-	-	-
788	Silverdale	Shore angling	-	-	-	-	4	-	-	-
		Shore angling	-	-	-	-	-	-	18	-
796	Silverdale	Walking	-	-	-	-	2	-	-	-
	<b>Jenny Brown's Point</b>	<b>Shore angling</b>	-	-	-	-	-	-	<b>168</b>	-
797	Silverdale	Walking	-	-	-	-	2	-	-	-
	<b>Jenny Brown's Point</b>	<b>Shore angling</b>	-	-	-	-	-	-	<b>168</b>	-
384	<b>Fleetwood</b>	<b>Shore angling</b>	-	-	-	-	-	<b>546</b>	-	-
340	<b>Fleetwood</b>	<b>Dog walking</b>	-	-	-	-	-	<b>365</b>	-	-
339	<b>Fleetwood</b>	<b>Dog walking</b>	-	-	-	-	-	<b>243</b>	-	-
820	Half Moon Bay	Dog walking	-	-	-	-	-	156	-	-
822	Half Moon Bay	Dog walking	-	-	-	-	-	156	-	-
83	Morecambe	Coastguard duties	-	-	-	-	-	100	-	-
84	Morecambe	Coastguard duties	-	-	-	-	-	100	-	-
85	Morecambe	Coastguard duties	-	-	-	-	-	100	-	-
86	Morecambe	Coastguard duties	-	-	-	-	-	100	-	-
87	Morecambe	Coastguard duties	-	-	-	-	-	100	-	-

**Table 13. Adults' intertidal occupancy rates in the Heysham aquatic survey area (h y<sup>-1</sup>)**

Observation number	Location	Activity	Mud	Mud and sand	Rock	Salt marsh	Sand	Sand and stones	Stones	Boat on mud
88	Morecambe	Coastguard duties	-	-	-	-	-	100	-	-
333	Fleetwood	Lifeguard duties	-	-	-	-	-	83	-	-
334	Fleetwood	Lifeguard duties	-	-	-	-	-	83	-	-
335	Fleetwood	Lifeguard duties	-	-	-	-	-	83	-	-
336	Fleetwood	Lifeguard duties	-	-	-	-	-	83	-	-
337	Fleetwood	Lifeguard duties	-	-	-	-	-	83	-	-
338	Fleetwood	Lifeguard duties	-	-	-	-	-	83	-	-
79	Morecambe	Dog walking	-	-	-	-	-	52	-	-
106	Half Moon Bay	Dog walking	-	-	-	-	-	52	-	-
273	Half Moon Bay	Collecting peeler crabs	-	-	-	-	-	40	-	-
105	Half Moon Bay	Dog walking	-	-	-	-	-	25	-	-
328	Fleetwood	Shore angling	-	-	-	-	-	18	-	-
<b>791</b>	<b>Jenny Brown's Point</b>	<b>Dog walking</b>	-	-	-	-	-	-	<b>322</b>	-
<b>783</b>	<b>Silverdale</b>	<b>Dog walking</b>	-	-	-	-	-	-	<b>169</b>	-

**Notes**

Emboldened observations are the high-rate individuals

The mean intertidal occupancy rate over mud based on 8 high-rate observations is 270 h y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 16 observations for mud is 356 h y<sup>-1</sup>

The mean intertidal occupancy rate over mud and sand based on 2 high-rate observations is 266 h y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 13 observations for mud and sand is 300 h y<sup>-1</sup>

The mean intertidal occupancy rate over rock based on 3 high-rate observations is 261 h y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 9 observations for rock is 332 h y<sup>-1</sup>

The mean intertidal occupancy rate over salt marsh based on 4 high-rate observations is 508 h y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 35 observations for salt marsh is 568 h y<sup>-1</sup>

The mean intertidal occupancy rate over sand based on 8 high-rate observations is 748 h y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 73 observations for sand is 861 h y<sup>-1</sup>

The mean intertidal occupancy rate over sand and stones based on 6 high-rate observations is 414 h y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 26 observations for sand and stones is 585 h y<sup>-1</sup>

The mean intertidal occupancy rate over stones based on 4 high-rate observations is 207 h y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 8 observations for stones is 295 h y<sup>-1</sup>

The mean intertidal occupancy rate on board a boat resting on mud based on 2 high-rate observations is 720 h y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 2 observations on board a boat resting on mud is 720 h y<sup>-1</sup>

**Table 14. Children's and infants' intertidal occupancy rates in the Heysham aquatic survey area (h y<sup>-1</sup>)**

**Child age group (6 - 15 years old)**

Observation number	Age	Location	Activity	Mud and sand	Salt marsh	Sand	Sand and stones	Stones
<b>461</b>	<b>12</b>	<b>Arnside</b>	<b>Shore angling</b>	<b>54</b>	-	-	-	-
		West of Red Nab	Shore angling	-	-	54	-	-
<b>523</b>	<b>12</b>	<b>Sand Gate Marsh near Flookburgh</b>	<b>Tending livestock and dog walking</b>	-	<b>127</b>	-	-	-
			<b>Dog walking and riding in a vehicle</b>	-	-	<b>221</b>	-	-
525	14	Sand Gate Marsh near Flookburgh	Dog walking	-	30	30	-	-
15	8	Hest Bank	Playing	-	10	-	-	-
71	6	Morecambe	Playing	-	-	24	-	-
72	8	Morecambe	Playing	-	-	24	-	-
69	10	Morecambe	Horse riding	-	-	8	-	-
<b>823</b>	<b>14</b>	<b>Half Moon Bay</b>	<b>Dog walking</b>	-	-	-	<b>156</b>	-
<b>784</b>	<b>13</b>	<b>Silverdale</b>	<b>Dog walking</b>	-	-	-	-	<b>58</b>

**Notes**

Emboldened observations are the high-rate individuals

The mean intertidal occupancy rate over mud and sand based on the only observation is 54 h y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate is not applicable for 1 observation

The mean intertidal occupancy rate over salt marsh based on 1 high-rate observations is 127 h y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 3 observations for salt marsh is 122 h y<sup>-1</sup>

The mean intertidal occupancy rate over sand based on 1 high-rate observations is 221 h y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 6 observations for sand is 200 h y<sup>-1</sup>

The mean intertidal occupancy rate over sand and stones based on the only observation is 156 h y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate is not applicable for 1 observation

The mean intertidal occupancy rate over stones based on the only observation is 58 h y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate is not applicable for 1 observation

**Infant age group (0 - 5 years old)**

Observation number	Age	Location	Activity	Mud and sand	Salt marsh	Sand	Sand and stones	Stones
<b>781</b>	<b>5</b>	<b>Silverdale</b>	<b>Playing</b>	-	-	<b>2</b>	-	<b>2</b>

**Notes**

The mean intertidal occupancy rate over sand based on the only observation is 2 h y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate is not applicable for 1 observation

The mean intertidal occupancy rate over stones based on the only observation is 2 h y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate is not applicable for 1 observation

**Table 15. Gamma dose rate measurements over intertidal substrates in the Heysham aquatic survey area ( $\mu\text{Gy h}^{-1}$ )**

<b>Location</b>	<b>NGR</b>	<b>Substrate</b>	<b>Gamma dose rate at 1 metre<sup>a</sup></b>
Walney Island	SD 186 688	Mud	0.090
Roa Island Causeway	SD 234 654	Mud and sand	0.085
Newbiggin	SD 268 689	Sand	0.066
Sand Gate	SD 352 755	Sand	0.076
Silverdale	SD 454 749	Sand	0.070
Silverdale	SD 457 749	Stones	0.058
Hest Bank	SD 467 667	Salt marsh	0.076
Morecambe	SD 440 649	Sand	0.058
Morecambe	SD 434 646	Sand	0.069
Morecambe	SD 424 638	Salt marsh	0.080
Half Moon Bay	SD 408 608	Sand	0.056
Middleton Sands	SD 410 570	Sand	0.074
Cockerham Marsh	SD 440 526	Salt marsh	0.088
Knott End	SD 347 489	Sand	0.064
Fleetwood	SD 331 484	Sand	0.065

**Notes**

<sup>a</sup> These measurements have not been adjusted for natural background dose rates.

**Table 16. Adults' handling rates of fishing gear and sediment in the Heysham aquatic survey area (h y<sup>-1</sup>)**

Observation number	Location	Activity	Fishing gear	Sediment
19	<b>Morecambe Bay</b>	<b>Handling nets</b>	<b>964</b>	-
	Morecambe to Heysham	Bait digging, collecting cockles and mussels	-	59
519	<b>Morecambe Bay and Kent Estuary</b>	<b>Handling nets</b>	<b>672</b>	-
	Morecambe and near Foulney Island	Collecting mussels	-	98
520	<b>Morecambe Bay and Kent Estuary</b>	<b>Handling nets</b>	<b>672</b>	-
	Morecambe and near Foulney Island	Collecting mussels	-	98
420	<b>Morecambe Bay and Lune Estuary</b>	<b>Handling nets</b>	<b>602</b>	-
	Heysham	Collecting mussels and winkles	-	16
	Middleton Sands	Collecting cockles	-	
421	<b>Morecambe Bay and Lune Estuary</b>	<b>Handling nets</b>	<b>602</b>	-
	Heysham	Collecting mussels and winkles	-	16
	Middleton Sands	Collecting cockles	-	
422	<b>Morecambe Bay, Wyre Estuary and Lune Estuary</b>	<b>Handling nets</b>	<b>583</b>	-
	Cockerham Marsh and Pilling Marsh	Wildfowling	-	160
	Heysham	Collecting mussels	-	
416	<b>Lune Estuary</b>	<b>Handling nets</b>	<b>578</b>	-
527	<b>Morecambe Bay</b>	<b>Handling nets</b>	<b>517</b>	-
846	<b>Morecambe Bay and Lune Estuary</b>	<b>Handling nets</b>	<b>436</b>	-
516	<b>Morecambe Bay and Kent Estuary</b>	<b>Handling nets</b>	<b>398</b>	-
	<b>Aldingham, Morecambe and Knott End</b>	<b>Collecting mussels</b>	-	375
	<b>Walney Channel</b>	<b>Collecting seaweed</b>	-	
383	<b>Lune Estuary</b>	<b>Handling nets</b>	<b>390</b>	-
413	Morecambe Bay and Wyre Estuary	Handling nets and pots	306	-
	Wyre Light	Bait digging	-	34
414	Morecambe Bay and Wyre Estuary	Handling nets	306	-
848	Lune Estuary	Handling nets	300	-
849	Lune Estuary	Handling nets	290	-
	Heysham	Collecting mussels	-	10
521	Morecambe Bay and Kent Estuary	Handling nets	226	-
	Foulney Island and Half Moon Bay	Collecting mussels	-	210
302	Morecambe	Handling nets	224	-
20	Morecambe	Handling nets	195	-
	Morecambe	Collecting cockles	-	6
533	Morecambe Bay	Handling nets	126	-
	Foulney Island	Collecting mussels	-	27

**Table 16. Adults' handling rates of fishing gear and sediment in the Heysham aquatic survey area (h y<sup>-1</sup>)**

Observation number	Location	Activity	Fishing gear	Sediment
534	Morecambe Bay	Handling nets	126	-
	Foulney Island	Collecting mussels	-	27
599	Off Hest Bank	Handling nets	108	-
386	Morecambe Bay	Handling nets	100	-
387	Morecambe Bay	Handling nets	100	-
231	Morecambe and Heysham	Handling longlines	88	-
841	Grange-over-Sands	Handling nets	30	-
<b>832</b>	<b>Hazelslack Marsh</b>	<b>Turf cutting</b>	-	<b>840</b>
<b>531</b>	<b>Offshore of Roosebeck</b>	<b>Oyster farming</b>	-	<b>546</b>
<b>532</b>	<b>Offshore of Roosebeck</b>	<b>Oyster farming</b>	-	<b>546</b>
<b>293</b>	<b>Cockerham Marsh</b>	<b>Wildfowling</b>	-	<b>348</b>
<b>291</b>	<b>Cockerham Marsh</b>	<b>Wildfowling</b>	-	<b>340</b>
<b>292</b>	<b>Cockerham Marsh</b>	<b>Wildfowling</b>	-	<b>340</b>
<b>833</b>	<b>Hazelslack Marsh</b>	<b>Turf cutting</b>	-	<b>336</b>
<b>834</b>	<b>Hazelslack Marsh</b>	<b>Turf cutting</b>	-	<b>336</b>
327	Fleetwood	Collecting crabs	-	225
	Wyre Light	Bait digging	-	
509	Various marshes on Walney Island	Wildfowling	-	200
349	Knott End	Bait digging	-	150
301	Cockerham Marsh	Wildfowling	-	138
295	Cockerham Marsh	Wildfowling	-	100
326	Wyre Light	Bait digging	-	100
457	Newbiggin	Bait digging	-	72
458	Newbiggin	Bait digging	-	72
818	Red Nab	Bait digging	-	54
77	Morecambe	Bait digging	-	52
294	Cockerham Marsh	Wildfowling	-	48
273	Half Moon Bay	Collecting crabs	-	40
526	Walney Channel	Bait digging	-	36
109	Morecambe	Bait digging	-	28
345	Knott End	Bait digging	-	24
346	Knott End	Bait digging	-	24
456	Newbiggin	Bait digging	-	21
93	Half Moon Bay	Bait digging and collecting cockles	-	18
94	Half Moon Bay	Bait digging	-	12

**Table 16. Adults' handling rates of fishing gear and sediment in the Heysham aquatic survey area (h y<sup>-1</sup>)**

<b>Observation number</b>	<b>Location</b>	<b>Activity</b>	<b>Fishing gear</b>	<b>Sediment</b>
73	Morecambe	Bait digging	-	6
511	Near Piel Island	Collecting cockles	-	5
512	Near Piel Island	Collecting cockles	-	5
513	Near Piel Island	Collecting cockles	-	5
514	Near Piel Island	Collecting cockles	-	5

**Notes**

Emboldened observations are the high-rate individuals

The mean fishing gear handling rate based on 11 high-rate observations is 583 h y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 25 observations for fishing gear is 789 h y<sup>-1</sup>

The mean sediment handling rate based on 9 high-rate observations is 445 h y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 45 observations for sediment is 546 h y<sup>-1</sup>

**Table 17. Adults' occupancy rates in and on water in the Heysham aquatic survey area (h y<sup>-1</sup>)**

Observation number	Location	Activity	In water	On water
74	Morecambe	Kitesurfing	560	-
329	Fleetwood and Knott End	Kitesurfing	312	-
330	Fleetwood and Knott End	Kitesurfing	260	-
331	Fleetwood and Knott End	Kitesurfing	260	-
332	Fleetwood and Knott End	Kitesurfing	260	-
76	Morecambe	Windsurfing	96	-
75	Morecambe	Windsurfing	84	-
448	Walney Channel, Roa Island and Piel Island	Snorkelling and kayaking	73	-
		Sailing and canoeing	-	646
449	Walney Channel, Roa Island and Piel Island	Snorkelling and kayaking	73	-
		Sailing and canoeing	-	646
450	Walney Channel, Roa Island and Piel Island	Snorkelling and kayaking	73	-
		Sailing and canoeing	-	310
451	Walney Channel, Roa Island and Piel Island	Kayaking	70	-
		Canoeing	-	70
500	Between Roa Island and Rampside	Kitesurfing and windsurfing	40	-
		Canoeing	-	20
488	Between Roa Island and Rampside	Windsurfing	18	-
489	Between Roa Island and Rampside	Windsurfing	18	-
490	Between Roa Island and Rampside	Windsurfing	18	-
491	Between Roa Island and Rampside	Windsurfing	18	-
492	Between Roa Island and Rampside	Windsurfing	18	-
333	Fleetwood	Lifeguard duties	16	-
334	Fleetwood	Lifeguard duties	16	-
335	Fleetwood	Lifeguard duties	16	-
336	Fleetwood	Lifeguard duties	16	-
337	Fleetwood	Lifeguard duties	16	-
338	Fleetwood	Lifeguard duties	16	-
80	Morecambe	Swimming	12	-
81	Morecambe	Swimming	12	-
82	Morecambe	Swimming	12	-
493	Piel Island	Swimming	5	-
	Between Roa Island and Fleetwood	Sailing	-	72
324	Wyre Dock, Fleetwood	Boat dwelling	-	5264
325	Wyre Dock, Fleetwood	Boat dwelling	-	5264

**Table 17. Adults' occupancy rates in and on water in the Heysham aquatic survey area (h y<sup>-1</sup>)**

Observation number	Location	Activity	In water	On water
413	Morecambe Bay	Trawling, potting, angling and RNLI duties	-	1807
	Wyre Estuary	Trawling and boatman duties	-	
19	Morecambe Bay	Trawling, gill netting and angling	-	1560
422	Morecambe Bay	Trawling, gill netting and push netting	-	1357
	Lune Estuary	Drift netting, push netting and wildfowling	-	
420	Morecambe Bay	Trawling, drift netting, gill netting	-	1306
	Lune Estuary	Trawling, drift netting, gill netting and stow netting	-	
421	Morecambe Bay	Trawling, drift netting, gill netting	-	1306
	Lune Estuary	Trawling, drift netting, gill netting and stow netting	-	
386	Morecambe Bay	Trawling	-	1200
387	Morecambe Bay	Trawling	-	1200
302	Morecambe Bay	Trawling	-	1008
344	Morecambe Bay	RNLI duties	-	1000
	Wyre Estuary	Passenger ferry crew	-	
341	Wyre Estuary	Passenger ferry crew	-	875
342	Wyre Estuary	Passenger ferry crew	-	875
343	Wyre Estuary	Passenger ferry crew	-	875
416	Lune Estuary	Drift netting and stow netting	-	780
516	Morecambe Bay	Tractor fishing	-	776
	Kent Estuary	Lave netting	-	
533	Morecambe Bay	Tractor fishing	-	756
534	Morecambe Bay	Tractor fishing	-	756
519	Morecambe Bay	Tractor fishing	-	660
	Kent Estuary	Lave netting	-	
520	Morecambe Bay	Tractor fishing	-	660
	Kent Estuary	Lave netting	-	
521	Morecambe Bay	Tractor fishing	-	562
	Kent Estuary	Gill netting and lave netting	-	
846	Off Heysham	Trawling	-	500
	Lune Estuary	Haaf netting	-	
527	Morecambe Bay	Tractor fishing	-	457
	Near Canal Foot	Lave netting	-	
414	Morecambe Bay	Trawling and potting	-	441
	Wyre Estuary	Trawling	-	
356	Morecambe Bay	Sailing	-	432

**Table 17. Adults' occupancy rates in and on water in the Heysham aquatic survey area (h y<sup>-1</sup>)**

Observation number	Location	Activity	In water	On water
357	Morecambe Bay	Sailing	-	432
358	Morecambe Bay	Sailing	-	432
359	Morecambe Bay	Sailing	-	432
20	Morecambe Bay	Trawling, gill netting and angling	-	375
383	Lune Estuary	Haaf netting	-	350
848	Lune Estuary	Haaf netting	-	300
849	Lune Estuary	Haaf netting	-	260
362	Lune Estuary	Sailing	-	250
363	Lune Estuary	Sailing	-	250
364	Lune Estuary	Sailing	-	250
365	Lune Estuary	Sailing	-	250
502	Barrow to Glasson and Fleetwood	Sailing	-	200
503	Barrow to Glasson and Fleetwood	Sailing	-	200
504	Barrow to Glasson and Fleetwood	Sailing	-	200
505	Barrow to Glasson and Fleetwood	Sailing	-	200
506	Barrow to Glasson and Fleetwood	Sailing	-	200
507	Barrow to Glasson and Fleetwood	Sailing	-	200
508	Barrow to Glasson and Fleetwood	Sailing	-	200
509	Barrow to Fleetwood	Sailing	-	200
511	Barrow to Fleetwood	Sailing	-	200
515	Barrow to Fleetwood	Sailing	-	200
463	Between Walney Island and Roa Island	RNLI duties	-	176
464	Between Walney Island and Roa Island	RNLI duties	-	176
465	Between Walney Island and Roa Island	RNLI duties	-	176
466	Between Walney Island and Roa Island	RNLI duties	-	176
467	Between Walney Island and Roa Island	RNLI duties	-	176
468	Between Walney Island and Roa Island	RNLI duties	-	176
469	Between Walney Island and Roa Island	RNLI duties	-	176
470	Between Walney Island and Roa Island	RNLI duties	-	176
471	Between Walney Island and Roa Island	RNLI duties	-	176
472	Between Walney Island and Roa Island	RNLI duties	-	176
389	Morecambe Bay	RNLI duties	-	125
390	Morecambe Bay	RNLI duties	-	125
391	Morecambe Bay	RNLI duties	-	125
392	Morecambe Bay	RNLI duties	-	125

**Table 17. Adults' occupancy rates in and on water in the Heysham aquatic survey area (h y<sup>-1</sup>)**

Observation number	Location	Activity	In water	On water
93	Morecambe Bay	Boat angling	-	108
94	Morecambe Bay	Boat angling	-	108
95	Morecambe Bay	Boat angling	-	108
96	Morecambe Bay	Boat angling	-	108
97	Morecambe Bay	Boat angling	-	108
98	Morecambe Bay	Boat angling	-	108
99	Morecambe Bay	Boat angling	-	108
100	Morecambe Bay	Boat angling	-	108
101	Morecambe Bay	Boat angling	-	108
102	Morecambe Bay	Boat angling	-	108
103	Morecambe Bay	Boat angling	-	108
104	Morecambe Bay	Boat angling	-	108
393	Morecambe Bay	RNLI duties	-	81
394	Morecambe Bay	RNLI duties	-	81
395	Morecambe Bay	RNLI duties	-	81
396	Morecambe Bay	RNLI duties	-	81
397	Morecambe Bay	RNLI duties	-	81
398	Morecambe Bay	RNLI duties	-	81
399	Morecambe Bay	RNLI duties	-	81
400	Morecambe Bay	RNLI duties	-	81
401	Morecambe Bay	RNLI duties	-	81
402	Morecambe Bay	RNLI duties	-	81
403	Morecambe Bay	RNLI duties	-	81
404	Morecambe Bay	RNLI duties	-	81
405	Morecambe Bay	RNLI duties	-	81
406	Morecambe Bay	RNLI duties	-	81
407	Morecambe Bay	RNLI duties	-	81
408	Morecambe Bay	RNLI duties	-	81
409	Morecambe Bay	RNLI duties	-	81
410	Morecambe Bay	RNLI duties	-	81
411	Morecambe Bay	RNLI duties	-	81
412	Morecambe Bay	RNLI duties	-	81
473	Between Roa Island and Fleetwood	Sailing	-	72
474	Between Roa Island and Fleetwood	Sailing	-	72
475	Between Roa Island and Fleetwood	Sailing	-	72

**Table 17. Adults' occupancy rates in and on water in the Heysham aquatic survey area (h y<sup>-1</sup>)**

Observation number	Location	Activity	In water	On water
476	Between Roa Island and Fleetwood	Sailing	-	72
477	Between Roa Island and Fleetwood	Sailing	-	72
478	Between Roa Island and Fleetwood	Sailing	-	72
479	Between Roa Island and Fleetwood	Sailing	-	72
480	Between Roa Island and Fleetwood	Sailing	-	72
481	Between Roa Island and Fleetwood	Sailing	-	72
482	Between Roa Island and Fleetwood	Sailing	-	72
87	Morecambe	Boat angling	-	54
90	Morecambe	Boat angling	-	54
483	Piel Island	Boat angling	-	48
484	Piel Island	Boat angling	-	48
485	Piel Island	Boat angling	-	48
486	Piel Island	Boat angling	-	48
487	Piel Island	Boat angling	-	48
132	Morecambe	Boat angling	-	42

**Table 18. Children's occupancy rates on water in the Heysham aquatic survey area (h y<sup>-1</sup>)**

**Child age group (6 - 15 years old)**

Observation number	Age	Location	Activity	On water
360	12	Morecambe Bay	Sailing	432
361	14	Morecambe Bay	Sailing	432
366	13	Lune Estuary	Sailing	250
367	11	Lune Estuary	Sailing	250

Table 19. Adults' consumption rates of green vegetables from the Heysham terrestrial survey area (kg y<sup>-1</sup>)

Observation number	Artichoke	Asparagus	Broccoli	Brussel sprouts	Cabbage	Calabrese	Cauliflower	Chard	Courgette	Cucumber	Herbs	Kale	Lettuce	Marrow	Pak choi	Spinach	Total
306	-	-	-	1.2	24.7	6.1	12.1	-	5.0	-	-	-	-	-	-	0.5	49.6
307	-	-	-	1.2	24.7	6.1	12.1	-	5.0	-	-	-	-	-	-	0.5	49.6
773	-	-	11.2	-	27.4	-	-	-	-	-	-	4.8	-	-	-	-	43.4
772	-	-	13.5	5.5	6.1	-	2.4	2.3	8.8	-	-	1.9	1.8	-	-	-	42.3
239	-	-	-	4.6	6.1	-	-	-	-	2.1	-	-	0.6	18.0	-	-	31.4
240	-	-	-	4.6	6.1	-	-	-	-	2.1	-	-	0.6	18.0	-	-	31.4
621	-	-	-	-	3.7	-	-	-	1.8	12.8	-	-	-	-	12.5	-	30.7
622	-	-	-	-	3.7	-	-	-	1.8	12.8	-	-	-	-	12.5	-	30.7
634	-	0.5	1.5	1.6	7.6	-	4.7	-	1.8	-	-	-	-	-	2.8	-	20.5
635	-	0.5	1.5	1.6	7.6	-	4.7	-	1.8	-	-	-	-	-	2.8	-	20.5
161	-	-	4.9	-	-	2.7	6.7	-	5.5	-	-	-	-	-	-	-	19.8
162	-	-	4.9	-	-	2.7	6.7	-	5.5	-	-	-	-	-	-	-	19.8
630	-	-	-	4.1	4.6	-	2.3	-	4.1	1.9	-	-	-	-	-	-	17.0
631	-	-	-	4.1	4.6	-	2.3	-	4.1	1.9	-	-	-	-	-	-	17.0
632	-	-	-	4.1	4.6	-	2.3	-	4.1	1.9	-	-	-	-	-	-	17.0
633	-	-	-	4.1	4.6	-	2.3	-	4.1	1.9	-	-	-	-	-	-	17.0
225	-	-	3.7	-	6.1	-	-	-	1.8	4.3	-	-	-	-	-	-	15.9
241	-	-	-	2.3	3.0	-	-	-	-	0.1	-	-	0.3	9.0	-	-	14.7
242	-	-	-	2.3	3.0	-	-	-	-	0.1	-	-	0.3	9.0	-	-	14.7
321	3.6	-	-	-	8.1	-	-	-	-	-	0.2	-	-	-	-	0.6	12.5
322	3.6	-	-	-	8.1	-	-	-	-	-	0.2	-	-	-	-	0.6	12.5
323	3.6	-	-	-	8.1	-	-	-	-	-	0.2	-	-	-	-	0.6	12.5
9	-	2.7	-	-	-	-	-	-	-	5.4	-	-	-	2.9	-	-	11.0
264	-	-	-	-	-	-	-	-	9.0	-	-	-	1.3	-	-	-	10.3
265	-	-	-	-	-	-	-	-	9.0	-	-	-	1.3	-	-	-	10.3
268	-	-	-	-	-	-	-	-	9.0	-	-	-	1.3	-	-	-	10.3
313	-	-	-	-	5.9	-	-	-	-	2.1	-	-	-	0.9	-	-	8.9
314	-	-	-	-	5.9	-	-	-	-	2.1	-	-	-	0.9	-	-	8.9
315	-	-	-	-	5.9	-	-	-	-	2.1	-	-	-	0.9	-	-	8.9
160	-	-	2.7	-	1.1	-	0.7	-	-	3.2	-	-	0.5	-	-	-	8.2
226	-	-	0.7	-	6.1	-	-	-	0.4	0.9	-	-	-	-	-	-	8.1
227	-	-	0.7	-	6.1	-	-	-	0.4	0.9	-	-	-	-	-	-	8.1
228	-	-	0.7	-	6.1	-	-	-	0.4	0.9	-	-	-	-	-	-	8.1
6	-	-	-	1.8	4.9	-	-	-	-	-	-	-	1.2	-	-	-	7.9
7	-	-	-	1.8	4.9	-	-	-	-	-	-	-	1.2	-	-	-	7.9
8	-	-	-	1.8	4.9	-	-	-	-	-	-	-	1.2	-	-	-	7.9
243	-	-	-	1.1	1.5	-	-	-	-	0.5	-	-	0.2	4.5	-	-	7.8
244	-	-	-	1.1	1.5	-	-	-	-	0.5	-	-	0.2	4.5	-	-	7.8
163	-	-	1.3	-	3.0	0.7	0.9	-	1.5	-	-	-	-	-	-	-	7.5
164	-	-	1.3	-	3.0	0.7	0.9	-	1.5	-	-	-	-	-	-	-	7.5
774	-	-	1.9	-	4.6	-	-	-	-	-	-	0.8	-	-	-	-	7.2
775	-	-	1.9	-	4.6	-	-	-	-	-	-	0.8	-	-	-	-	7.2
317	-	-	-	-	4.7	-	-	-	-	1.7	-	-	-	0.7	-	-	7.1
318	-	-	-	-	4.7	-	-	-	-	1.7	-	-	-	0.7	-	-	7.1
319	-	-	-	-	4.7	-	-	-	-	1.7	-	-	-	0.7	-	-	7.1

**Table 19. Adults' consumption rates of green vegetables from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

Observation number	Artichoke	Asparagus	Broccoli	Brussel sprouts	Cabbage	Calabrese	Cauliflower	Chard	Courgette	Cucumber	Herbs	Kale	Lettuce	Marrow	Pak choi	Spinach	Total
320	-	-	-	-	4.7	-	-	-	-	1.7	-	-	-	0.7	-	-	7.1
636	-	0.4	0.3	0.5	2.5	-	1.6	-	0.6	-	-	-	-	-	0.9	-	6.9
637	-	0.4	0.3	0.5	2.5	-	1.6	-	0.6	-	-	-	-	-	0.9	-	6.9
155	-	-	0.7	-	1.1	-	0.7	-	-	3.2	-	-	0.5	-	-	-	6.1
219	-	0.2	0.7	0.2	1.2	-	0.2	-	2.5	-	-	-	-	-	-	0.5	5.6
220	-	0.2	0.7	0.2	1.2	-	0.2	-	2.5	-	-	-	-	-	-	0.5	5.6
640	-	0.1	0.4	0.4	1.9	-	1.2	-	0.5	-	-	-	-	-	0.7	-	5.1
231	-	-	1.9	-	-	-	-	-	0.9	2.1	-	-	-	-	-	-	4.9
232	-	-	1.9	-	-	-	-	-	0.9	2.1	-	-	-	-	-	-	4.9
429	-	-	-	-	-	-	-	-	4.4	-	-	-	-	-	-	-	4.4
430	-	-	-	-	-	-	-	-	4.4	-	-	-	-	-	-	-	4.4
812	-	-	0.8	-	-	-	-	-	1.8	1.7	-	-	-	-	-	-	4.3
813	-	-	0.8	-	-	-	-	-	1.8	1.7	-	-	-	-	-	-	4.3
641	-	0.1	-	0.4	1.9	-	-	-	0.5	-	-	-	-	-	0.7	-	3.6
156	-	-	0.3	-	0.5	-	0.5	-	-	1.6	-	-	0.3	-	-	-	3.2
157	-	-	0.3	-	0.5	-	0.5	-	-	1.6	-	-	0.3	-	-	-	3.2
159	-	-	0.3	-	0.5	-	0.5	-	-	1.6	-	-	0.3	-	-	-	3.2
221	-	-	0.4	0.1	0.6	-	0.2	-	1.2	-	-	-	-	-	-	-	2.5
222	-	-	0.4	0.1	0.6	-	0.2	-	1.2	-	-	-	-	-	-	-	2.5
223	-	-	0.4	0.1	0.6	-	0.2	-	1.2	-	-	-	-	-	-	-	2.5
224	-	-	0.4	0.1	0.6	-	0.2	-	1.2	-	-	-	-	-	-	-	2.5
233	-	-	0.7	-	-	-	-	-	0.4	0.9	-	-	-	-	-	-	2.0
234	-	-	0.7	-	-	-	-	-	0.4	0.9	-	-	-	-	-	-	2.0
167	-	-	-	-	-	-	-	-	-	-	-	-	1.8	-	-	-	1.8
168	-	-	-	-	-	-	-	-	-	-	-	-	1.8	-	-	-	1.8
169	-	-	-	-	-	-	-	-	-	-	-	-	1.8	-	-	-	1.8
308	-	-	-	-	0.9	0.2	-	-	0.2	-	-	-	-	-	-	-	1.3
309	-	-	-	-	0.9	0.2	-	-	0.2	-	-	-	-	-	-	-	1.3
623	-	-	-	-	-	-	-	-	-	-	-	-	0.2	-	-	-	0.2
624	-	-	-	-	-	-	-	-	-	-	-	-	0.2	-	-	-	0.2
625	-	-	-	-	-	-	-	-	-	-	-	-	0.2	-	-	-	0.2
627	-	-	-	-	-	-	-	-	-	-	-	-	0.2	-	-	-	0.2
628	-	-	-	-	-	-	-	-	-	-	-	-	0.2	-	-	-	0.2

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of green vegetables based on the 16 high-rate adult consumers is 28.6 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 78 observations is 43.9 kg y<sup>-1</sup>

**Table 20. Adults' consumption rates of other vegetables from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

Observation number	Broad bean	Chilli pepper	French bean	Pea	Pepper	Pumpkin	Runner bean	Squash	Sweetcorn	Tomato	Total
772	10.9	-	3.2	8.1	-	1.2	14.7	1.6	6.9	8.6	55.3
773	8.2	-	-	6.8	1.2	1.2	9.8	0.3	6.9	19.4	53.7
225	0.9	0.2	-	3.6	0.7	-	12.8	-	2.3	17.3	37.9
9	-	-	-	8.6	-	-	15.7	-	-	8.6	32.9
621	4.6	-	1.8	1.1	-	1.0	6.8	-	0.9	14.4	30.6
622	4.6	-	1.8	1.1	-	1.0	6.8	-	0.9	14.4	30.6
231	4.4	0.2	-	-	0.4	-	11.2	-	-	10.8	27.1
232	4.4	0.2	-	-	0.4	-	11.2	-	-	10.8	27.1
321	3.0	-	-	1.5	-	-	9.1	-	0.9	10.8	25.3
322	3.0	-	-	1.5	-	-	9.1	-	0.9	10.8	25.3
323	3.0	-	-	1.5	-	-	9.1	-	0.9	10.8	25.3
1	-	-	-	-	-	-	-	-	-	25.2	25.2
2	-	-	-	-	-	-	-	-	-	25.2	25.2
630	0.8	1.0	1.4	2.0	0.4	0.6	0.8	-	0.8	14.6	22.5
631	0.8	1.0	1.4	2.0	0.4	0.6	0.8	-	0.8	14.6	22.5
632	0.8	1.0	1.4	2.0	0.4	0.6	0.8	-	0.8	14.6	22.5
633	0.8	1.0	1.4	2.0	0.4	0.6	0.8	-	0.8	14.6	22.5
161	1.6	-	0.5	2.7	1.2	3.9	4.3	-	-	7.0	21.3
162	1.6	-	0.5	2.7	1.2	3.9	4.3	-	-	7.0	21.3
429	4.5	-	-	-	-	-	16.3	-	-	-	20.8
430	4.5	-	-	-	-	-	16.3	-	-	-	20.8
239	-	-	0.5	3.4	0.7	-	4.1	-	0.6	10.8	20.1
240	-	-	0.5	3.4	0.7	-	4.1	-	0.6	10.8	20.1
155	-	-	0.1	3.4	0.5	-	-	-	-	13.5	17.5
160	-	-	0.1	3.4	0.5	-	-	-	-	13.5	17.5
627	-	-	-	0.6	-	13.2	2.1	-	0.5	-	16.3
306	-	-	-	6.1	-	-	9.2	-	-	-	15.3
307	-	-	-	6.1	-	-	9.2	-	-	-	15.3
634	-	-	0.2	-	-	-	-	-	0.3	14.0	14.6
635	-	-	0.2	-	-	-	-	-	0.3	14.0	14.6
623	-	-	-	0.6	-	11.0	2.1	-	0.5	-	14.1
624	-	-	-	0.6	-	11.0	2.1	-	0.5	-	14.1
625	-	-	-	0.6	-	11.0	2.1	-	0.5	-	14.1
628	-	-	-	0.6	-	11.0	2.1	-	0.5	-	14.1
233	1.8	0.1	-	-	0.1	-	4.5	-	-	4.3	10.8

**Table 20. Adults' consumption rates of other vegetables from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

Observation number	Broad bean	Chilli pepper	French bean	Pea	Pepper	Pumpkin	Runner bean	Squash	Sweetcorn	Tomato	Total
234	1.8	0.1	-	-	0.1	-	4.5	-	-	4.3	10.8
775	1.4	-	-	1.1	0.2	0.2	1.6	-	1.2	5.0	10.7
241	-	-	0.3	1.7	0.4	-	2.0	-	0.3	5.4	10.1
242	-	-	0.3	1.7	0.4	-	2.0	-	0.3	5.4	10.1
774	-	-	-	1.1	0.2	0.2	1.6	-	1.2	5.0	9.3
226	-	0.1	-	-	0.1	-	4.5	-	-	4.3	9.0
227	-	0.1	-	-	0.1	-	4.5	-	-	4.3	9.0
228	-	0.1	-	-	0.1	-	4.5	-	-	4.3	9.0
156	-	-	0.1	1.7	0.2	-	-	-	-	6.8	8.8
157	-	-	0.1	1.7	0.2	-	-	-	-	6.8	8.8
159	-	-	0.1	1.7	0.2	-	-	-	-	6.8	8.8
636	-	-	0.1	-	-	-	-	-	0.2	7.8	8.0
637	-	-	-	-	-	-	-	-	0.2	7.8	8.0
6	-	-	-	-	-	-	-	-	-	7.2	7.2
7	-	-	-	-	-	-	-	-	-	7.2	7.2
8	-	-	-	-	-	-	-	-	-	7.2	7.2
264	-	-	-	4.0	-	2.2	-	-	1.0	-	7.2
265	-	-	-	4.0	-	2.2	-	-	1.0	-	7.2
268	-	-	-	4.0	-	2.2	-	-	1.0	-	7.2
313	-	-	-	-	-	-	3.4	-	0.6	3.2	7.1
314	-	-	-	-	-	-	3.4	-	0.6	3.2	7.1
315	-	-	-	-	-	-	3.4	-	0.6	3.2	7.1
219	-	-	0.5	-	-	-	-	-	-	6.0	6.5
220	-	-	0.5	-	-	-	-	-	-	6.0	6.5
221	-	-	-	-	-	-	-	-	-	6.0	6.0
222	-	-	-	-	-	-	-	-	-	6.0	6.0
223	-	-	-	-	-	-	-	-	-	6.0	6.0
224	-	-	-	-	-	-	-	-	-	6.0	6.0
812	-	-	-	-	0.2	0.2	0.4	-	0.1	5.0	6.0
813	-	-	-	-	0.2	0.2	0.4	-	0.1	5.0	6.0
640	-	-	-	-	-	-	-	-	0.1	5.9	6.0
641	-	-	-	-	-	-	-	-	0.1	5.9	6.0
167	-	-	-	4.1	-	-	1.5	0.2	-	-	5.8
168	-	-	-	4.1	-	-	1.5	0.2	-	-	5.8
169	-	-	-	4.1	-	-	1.5	0.2	-	-	5.8

**Table 20. Adults' consumption rates of other vegetables from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

Observation number	Broad bean	Chilli pepper	French bean	Pea	Pepper	Pumpkin	Runner bean	Squash	Sweetcorn	Tomato	Total
317	-	-	-	-	-	-	2.7	-	0.5	2.5	5.7
318	-	-	-	-	-	-	2.7	-	0.5	2.5	5.7
319	-	-	-	-	-	-	2.7	-	0.5	2.5	5.7
320	-	-	-	-	-	-	2.7	-	0.5	2.5	5.7
416	-	-	-	-	-	-	-	-	-	5.7	5.7
417	-	-	-	-	-	-	-	-	-	5.7	5.7
418	-	-	-	-	-	-	-	-	-	5.7	5.7
419	-	-	-	-	-	-	-	-	-	5.7	5.7
243	-	-	0.1	0.8	0.2	-	1.0	-	0.1	2.7	5.0
244	-	-	0.1	0.8	0.2	-	1.0	-	0.1	2.7	5.0
163	0.5	-	0.1	0.7	0.3	-	1.2	-	-	1.9	4.8
164	0.5	-	0.1	0.7	0.3	-	1.2	-	-	1.9	4.8
308	-	-	-	0.2	-	-	0.3	-	-	-	0.6
309	-	-	-	0.2	-	-	0.3	-	-	-	0.6

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of other vegetables based on the 23 high-rate adult consumers is 27.6 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 84 observations is 37.5 kg y<sup>-1</sup>

**Table 21. Adults' consumption rates of root vegetables from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

Observation number	Beetroot	Carrot	Celeriac	Celery	Fennel	Garlic	Kohl rabi	Leek	Onion	Parsnip	Radish	Shallot	Spring onion	Swede	Turnip	Total
773	6.2	8.1	4.8	-	0.7	0.8	-	6.8	10.8	2.7	-	-	1.5	13.6	-	55.9
772	10.8	5.4	-	-	-	0.8	-	5.4	13.0	2.2	1.1	-	1.3	8.2	6.5	54.5
239	4.5	4.5	-	-	-	-	-	11.3	3.6	-	0.9	-	-	6.8	2.7	34.2
240	4.5	4.5	-	-	-	-	-	11.3	3.6	-	0.9	-	-	6.8	2.7	34.2
167	10.1	4.1	-	-	-	-	-	6.8	8.1	-	-	-	0.9	-	-	29.9
168	10.1	4.1	-	-	-	-	-	6.8	8.1	-	-	-	0.9	-	-	29.9
169	10.1	4.1	-	-	-	-	-	6.8	8.1	-	-	-	0.9	-	-	29.9
161	4.9	2.7	-	-	-	-	-	10.8	2.2	2.2	-	-	-	-	6.5	29.2
416	5.7	11.3	-	-	-	-	-	-	11.3	-	-	-	-	-	-	28.4
417	5.7	11.3	-	-	-	-	-	-	11.3	-	-	-	-	-	-	28.4
418	5.7	11.3	-	-	-	-	-	-	11.3	-	-	-	-	-	-	28.4
419	5.7	11.3	-	-	-	-	-	-	11.3	-	-	-	-	-	-	28.4
321	1.4	1.5	-	-	-	-	-	1.5	11.0	-	-	-	0.3	2.3	1.8	19.8
322	1.4	1.5	-	-	-	-	-	1.5	11.0	-	-	-	0.3	2.3	1.8	19.8
323	1.4	1.5	-	-	-	-	-	1.5	11.0	-	-	-	0.3	2.3	1.8	19.8
306	3.0	-	-	-	-	-	-	1.4	15.2	-	-	-	-	-	-	19.6
307	3.0	-	-	-	-	-	-	1.4	15.2	-	-	-	-	-	-	19.6
241	2.3	2.3	-	-	-	-	-	5.6	1.8	-	0.4	-	-	3.4	1.4	17.1
242	2.3	2.3	-	-	-	-	-	5.6	1.8	-	0.4	-	-	3.4	1.4	17.1
264	4.0	4.0	-	-	-	-	-	4.0	4.8	-	-	-	-	-	-	16.8
265	4.0	4.0	-	-	-	-	-	4.0	4.8	-	-	-	-	-	-	16.8
268	4.0	4.0	-	-	-	-	-	4.0	4.8	-	-	-	-	-	-	16.8
313	4.5	1.2	-	-	-	-	-	-	5.5	-	-	-	-	-	-	11.2
314	4.5	1.2	-	-	-	-	-	-	5.5	-	-	-	-	-	-	11.2
315	4.5	1.2	-	-	-	-	-	-	5.5	-	-	-	-	-	-	11.2
162	-	-	-	-	-	-	-	-	2.2	2.2	-	-	-	-	6.5	10.8
225	8.2	-	-	-	-	-	-	2.3	-	-	-	-	-	-	-	10.5
774	1.0	1.4	0.8	-	-	0.1	-	1.1	1.8	0.5	-	-	0.3	3.4	-	10.3
775	1.0	1.4	0.8	-	-	0.1	-	1.1	1.8	0.5	-	-	0.3	3.4	-	10.3
630	0.3	-	-	-	-	-	-	4.5	1.6	1.8	-	1.4	-	-	0.6	10.3
631	0.3	-	-	-	-	-	-	4.5	1.6	1.8	-	1.4	-	-	0.6	10.3
632	0.3	-	-	-	-	-	-	4.5	1.6	1.8	-	1.4	-	-	0.6	10.3
633	0.3	-	-	-	-	-	-	4.5	1.6	1.8	-	1.4	-	-	0.6	10.3
317	3.6	1.0	-	-	-	-	-	-	4.4	-	-	-	-	-	-	9.0
318	3.6	1.0	-	-	-	-	-	-	4.4	-	-	-	-	-	-	9.0

**Table 21. Adults' consumption rates of root vegetables from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

Observation number	Beetroot	Carrot	Celeriac	Celery	Fennel	Garlic	Kohl rabi	Leek	Onion	Parsnip	Radish	Shallot	Spring onion	Swede	Turnip	Total
319	3.6	1.0	-	-	-	-	-	-	4.4	-	-	-	-	-	-	9.0
320	3.6	1.0	-	-	-	-	-	-	4.4	-	-	-	-	-	-	9.0
429	-	-	-	-	-	-	-	-	8.8	-	-	-	-	-	-	8.8
430	-	-	-	-	-	-	-	-	8.8	-	-	-	-	-	-	8.8
6	1.8	1.8	-	-	-	-	-	-	2.9	-	-	-	-	-	2.2	8.6
7	1.8	1.8	-	-	-	-	-	-	2.9	-	-	-	-	-	2.2	8.6
8	1.8	1.8	-	-	-	-	-	-	2.9	-	-	-	-	-	2.2	8.6
243	1.1	1.1	-	-	-	-	-	2.8	0.9	-	0.2	-	-	1.7	0.7	8.6
244	1.1	1.1	-	-	-	-	-	2.8	0.9	-	0.2	-	-	1.7	0.7	8.6
621	2.3	-	-	-	-	-	-	-	5.5	-	-	-	-	-	-	7.8
622	2.3	-	-	-	-	-	-	-	5.5	-	-	-	-	-	-	7.8
163	0.7	0.7	-	-	-	-	-	3.0	0.6	0.6	-	-	-	-	1.8	7.4
164	0.7	0.7	-	-	-	-	-	3.0	0.6	0.6	-	-	-	-	1.8	7.4
219	0.5	0.2	-	-	-	-	-	0.5	1.4	-	-	-	0.2	2.0	-	4.7
220	0.5	0.2	-	-	-	-	-	0.5	1.4	-	-	-	0.2	2.0	-	4.7
1	1.5	0.9	-	-	-	-	-	1.4	-	-	-	-	-	-	-	3.8
2	1.5	0.9	-	-	-	-	-	1.4	-	-	-	-	-	-	-	3.8
231	2.3	-	-	-	-	-	-	1.1	-	-	-	-	-	-	-	3.4
232	2.3	-	-	-	-	-	-	1.1	-	-	-	-	-	-	-	3.4
634	0.6	0.2	-	-	-	0.4	0.7	0.8	-	-	-	-	-	-	-	2.7
635	0.6	0.2	-	-	-	0.4	0.7	0.8	-	-	-	-	-	-	-	2.7
623	0.3	0.7	-	-	-	-	-	-	1.4	-	-	-	-	-	-	2.4
624	0.3	0.7	-	-	-	-	-	-	1.4	-	-	-	-	-	-	2.4
625	0.3	0.7	-	-	-	-	-	-	1.4	-	-	-	-	-	-	2.4
627	0.3	0.7	-	-	-	-	-	-	1.4	-	-	-	-	-	-	2.4
628	0.3	0.7	-	-	-	-	-	-	1.4	-	-	-	-	-	-	2.4
221	0.2	0.1	-	-	-	-	-	0.2	0.7	-	-	-	0.1	1.0	-	2.3
222	0.2	0.1	-	-	-	-	-	0.2	0.7	-	-	-	0.1	1.0	-	2.3
223	0.2	0.1	-	-	-	-	-	0.2	0.7	-	-	-	0.1	1.0	-	2.3
224	0.2	0.1	-	-	-	-	-	0.2	0.7	-	-	-	0.1	1.0	-	2.3
812	-	0.3	-	-	-	-	-	-	1.8	0.2	-	-	-	-	-	2.3
813	-	0.3	-	-	-	-	-	-	1.8	0.2	-	-	-	-	-	2.3
155	0.3	0.8	-	-	-	-	-	1.1	-	-	-	-	-	-	-	2.2
160	0.3	0.8	-	-	-	-	-	1.1	-	-	-	-	-	-	-	2.2
170	-	0.2	-	0.4	-	-	-	-	1.3	-	-	-	-	-	-	2.0

**Table 21. Adults' consumption rates of root vegetables from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

Observation number	Beetroot	Carrot	Celeriac	Celery	Fennel	Garlic	Kohl rabi	Leek	Onion	Parsnip	Radish	Shallot	Spring onion	Swede	Turnip	Total
171	-	0.2	-	0.4	-	-	-	-	1.3	-	-	-	-	-	-	2.0
226	0.9	-	-	-	-	-	-	0.5	-	-	-	-	-	-	-	1.4
227	0.9	-	-	-	-	-	-	0.5	-	-	-	-	-	-	-	1.4
228	0.9	-	-	-	-	-	-	0.5	-	-	-	-	-	-	-	1.4
233	0.9	-	-	-	-	-	-	0.5	-	-	-	-	-	-	-	1.4
234	0.9	-	-	-	-	-	-	0.5	-	-	-	-	-	-	-	1.4
156	0.1	0.4	-	-	-	-	-	0.5	-	-	-	-	-	-	-	1.1
159	0.1	0.4	-	-	-	-	-	0.5	-	-	-	-	-	-	-	1.1
636	0.2	0.1	-	-	-	0.1	0.4	-	-	-	-	-	-	-	-	0.8
637	0.2	0.1	-	-	-	0.1	0.4	-	-	-	-	-	-	-	-	0.8
157	0.1	-	-	-	-	-	-	0.5	-	-	-	-	-	-	-	0.7
308	0.1	-	-	-	-	-	-	-	0.4	-	-	-	-	-	-	0.5
309	0.1	-	-	-	-	-	-	-	0.4	-	-	-	-	-	-	0.5
640	0.1	-	-	-	-	-	0.2	0.2	-	-	-	-	-	-	-	0.5
641	-	-	-	-	-	-	0.2	0.2	-	-	-	-	-	-	-	0.4

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of root vegetables based on the 17 high-rate adult consumers is 30.0 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 85 observations is 34.2 kg y<sup>-1</sup>

**Table 22. Adults' consumption rates of potato from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

<b>Observation number</b>	<b>Potato</b>
306	88.5
307	88.5
416	79.4
417	79.4
418	79.4
419	79.4
231	45.5
232	45.5
313	44.9
314	44.9
315	44.9
772	43.5
239	36.4
240	36.4
167	32.4
168	32.4
169	32.4
773	31.9
774	31.9
775	31.9
321	30.3
322	30.3
323	30.3
630	29.4
631	29.4
632	29.4
633	29.4
634	29.0
635	29.0
317	28.8
318	28.8
319	28.8
320	28.8
1	20.2
2	20.2
429	18.9
430	18.9
241	18.2
242	18.2
621	18.1
622	18.1
6	14.6
7	14.6
8	14.6
264	12.1
265	12.1
268	12.1
636	9.7
637	9.7
243	9.1
244	9.1
233	8.9
234	8.9
623	8.2
624	8.2
625	8.2

**Table 22. Adults' consumption rates of potato from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

<b>Observation number</b>	<b>Potato</b>
627	8.2
628	8.2
640	7.3
641	7.3
161	6.2
162	6.2
225	4.5
308	3.3
309	3.3
219	2.7
220	2.7
163	1.7
164	1.7
221	1.4
222	1.4
223	1.4
224	1.4

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of potato based on the 23 high-rate adult consumers is 48.7 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 73 observations is 81.2 kg y<sup>-1</sup>

**Table 23. Adults' consumption rates of domestic fruit from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

Observation number	Apple	Blackberry	Blackcurrant	Blueberry	Cherry	Damson	Gooseberry	Grape	Greengages	Loganberry	Pear	Plum	Raspberry	Redcurrant	Rhubarb	Strawberry	Tayberry	Whitecurrant	Total
773	-	-	4.1	6.5	-	-	12.3	6.8	-	-	-	-	12.2	4.1	5.5	20.4	-	-	71.9
9	36.3	-	9.1	-	-	-	-	-	-	-	-	-	-	3.6	-	-	-	-	49.0
225	-	-	2.8	-	-	-	3.1	4.5	-	6.0	-	-	1.7	2.3	4.0	3.1	-	2.3	29.7
161	6.8	0.5	-	-	-	-	-	-	-	-	4.5	8.2	-	-	-	5.0	-	-	24.9
621	-	-	8.5	-	-	-	10.2	-	-	-	-	-	1.7	-	-	2.4	-	-	22.8
622	-	-	8.5	-	-	-	10.2	-	-	-	-	-	1.7	-	-	2.4	-	-	22.8
772	9.1	-	-	-	5.7	-	-	-	-	-	-	6.8	-	-	-	-	-	-	21.5
431	2.0	-	2.0	-	-	2.0	2.0	-	2.0	-	2.0	2.0	2.0	2.0	2.0	-	-	-	20.0
432	2.0	-	2.0	-	-	2.0	2.0	-	2.0	-	2.0	2.0	2.0	2.0	2.0	-	-	-	20.0
429	10.0	-	-	-	-	-	-	-	-	-	-	-	6.8	-	-	-	-	-	16.8
430	10.0	-	-	-	-	-	-	-	-	-	-	-	6.8	-	-	-	-	-	16.8
231	-	-	1.4	-	-	-	1.5	2.3	-	3.0	-	-	0.9	1.1	2.0	1.5	-	1.1	14.9
232	-	-	1.4	-	-	-	1.5	2.3	-	3.0	-	-	0.9	1.1	2.0	1.5	-	1.1	14.9
774	-	-	0.7	1.1	-	-	2.0	-	-	-	-	-	2.0	0.7	0.9	6.8	-	-	14.3
775	-	-	0.7	1.1	-	-	2.0	-	-	-	-	-	2.0	0.7	0.9	6.8	-	-	14.3
416	-	2.3	1.1	-	-	-	3.4	-	-	-	-	-	2.3	1.1	-	-	1.1	1.1	12.5
417	-	2.3	1.1	-	-	-	3.4	-	-	-	-	-	2.3	1.1	-	-	1.1	1.1	12.5
418	-	2.3	1.1	-	-	-	3.4	-	-	-	-	-	2.3	1.1	-	-	1.1	1.1	12.5
419	-	2.3	1.1	-	-	-	3.4	-	-	-	-	-	2.3	1.1	-	-	1.1	1.1	12.5
239	2.3	-	-	-	-	-	0.4	0.8	-	-	2.0	-	-	-	5.1	-	-	-	10.6
240	2.3	-	-	-	-	-	0.4	0.8	-	-	2.0	-	-	-	5.1	-	-	-	10.6
167	1.7	-	6.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.5
321	-	-	-	-	-	-	-	-	-	-	-	0.8	-	-	3.8	3.2	-	-	7.8
322	-	-	-	-	-	-	-	-	-	-	-	0.8	-	-	3.8	3.2	-	-	7.8
323	-	-	-	-	-	-	-	-	-	-	-	0.8	-	-	3.8	3.2	-	-	7.8
635	0.8	-	0.5	-	-	-	0.4	-	-	-	-	-	2.4	1.2	0.2	0.1	-	1.5	7.0
168	-	-	6.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.8
169	-	-	6.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.8
226	-	-	0.6	-	-	-	0.6	0.9	-	1.2	-	-	0.3	0.5	0.8	0.6	-	0.5	5.9
227	-	-	0.6	-	-	-	0.6	0.9	-	1.2	-	-	0.3	0.5	0.8	0.6	-	0.5	5.9
228	-	-	0.6	-	-	-	0.6	0.9	-	1.2	-	-	0.3	0.5	0.8	0.6	-	0.5	5.9

**Table 23. Adults' consumption rates of domestic fruit from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

Observation number	Apple	Blackberry	Blackcurrant	Blueberry	Cherry	Damson	Gooseberry	Grape	Greengages	Loganberry	Pear	Plum	Raspberry	Redcurrant	Rhubarb	Strawberry	Tayberry	Whitecurrant	Total
634	0.8	-	0.5	-	-	-	0.4	-	-	-	-	-	2.4	-	0.2	0.1	-	1.5	5.8
241	1.1	-	-	-	-	-	0.2	0.4	-	-	1.0	-	-	-	2.6	-	-	-	5.3
242	1.1	-	-	-	-	-	0.2	0.4	-	-	1.0	-	-	-	2.6	-	-	-	5.3
264	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.1	-	-	-	5.1
265	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.1	-	-	-	5.1
268	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.1	-	-	-	5.1
233	-	-	0.5	-	-	-	0.5	0.8	-	1.0	-	-	0.3	0.4	0.8	0.5	-	0.4	5.0
234	-	-	0.5	-	-	-	0.5	0.8	-	1.0	-	-	0.3	0.4	0.8	0.5	-	0.4	5.0
442	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.0
443	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.0
444	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.0
162	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.0	-	-	5.0
163	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.0	-	-	5.0
164	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.0	-	-	5.0
636	0.8	-	-	-	-	-	-	-	-	-	-	-	2.4	-	0.2	0.1	-	1.5	5.0
637	0.8	-	-	-	-	-	-	-	-	-	-	-	2.4	-	0.2	0.1	-	1.5	5.0
623	-	0.3	0.9	-	-	-	-	-	-	-	-	0.2	-	-	-	3.5	-	-	4.8
624	-	0.3	0.9	-	-	-	-	-	-	-	-	0.2	-	-	-	3.5	-	-	4.8
625	-	-	0.9	-	-	-	-	-	-	-	-	-	-	-	-	3.5	-	-	4.4
627	-	-	0.9	-	-	-	-	-	-	-	-	-	-	-	-	3.5	-	-	4.4
628	-	-	0.9	-	-	-	-	-	-	-	-	-	-	-	-	3.5	-	-	4.4
155	-	-	-	-	-	-	0.3	-	-	-	-	-	1.7	-	-	1.1	-	-	3.1
160	-	-	-	-	-	-	0.3	-	-	-	-	-	1.7	-	-	1.1	-	-	3.1
219	1.5	-	-	0.5	-	-	0.7	-	-	-	-	-	-	-	0.4	-	-	-	3.0
220	1.5	-	-	0.5	-	-	0.7	-	-	-	-	-	-	-	0.4	-	-	-	3.0
221	1.5	-	-	0.5	-	-	0.7	-	-	-	-	-	-	-	0.2	-	-	-	2.8
222	1.5	-	-	0.5	-	-	0.7	-	-	-	-	-	-	-	0.2	-	-	-	2.8
223	1.5	-	-	0.5	-	-	0.7	-	-	-	-	-	-	-	0.2	-	-	-	2.8
224	1.5	-	-	0.5	-	-	0.7	-	-	-	-	-	-	-	0.2	-	-	-	2.8
243	0.6	-	-	-	-	-	0.1	0.2	-	-	0.5	-	-	-	1.3	-	-	-	2.6
244	0.6	-	-	-	-	-	0.1	0.2	-	-	0.5	-	-	-	1.3	-	-	-	2.6

**Table 23. Adults' consumption rates of domestic fruit from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

Observation number	Apple	Blackberry	Blackcurrant	Blueberry	Cherry	Damson	Gooseberry	Grape	Greengages	Loganberry	Pear	Plum	Raspberry	Redcurrant	Rhubarb	Strawberry	Tayberry	Whitecurrant	Total
640	0.8	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	0.1	-	1.5	2.6
641	0.8	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	0.1	-	1.5	2.6
313	-	-	-	-	-	-	-	0.3	-	-	-	-	-	-	1.2	-	-	-	1.4
314	-	-	-	-	-	-	-	0.3	-	-	-	-	-	-	1.2	-	-	-	1.4
315	-	-	-	-	-	-	-	0.3	-	-	-	-	-	-	1.2	-	-	-	1.4
812	-	0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	0.6	-	-	1.2
813	-	0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	0.6	-	-	1.2
317	-	-	-	-	-	-	-	0.2	-	-	-	-	-	-	0.9	-	-	-	1.1
318	-	-	-	-	-	-	-	0.2	-	-	-	-	-	-	0.9	-	-	-	1.1
319	-	-	-	-	-	-	-	0.2	-	-	-	-	-	-	0.9	-	-	-	1.1
320	-	-	-	-	-	-	-	0.2	-	-	-	-	-	-	0.9	-	-	-	1.1
156	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.6	-	-	0.6
157	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.6	-	-	0.6
159	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.6	-	-	0.6
3	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5
4	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5
5	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5
143	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5
144	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5
145	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5
146	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5
147	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5
630	-	-	-	-	-	-	-	-	-	-	0.2	-	-	-	-	-	-	-	0.2
631	-	-	-	-	-	-	-	-	-	-	0.2	-	-	-	-	-	-	-	0.2
632	-	-	-	-	-	-	-	-	-	-	0.2	-	-	-	-	-	-	-	0.2
633	-	-	-	-	-	-	-	-	-	-	0.2	-	-	-	-	-	-	-	0.2

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of domestic fruit based on the 4 high-rate adult consumers is 43.9 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 88 observations is 28.9 kg y<sup>-1</sup>

**Table 24. Adults' consumption rates of milk from the Heysham terrestrial survey area ( $l\ y^{-1}$ )**

<b>Observation number</b>	<b>Milk</b>
<b>437</b>	<b>365.0</b>
<b>438</b>	<b>365.0</b>
<b>439</b>	<b>365.0</b>
<b>440</b>	<b>365.0</b>
<b>441</b>	<b>365.0</b>
<b>3</b>	<b>311.1</b>
<b>4</b>	<b>311.1</b>
<b>287</b>	<b>182.5</b>
<b>288</b>	<b>182.5</b>
<b>289</b>	<b>182.5</b>
<b>290</b>	<b>182.5</b>
<b>431</b>	<b>172.9</b>
<b>432</b>	<b>172.9</b>
<b>433</b>	<b>172.9</b>
<b>434</b>	<b>172.9</b>
<b>435</b>	<b>172.9</b>
<b>436</b>	<b>172.9</b>
143	103.7
144	103.7
145	103.7
146	103.7
147	103.7
149	103.7

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of milk based on the 17 high-rate adult consumers is  $247.9\ l\ y^{-1}$

The observed 97.5<sup>th</sup> percentile rate based on 23 observations is  $365.0\ l\ y^{-1}$

**Table 25. Adults' consumption rates of cattle meat from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

<b>Observation number</b>	<b>Beef</b>
<b>429</b>	<b>56.8</b>
442	13.0
443	13.0
444	13.0

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of cattle meat based on the only high-rate adult consumer is 56.8 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 4 observations is 53.5 kg y<sup>-1</sup>

**Table 26. Adults' consumption rates of pig meat from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

<b>Observation number</b>	<b>Pork</b>
<b>442</b>	<b>26.0</b>
<b>443</b>	<b>26.0</b>
<b>444</b>	<b>26.0</b>

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of pig meat based on the 3 high-rate adult consumers is 26.0 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 3 observations is 26.0 kg y<sup>-1</sup>

**Table 27. Adults' consumption rates of sheep meat from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

<b>Observation number</b>	<b>Lamb</b>
<b>429</b>	<b>27.1</b>
<b>846</b>	<b>11.3</b>
<b>847</b>	<b>11.3</b>
431	8.5
432	8.5
442	6.5
443	6.5
444	6.5
827	2.8
830	2.8

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of sheep meat based on the 3 high-rate adult consumers is 16.6 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 10 observations is 23.6 kg y<sup>-1</sup>

**Table 28. Adults' consumption rates of poultry from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

<b>Observation number</b>	<b>Pheasant</b>
<b>301</b>	<b>1.8</b>
295	0.1
296	0.1
297	0.1
298	0.1
299	0.1
300	0.1

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of poultry based on the only high-rate adult consumer is 1.8 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 7 observations is 1.5 kg y<sup>-1</sup>

**Table 29. Adults' consumption rates of eggs from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

<b>Observation number</b>	<b>Chicken egg</b>
<b>431</b>	<b>23.4</b>
<b>432</b>	<b>23.4</b>
<b>9</b>	<b>21.9</b>
<b>846</b>	<b>20.7</b>
<b>149</b>	<b>17.8</b>
<b>170</b>	<b>17.8</b>
<b>171</b>	<b>17.8</b>
<b>420</b>	<b>17.8</b>
<b>421</b>	<b>17.8</b>
<b>778</b>	<b>17.8</b>
<b>779</b>	<b>17.8</b>
<b>429</b>	<b>12.2</b>
<b>430</b>	<b>12.2</b>
<b>143</b>	<b>10.7</b>
<b>144</b>	<b>10.7</b>
<b>145</b>	<b>10.7</b>
<b>146</b>	<b>10.7</b>
<b>147</b>	<b>10.7</b>
<b>313</b>	<b>8.9</b>
<b>314</b>	<b>8.9</b>
<b>315</b>	<b>8.9</b>
<b>264</b>	<b>7.9</b>
<b>265</b>	<b>7.9</b>
<b>268</b>	<b>7.9</b>
824	6.0
825	6.0
847	5.9
317	4.4
318	4.4
319	4.4
320	4.4
812	3.0
813	3.0
630	0.5
631	0.5
632	0.5
633	0.5
773	0.4
774	0.4
775	0.4
634	0.3
635	0.3
636	0.3
637	0.3
640	0.3
641	0.3
623	0.3
624	0.3
625	0.3
627	0.3
628	0.3

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of eggs based on the 24 high-rate adult consumers is 14.3 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 51 observations is 23.0 kg y<sup>-1</sup>

**Table 30. Adults' consumption rates of wild/free foods from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

Observation number	Blackberry	Crab apple	Damson	Rosehip	Sloe	Total
<b>383</b>	<b>1.4</b>	-	<b>3.2</b>	-	-	<b>4.5</b>
<b>420</b>	<b>2.5</b>	-	<b>0.5</b>	-	-	<b>3.0</b>
<b>421</b>	<b>2.5</b>	-	<b>0.5</b>	-	-	<b>3.0</b>
<b>321</b>	<b>1.2</b>	<b>0.8</b>	-	-	<b>0.3</b>	<b>2.3</b>
<b>322</b>	<b>1.2</b>	<b>0.8</b>	-	-	<b>0.3</b>	<b>2.3</b>
<b>323</b>	<b>1.2</b>	<b>0.8</b>	-	-	<b>0.3</b>	<b>2.3</b>
431	1.5	-	-	-	-	1.5
432	1.5	-	-	-	-	1.5
442	0.9	-	-	0.5	-	1.4
443	0.9	-	-	0.5	-	1.4
444	0.9	-	-	0.5	-	1.4
1	0.5	-	-	-	-	0.5
2	0.5	-	-	-	-	0.5
151	0.3	-	-	-	-	0.3
152	0.3	-	-	-	-	0.3
3	0.3	-	-	-	-	0.3
4	0.3	-	-	-	-	0.3
5	0.3	-	-	-	-	0.3
634	0.3	-	-	-	-	0.3
635	0.3	-	-	-	-	0.3
143	0.2	-	-	-	-	0.2
144	0.2	-	-	-	-	0.2
145	0.2	-	-	-	-	0.2
146	0.2	-	-	-	-	0.2
147	0.2	-	-	-	-	0.2

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of wild/free foods based on the 6 high-rate adult consumers is 2.9 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 25 observations is 3.6 kg y<sup>-1</sup>

**Table 31. Adults' consumption rates of rabbits/hares from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

<b>Observation number</b>	<b>Rabbit</b>
<b>846</b>	<b>6.8</b>
<b>383</b>	<b>2.3</b>
<b>847</b>	<b>2.3</b>
301	1.8
6	0.6
8	0.6

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of rabbits/hares based on the 3 high-rate adult consumers is 3.8 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 6 observations is 6.2 kg y<sup>-1</sup>

**Table 32. Adults' consumption rates of honey from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

<b>Observation number</b>	<b>Honey</b>
<b>304</b>	<b>9.1</b>
<b>305</b>	<b>9.1</b>
778	0.5
287	0.3
288	0.3
289	0.3
290	0.3
6	0.3
7	0.3
8	0.3
225	0.3

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of honey based on the 2 high-rate adult consumers is 9.1 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 11 observations is 9.1 kg y<sup>-1</sup>

**Table 33. Adults' consumption rates of wild fungi from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

Observation number	Mixed fungi	Mushrooms	Total
<b>442</b>	-	<b>1.7</b>	<b>1.7</b>
<b>443</b>	-	<b>1.7</b>	<b>1.7</b>
<b>444</b>	-	<b>1.7</b>	<b>1.7</b>
<b>420</b>	-	<b>1.0</b>	<b>1.0</b>
<b>421</b>	-	<b>1.0</b>	<b>1.0</b>
<b>383</b>	-	<b>0.9</b>	<b>0.9</b>
225	0.5	-	0.5
231	0.2	-	0.2
232	0.2	-	0.2
239	0.2	-	0.2
240	0.2	-	0.2
295	-	0.2	0.2
296	-	0.2	0.2
846	-	0.2	0.2
847	-	0.2	0.2
3	-	0.2	0.2
4	-	0.2	0.2
5	-	0.2	0.2
143	-	0.1	0.1
144	-	0.1	0.1
145	-	0.1	0.1
146	-	0.1	0.1
147	-	0.1	0.1

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of wild fungi based on the 6 high-rate adult consumers is 1.3 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 23 observations is 1.7 kg y<sup>-1</sup>

**Table 34. Children's and infants' consumption rates of green vegetables from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

**Child age group (6 - 15 years old)**

Observation number	Age	Asparagus	Broccoli	Brussel sprouts	Cabbage	Calabrese	Cauliflower	Courgette	Cucumber	Kale	Lettuce	Marrow	Pak choi	Total
<b>267</b>	<b>15</b>	-	-	-	-	-	-	<b>9.0</b>	-	-	<b>1.3</b>	-	-	<b>10.3</b>
<b>316</b>	<b>14</b>	-	-	-	<b>5.9</b>	-	-	-	<b>2.1</b>	-	-	<b>0.9</b>	-	<b>8.9</b>
<b>229</b>	<b>14</b>	-	<b>0.7</b>	-	<b>6.1</b>	-	-	<b>0.4</b>	<b>0.9</b>	-	-	-	-	<b>8.1</b>
<b>166</b>	<b>12</b>	-	<b>1.3</b>	-	<b>3.0</b>	<b>0.7</b>	<b>0.9</b>	<b>1.5</b>	-	-	-	-	-	<b>7.5</b>
<b>245</b>	<b>10</b>	-	-	<b>0.8</b>	<b>1.1</b>	-	-	-	<b>0.4</b>	-	<b>0.1</b>	<b>3.2</b>	-	<b>5.6</b>
<b>246</b>	<b>8</b>	-	-	<b>0.8</b>	<b>1.1</b>	-	-	-	<b>0.4</b>	-	<b>0.1</b>	<b>3.2</b>	-	<b>5.6</b>
<b>642</b>	<b>11</b>	<b>0.1</b>	-	<b>0.4</b>	<b>1.9</b>	-	<b>1.2</b>	<b>0.5</b>	-	-	-	-	<b>0.7</b>	<b>4.7</b>
<b>643</b>	<b>13</b>	<b>0.1</b>	-	<b>0.4</b>	<b>1.9</b>	-	<b>1.2</b>	<b>0.5</b>	-	-	-	-	<b>0.7</b>	<b>4.7</b>
<b>165</b>	<b>8</b>	-	<b>0.8</b>	-	<b>1.8</b>	<b>0.4</b>	<b>0.5</b>	<b>0.9</b>	-	-	-	-	-	<b>4.5</b>
<b>814</b>	<b>13</b>	-	<b>0.8</b>	-	-	-	-	<b>1.8</b>	<b>1.7</b>	-	-	-	-	<b>4.3</b>
<b>815</b>	<b>12</b>	-	<b>0.8</b>	-	-	-	-	<b>1.8</b>	<b>1.7</b>	-	-	-	-	<b>4.3</b>
158	13	-	0.3	-	0.5	-	0.5	-	1.6	-	0.3	-	-	3.2
776	6	-	0.6	-	1.4	-	-	-	-	0.2	-	-	-	2.2
235	15	-	0.7	-	-	-	-	0.4	0.9	-	-	-	-	2.0
638	6	-	0.1	0.1	0.6	-	0.4	0.2	-	-	-	-	0.2	1.7
639	8	-	0.1	0.1	0.6	-	0.4	0.2	-	-	-	-	0.2	1.7
236	7	-	0.5	-	-	-	-	0.3	0.6	-	-	-	-	1.4

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of green vegetables for the child age group based upon the 11 high-rate consumers is 6.2 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 17 observations is 9.8 kg y<sup>-1</sup>

**Infant age group (0 - 5 years old)**

Observation number	Age	Asparagus	Broccoli	Brussel sprout	Cabbage	Calabrese	Cauliflower	Courgette	Cucumber	Kale	Lettuce	Marrow	Pak choi	Total
<b>266</b>	<b>3</b>	-	-	-	-	-	-	<b>9.0</b>	-	-	<b>1.3</b>	-	-	<b>10.3</b>
777	4	-	0.4	-	0.9	-	-	-	-	0.2	-	-	-	1.4
816	4	-	0.2	-	-	-	-	0.4	0.4	-	-	-	-	1.1
237	4	-	0.4	-	-	-	-	0.2	0.4	-	-	-	-	1.0
230	2	-	0.1	-	0.3	-	-	0.1	0.2	-	-	-	-	0.7
310	1	-	-	-	0.2	-	-	-	-	-	-	-	-	0.2

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of green vegetables for the infant age group based upon the only high-rate consumer is 10.3 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 6 observations is 9.2 kg y<sup>-1</sup>

**Table 35. Children's and infants' consumption rates of other vegetables from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

**Child age group (6 - 15 years old)**

Observation number	Age	Broad bean	Chilli pepper	French bean	Pea	Pepper	Pumpkin	Runner bean	Sweetcorn	Tomato	Total
<b>235</b>	<b>15</b>	<b>1.8</b>	<b>0.1</b>	-	-	<b>0.1</b>	-	<b>4.5</b>	-	<b>4.3</b>	<b>10.8</b>
<b>229</b>	<b>14</b>	-	<b>0.1</b>	-	-	<b>0.1</b>	-	<b>4.5</b>	-	<b>4.3</b>	<b>9.0</b>
<b>158</b>	<b>13</b>	-	-	<b>0.1</b>	<b>1.7</b>	<b>0.2</b>	-	-	-	<b>6.8</b>	<b>8.8</b>
<b>236</b>	<b>7</b>	<b>1.3</b>	-	-	-	<b>0.1</b>	-	<b>3.2</b>	-	<b>3.1</b>	<b>7.7</b>
<b>267</b>	<b>15</b>	-	-	-	<b>4.0</b>	-	<b>2.2</b>	-	<b>1.0</b>	-	<b>7.2</b>
<b>316</b>	<b>14</b>	-	-	-	-	-	-	<b>3.4</b>	<b>0.6</b>	<b>3.2</b>	<b>7.1</b>
<b>814</b>	<b>13</b>	-	-	-	-	<b>0.2</b>	<b>0.2</b>	<b>0.4</b>	<b>0.1</b>	<b>5.0</b>	<b>6.0</b>
<b>642</b>	<b>11</b>	-	-	-	-	-	-	-	<b>0.1</b>	<b>5.9</b>	<b>6.0</b>
<b>643</b>	<b>13</b>	-	-	-	-	-	-	-	<b>0.1</b>	<b>5.9</b>	<b>6.0</b>
<b>166</b>	<b>12</b>	<b>0.5</b>	-	<b>0.1</b>	<b>0.7</b>	<b>0.3</b>	-	<b>1.2</b>	-	<b>1.9</b>	<b>4.8</b>
<b>245</b>	<b>10</b>	-	-	<b>0.1</b>	<b>0.6</b>	<b>0.1</b>	-	<b>0.7</b>	<b>0.1</b>	<b>1.9</b>	<b>3.6</b>
<b>246</b>	<b>8</b>	-	-	<b>0.1</b>	<b>0.6</b>	<b>0.1</b>	-	<b>0.7</b>	<b>0.1</b>	<b>1.9</b>	<b>3.6</b>
776	6	0.4	-	-	0.3	-	-	0.5	0.3	1.5	3.1
165	8	0.3	-	0.1	0.5	0.2	-	0.7	-	1.2	2.9
815	12	-	-	-	-	0.2	0.2	0.4	0.1	-	0.9
638	6	-	-	-	-	-	-	-	0.6	0.3	0.8
639	8	-	-	-	-	-	-	-	-	0.3	0.3

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of other vegetables for the child age group based upon the 12 high-rate consumers is 6.7 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 17 observations is 10.1 kg y<sup>-1</sup>

**Infant age group (0 - 5 years old)**

Observation number	Age	Broad bean	Chilli pepper	French bean	Pea	Pepper	Pumpkin	Runner bean	Sweetcorn	Tomato	Total
<b>266</b>	<b>3</b>	-	-	-	<b>4.0</b>	-	<b>2.2</b>	-	<b>1.0</b>	-	<b>7.2</b>
<b>237</b>	<b>4</b>	<b>0.9</b>	-	-	-	<b>0.1</b>	-	<b>2.2</b>	-	<b>2.2</b>	<b>5.4</b>
777	4	0.3	-	-	0.2	-	-	0.3	0.2	1.0	2.1
230	2	-	-	-	-	-	-	0.9	-	0.9	1.8
816	4	-	-	-	-	-	-	0.1	-	1.3	1.4
629	2	-	-	-	0.1	-	-	0.4	0.1	-	0.7
626	1	-	-	-	0.1	-	-	0.3	0.1	-	0.4

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of other vegetables for the infant age group based upon the 2 high-rate consumers is 6.3 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 7 observations is 6.9 kg y<sup>-1</sup>

**Table 36. Children's and infants' consumption rates of root vegetables from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

**Child age group (6 - 15 years old)**

Observation number	Age	Beetroot	Carrot	Celeriac	Kohl rabi	Leek	Onion	Parsnip	Radish	Swede	Turnip	Total
<b>267</b>	<b>15</b>	<b>4.0</b>	<b>4.0</b>	-	-	<b>4.0</b>	<b>4.8</b>	-	-	-	-	<b>16.8</b>
<b>316</b>	<b>14</b>	<b>4.5</b>	<b>1.2</b>	-	-	-	<b>5.5</b>	-	-	-	-	<b>11.2</b>
<b>166</b>	<b>12</b>	<b>0.7</b>	<b>0.7</b>	-	-	<b>3.0</b>	<b>0.6</b>	<b>0.6</b>	-	-	<b>1.8</b>	<b>7.4</b>
<b>245</b>	<b>10</b>	<b>0.8</b>	<b>0.8</b>	-	-	<b>2.0</b>	<b>0.6</b>	-	<b>0.2</b>	<b>1.2</b>	<b>0.5</b>	<b>6.2</b>
<b>246</b>	<b>8</b>	<b>0.8</b>	<b>0.8</b>	-	-	<b>2.0</b>	<b>0.6</b>	-	<b>0.2</b>	<b>1.2</b>	<b>0.5</b>	<b>6.2</b>
165	8	0.5	0.5	-	-	1.8	0.4	0.4	-	-	1.1	4.5
776	6	0.3	0.4	0.2	-	0.3	0.5	0.1	-	1.0	-	3.0
814	13	-	0.3	-	-	-	1.8	0.2	-	-	-	2.3
815	12	-	0.3	-	-	-	1.8	0.2	-	-	-	2.3
229	14	0.9	-	-	-	0.5	-	-	-	-	-	1.4
235	15	0.9	-	-	-	0.5	-	-	-	-	-	1.4
158	13	0.1	0.4	-	-	0.5	-	-	-	-	-	1.1
236	7	0.6	-	-	-	0.3	-	-	-	-	-	1.0
642	11	0.1	-	-	0.2	0.2	-	-	-	-	-	0.5
643	13	0.1	-	-	0.2	0.2	-	-	-	-	-	0.5

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of root vegetables for the child age group based upon the 5 high-rate consumers is 9.6 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 15 observations is 14.9 kg y<sup>-1</sup>

**Infant age group (0 - 5 years old)**

Observation number	Age	Beetroot	Carrot	Celeriac	Kohl rabi	Leek	Onion	Parsnip	Radish	Swede	Turnip	Total
<b>266</b>	<b>3</b>	<b>4.0</b>	<b>4.0</b>	-	-	<b>4.0</b>	<b>4.8</b>	-	-	-	-	<b>16.8</b>
777	4	0.2	0.3	0.2	-	0.2	0.4	0.1	-	0.7	-	2.0
237	4	0.5	-	-	-	0.2	-	-	-	-	-	0.7
816	4	-	0.1	-	-	-	0.4	-	-	-	-	0.5
626	1	0.1	0.1	-	-	-	0.3	-	-	-	-	0.5
629	2	0.1	0.1	-	-	-	0.3	-	-	-	-	0.4
230	2	0.2	-	-	-	0.1	-	-	-	-	-	0.3

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of root vegetables for the infant age group based upon the only high-rate consumer is 16.8 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 7 observations is 14.6 kg y<sup>-1</sup>

**Table 37. Children's and infants' consumption rates of potato from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

**Child age group (6 - 15 years old)**

Observation number	Age	Potato
<b>316</b>	<b>14</b>	<b>44.9</b>
267	15	12.1
776	6	9.6
235	15	8.9
642	11	7.3
643	13	7.3
245	10	6.6
246	8	6.6
236	7	6.4
638	6	2.4
639	8	2.4
166	12	1.7
165	8	1.0

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of potato for the child age group based upon the only high-rate consumer is 44.9 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 13 observations is 35.1 kg y<sup>-1</sup>

**Infant age group (0 - 5 years old)**

Observation number	Age	Potato
<b>266</b>	<b>3</b>	<b>12.1</b>
<b>777</b>	<b>4</b>	<b>6.4</b>
<b>237</b>	<b>4</b>	<b>4.4</b>
629	2	1.6
626	1	1.2
310	1	0.7

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of potato for the infant age group based upon the 3 high-rate consumers is 7.6 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 6 observations is 11.4 kg y<sup>-1</sup>

**Table 38. Children's and infants' consumption rates of domestic fruit from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

**Child age group (6 - 15 years old)**

Observation number	Age	Apple	Blackberry	Blackcurrant	Blueberry	Gooseberry	Grape	Loganberry	Pear	Raspberry	Redcurrant	Rhubarb	Strawberry	Whitecurrant	Total
<b>638</b>	<b>6</b>	<b>1.7</b>	-	<b>0.2</b>	-	<b>0.1</b>	-	-	-	<b>5.4</b>	-	<b>0.4</b>	<b>0.3</b>	<b>3.4</b>	<b>11.5</b>
<b>639</b>	<b>8</b>	<b>1.7</b>	-	<b>0.2</b>	-	<b>0.1</b>	-	-	-	<b>5.4</b>	-	<b>0.4</b>	<b>0.3</b>	<b>3.4</b>	<b>11.5</b>
<b>643</b>	<b>13</b>	<b>1.7</b>	-	<b>0.2</b>	-	<b>0.1</b>	-	-	-	<b>5.4</b>	-	<b>0.4</b>	<b>0.3</b>	<b>3.4</b>	<b>11.5</b>
<b>642</b>	<b>11</b>	-	-	<b>0.2</b>	-	<b>0.1</b>	-	-	-	<b>5.4</b>	-	<b>0.4</b>	<b>0.3</b>	<b>3.4</b>	<b>9.8</b>
<b>229</b>	<b>14</b>	-	-	<b>0.6</b>	-	<b>0.6</b>	<b>0.9</b>	<b>1.2</b>	-	<b>0.3</b>	<b>0.5</b>	<b>0.8</b>	<b>0.6</b>	<b>0.5</b>	<b>5.9</b>
<b>267</b>	<b>15</b>	-	-	-	-	-	-	-	-	-	-	<b>5.1</b>	-	-	<b>5.1</b>
<b>235</b>	<b>15</b>	-	-	<b>0.5</b>	-	<b>0.5</b>	<b>0.8</b>	<b>1.0</b>	-	<b>0.3</b>	<b>0.4</b>	<b>0.8</b>	<b>0.5</b>	<b>0.4</b>	<b>5.0</b>
<b>445</b>	<b>15</b>	<b>5.0</b>	-	-	-	-	-	-	-	-	-	-	-	-	<b>5.0</b>
<b>166</b>	<b>12</b>	-	-	-	-	-	-	-	-	-	-	-	<b>5.0</b>	-	<b>5.0</b>
<b>776</b>	<b>6</b>	-	-	<b>0.2</b>	<b>0.3</b>	<b>0.6</b>	-	-	-	<b>0.6</b>	<b>0.2</b>	<b>0.3</b>	<b>2.0</b>	-	<b>4.3</b>
165	8	-	-	-	-	-	-	-	-	-	-	-	3.7	-	3.7
236	7	-	-	0.3	-	-	0.5	0.7	-	0.2	0.3	0.5	0.4	0.3	3.2
245	10	0.4	-	-	-	0.1	0.1	-	0.4	-	-	0.9	-	-	1.9
246	8	0.4	-	-	-	0.1	0.1	-	0.4	-	-	0.9	-	-	1.9
316	14	-	-	-	-	-	0.3	-	-	-	-	1.2	-	-	1.4
814	13	-	0.6	-	-	-	-	-	-	-	-	-	0.6	-	1.2
815	12	-	0.6	-	-	-	-	-	-	-	-	-	0.6	-	1.2
158	13	-	-	-	-	-	-	-	-	-	-	-	0.6	-	0.6

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of domestic fruit for the child age group based upon the 10 high-rate consumers is 7.5 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 18 observations is 11.5 kg y<sup>-1</sup>

**Infant age group (0 - 5 years old)**

Observation number	Age	Apple	Blackberry	Blackcurrant	Blueberry	Gooseberry	Grape	Loganberry	Pear	Raspberry	Redcurrant	Rhubarb	Strawberry	Whitecurrant	Total
<b>266</b>	<b>3</b>	-	-	-	-	-	-	-	-	-	-	<b>5.1</b>	-	-	<b>5.1</b>
<b>777</b>	<b>4</b>	-	-	<b>0.1</b>	<b>0.2</b>	<b>0.4</b>	-	-	-	<b>0.4</b>	<b>0.1</b>	<b>0.2</b>	<b>1.4</b>	-	<b>2.9</b>
<b>816</b>	<b>4</b>	-	<b>0.2</b>	-	-	-	-	-	-	-	-	-	<b>2.4</b>	-	<b>2.5</b>
<b>237</b>	<b>4</b>	-	-	<b>0.2</b>	-	-	<b>0.4</b>	<b>0.5</b>	-	<b>0.1</b>	<b>0.2</b>	<b>0.3</b>	<b>0.3</b>	<b>0.2</b>	<b>2.2</b>
230	2	-	-	0.1	-	0.1	0.2	0.2	-	0.1	0.1	0.2	0.1	0.1	1.2
238	2	-	-	0.1	-	-	0.2	0.2	-	0.1	0.1	0.1	0.1	0.1	0.9
629	2	-	-	0.2	-	-	-	-	-	-	-	-	0.7	-	0.9
626	1	-	-	0.1	-	-	-	-	-	-	-	-	0.5	-	0.6
148	3	0.5	-	-	-	-	-	-	-	-	-	-	-	-	0.5

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of domestic fruit for the infant age group based upon the 4 high-rate consumers is 3.2 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 9 observations is 4.7 kg y<sup>-1</sup>

**Table 39. Infants' consumption rates of milk from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

**Infant age group (0 - 5 years old)**

<b>Observation number</b>	<b>Age</b>	<b>Milk</b>
<b>148</b>	<b>3</b>	<b>207.4</b>

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of milk for the infant age group based upon the only high-rate consumer is 207.4 l y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate is not applicable for 1 observation

**Table 40. Children's consumption rates of cattle meat from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

**Child age group (6 - 15 years old)**

<b>Observation number</b>	<b>Age</b>	<b>Beef</b>
<b>445</b>	<b>15</b>	<b>13.0</b>

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of cattle meat for the child age group based upon the only high-rate consumer is 13.0 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate is not applicable for 1 observation

**Table 41. Children's consumption rates of pig meat from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

**Child age group (6 - 15 years old)**

<b>Observation number</b>	<b>Age</b>	<b>Pork</b>
<b>445</b>	<b>15</b>	<b>26.0</b>

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of pig meat for the child age group based upon the only high-rate consumer is 26.0 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate is not applicable for 1 observation

**Table 42. Children's consumption rates of sheep meat from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

**Child age group (6 - 15 years old)**

<b>Observation number</b>	<b>Age</b>	<b>Lamb</b>
<b>445</b>	<b>15</b>	<b>6.5</b>
<b>828</b>	<b>13</b>	<b>2.8</b>
<b>829</b>	<b>15</b>	<b>2.8</b>

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of sheep meat for the child age group based upon the 3 high-rate consumers is 4.1 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 3 observations is 6.3 kg y<sup>-1</sup>

**Table 43. Children's and infants' consumption rates of eggs from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

**Child age group (6 - 15 years old)**

<b>Observation number</b>	<b>Age</b>	<b>Chicken egg</b>
<b>316</b>	<b>14</b>	<b>8.9</b>
<b>267</b>	<b>15</b>	<b>7.9</b>
<b>814</b>	<b>13</b>	<b>3.0</b>
<b>815</b>	<b>12</b>	<b>3.0</b>
638	6	0.7
639	8	0.7
642	11	0.7
643	13	0.7
776	6	0.1

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of eggs for the child age group based upon the 4 high-rate consumers is 5.7 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 9 observations is 8.7 kg y<sup>-1</sup>

**Infant age group (0 - 5 years old)**

<b>Observation number</b>	<b>Age</b>	<b>Chicken egg</b>
<b>266</b>	<b>3</b>	<b>7.9</b>
626	1	0.5
816	4	0.4
777	4	0.1
629	2	0.1

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of eggs for the infant age group based upon the only high-rate consumer is 7.9 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate based on 5 observations is 7.2 kg y<sup>-1</sup>

**Table 44. Children's and infants' consumption rates of wild/free foods from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

**Child age group (6 - 15 years old)**

<b>Observation number</b>	<b>Age</b>	<b>Blackberry</b>	<b>Rosehip</b>	<b>Total</b>
<b>445</b>	<b>15</b>	<b>0.9</b>	<b>0.5</b>	<b>1.4</b>

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of wild/free foods for the child age group based upon the only high-rate consumer is 1.4 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate is not applicable for 1 observation

**Infant age group (0 - 5 years old)**

<b>Observation number</b>	<b>Age</b>	<b>Blackberry</b>	<b>Rosehip</b>	<b>Total</b>
<b>148</b>	<b>3</b>	<b>0.2</b>	<b>-</b>	<b>0.2</b>

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of wild/free foods for the infant age group based upon the only high-rate consumer is 0.2 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate is not applicable for 1 observation

**Table 45. Children's and infants' consumption rates of wild fungi from the Heysham terrestrial survey area (kg y<sup>-1</sup>)**

**Child age group (6 - 15 years old)**

<b>Observation number</b>	<b>Age</b>	<b>Mushrooms</b>
<b>445</b>	<b>15</b>	<b>1.7</b>

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of wild fungi for the child age group based upon the only high-rate consumer is 1.7 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate is not applicable for 1 observation

**Infant age group (0 - 5 years old)**

<b>Observation number</b>	<b>Age</b>	<b>Mushrooms</b>
<b>148</b>	<b>3</b>	<b>0.1</b>

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of wild fungi for the infant age group based upon the only high-rate consumer is 0.1 kg y<sup>-1</sup>

The observed 97.5<sup>th</sup> percentile rate is not applicable for 1 observation

**Table 46. Percentage contribution each food type makes to its terrestrial food group for adults**

<p><b>Green vegetables</b></p> <p><i><b>Cabbage</b></i> 33.3 %            Courgette 13.6 %            Cucumber 10.1 %            Marrow 8.5 %            Cauliflower 8.2 %            Broccoli 7.8 %  <i><b>Brussels sprout</b></i> 6.2 %            Pak choi 4.0 %            Lettuce 2.3 %            Calabrese 2.3 %            Artichoke 1.3 %            Kale 1.0 %            Asparagus 0.6 %            Spinach 0.5 %            Chard 0.3 %            Herbs 0.1 %</p>	<p><b>Potato</b></p> <p><i><b>Potato</b></i> 100.0 %</p>	<p><b>Eggs</b></p> <p>Chicken egg 100.0 %</p>
<p><b>Other vegetables</b></p> <p>Tomato 47.7 %            Runner bean 22.6 %            Pea 10.0 %            Pumpkin 6.9 %            Broad bean 6.0 %            Sweetcorn 3.4 %            French bean 1.5 %            Pepper 1.2 %            Chilli pepper 0.4 %            Squash 0.2 %</p>	<p><b>Domestic fruit</b></p> <p><i><b>Apple</b></i> 17.6 %            Strawberry 15.0 %            Rhubarb 11.5 %            Blackcurrant 11.0 %            Gooseberry 10.4 %            Raspberry 9.6 %            Redcurrant 3.8 %            Grape 3.6 %            Plum 3.2 %            Whitecurrant 3.0 %            Loganberry 2.6 %            Pear 2.5 %            Blueberry 1.7 %            Blackberry 1.7 %            Cherry 0.8 %            Tayberry 0.7 %            Greengage 0.6 %            Damson 0.6 %</p>	<p><b>Wild/free foods</b></p> <p><i><b>Blackberry</b></i> 69.0 %            Damson 14.6 %            Crab apple 8.0 %            Rosehip 5.3 %            Sloe 3.2 %</p>
<p><b>Root vegetables</b></p> <p>Onion 31.7 %  <i><b>Beetroot</b></i> 19.9 %            Leek 15.9 %            Carrot 14.6 %            Swede 7.4 %            Turnip 5.1 %            Parsnip 2.1 %            Spring onion 0.9 %            Celeriac 0.7 %            Shallot 0.6 %            Radish 0.4 %            Garlic 0.3 %            Kohl rabi 0.3 %            Celery 0.1 %            Fennel 0.1 %</p>	<p><b>Milk</b></p> <p><i><b>Cows' milk</b></i> 100.0 %</p>	<p><b>Rabbits/hares</b></p> <p>Rabbit 100.0 %</p>
	<p><b>Cattle meat</b></p> <p>Beef 100.0 %</p>	<p><b>Honey</b></p> <p><i><b>Honey</b></i> 100.0 %</p>
	<p><b>Pig meat</b></p> <p>Pork 100.0 %</p>	<p><b>Wild fungi</b></p> <p>Mushroom 87.9 %            Mixed fungi 12.1 %</p>
	<p><b>Sheep meat</b></p> <p>Lamb 100.0 %</p>	
	<p><b>Poultry</b></p> <p>Pheasant 100.0 %</p>	

**Notes**

Food types in emboldened italics were monitored by FSA in 2010 (EA, FSA, NIEA and SEPA, 2011).

Barley was also monitored.

Percentages are based on the consumption of all adults in the survey consuming that particular food group.

**Table 47. Direct radiation occupancy rates for adults, children and infants in the Heysham area ( $\text{h y}^{-1}$ )**

Observation Number	Sex	Age (years)	Main activity	Indoor occupancy	Outdoor occupancy	Total occupancy
<b>0 to 0.25 km zone</b>						
594	M	59	Residing and working	5980	2544	8524
595	F	54	Residing and working	6624	208	6832
554	F	U	Working	1269	705	1974
536	M	U	Working	211	1763	1974
537	M	U	Working	211	1763	1974
538	M	U	Working	211	1763	1974
539	M	U	Working	211	1763	1974
540	M	U	Working	211	1763	1974
541	M	U	Working	211	1763	1974
542	M	U	Working	211	1763	1974
817	F	43	Nature conservation warden duties	1007	603	1610
548	F	U	Working	972	540	1512
549	F	U	Working	972	540	1512
550	F	U	Working	972	540	1512
551	F	U	Working	972	540	1512
552	F	U	Working	972	540	1512
553	F	U	Working	972	540	1512
311	M	34	Nature conservation warden duties	440	916	1356
312	M	U	Nature conservation warden duties	440	916	1356
129	M	23	Shore angling	-	1053	1053
136	M	56	Nature conservation volunteer duties	688	173	861
262	M	52	Dog walking	-	730	730
263	F	42	Dog walking	-	624	624
285	M	53	Shore angling	-	540	540
278	M	50	Shore angling	-	480	480
280	M	50	Shore angling	-	480	480
261	F	53	Dog walking	-	365	365
150	M	32	Shore angling	-	364	364
282	M	72	Bird watching	-	240	240
283	F	71	Bird watching	-	240	240
137	M	U	Bird watching	-	139	139
138	M	U	Bird watching	-	139	139
139	M	U	Bird watching	-	139	139
140	F	U	Bird watching	-	139	139
141	F	U	Bird watching	-	139	139
142	F	U	Bird watching	-	139	139
284	M	41	Shore angling	-	135	135
459	M	U	Shore angling	-	54	54
460	M	U	Shore angling	-	54	54
461	F	12	Shore angling	-	54	54
818	M	66	Bait digging	-	54	54
135	M	70	Shore angling	-	40	40
274	M	67	Shore angling	-	8	8
275	F	68	Crabbing	-	8	8
276	M	8	Crabbing	-	8	8
277	F	10	Crabbing	-	8	8
132	M	40	Shore angling	-	4	4
134	M	28	Shore angling	-	4	4
<b>&gt;0.25 to 0.5 km zone</b>						
810	M	48	Residing and working	6142	2099	8241
154	M	29	Residing and working	8052	108	8160
593	F	60	Residing and working	7704	336	8040
152	M	62	Residing	7531	477	8008
151	F	52	Residing	7327	403	7730
153	F	27	Residing	7172	220	7392
811	M	20	Residing	4599	347	4946
809	F	38	Residing	3164	304	3468
247	M	U	Working	1296	1296	2592
248	M	U	Working	1296	1296	2592
249	M	U	Working	1296	1296	2592

**Table 47. Direct radiation occupancy rates for adults, children and infants in the Heysham area ( $\text{h y}^{-1}$ )**

Observation Number	Sex	Age (years)	Main activity	Indoor occupancy	Outdoor occupancy	Total occupancy
250	M	U	Working	1296	1296	2592
251	M	U	Working	1296	1296	2592
252	M	U	Working	1296	1296	2592
253	M	U	Working	1296	1296	2592
254	M	U	Working	1296	1296	2592
849	M	59	Working	1820	232	2052
32	M	U	Working	1820	202	2022
33	M	U	Working	1820	202	2022
34	M	U	Working	1820	202	2022
35	M	U	Working	1820	202	2022
36	M	U	Working	1820	202	2022
37	F	U	Working	1820	202	2022
38	F	U	Working	1820	202	2022
39	F	U	Working	1820	202	2022
40	F	U	Working	1820	202	2022
41	F	U	Working	1820	202	2022
22	M	U	Working	809	1213	2022
23	M	U	Working	809	1213	2022
24	M	U	Working	809	1213	2022
25	M	U	Working	809	1213	2022
26	M	U	Working	809	1213	2022
27	F	U	Working	809	1213	2022
28	F	U	Working	809	1213	2022
29	F	U	Working	809	1213	2022
30	F	U	Working	809	1213	2022
31	F	U	Working	809	1213	2022
543	M	U	Working	1034	940	1974
544	M	U	Working	1034	940	1974
545	M	U	Working	1034	940	1974
546	M	U	Working	1034	940	1974
547	F	U	Working	1034	940	1974
2	F	46	Working	920	935	1855
563	M	U	Working	964	94	1058
564	M	U	Working	964	94	1058
565	M	U	Working	964	94	1058
566	M	U	Working	964	94	1058
567	M	U	Working	964	94	1058
568	M	U	Working	964	94	1058
569	M	U	Working	964	94	1058
570	M	U	Working	964	94	1058
571	M	U	Working	964	94	1058
572	M	U	Working	964	94	1058
573	M	U	Working	964	94	1058
574	M	U	Working	964	94	1058
575	M	U	Working	964	94	1058
576	M	U	Working	964	94	1058
577	M	U	Working	964	94	1058
578	F	U	Working	964	94	1058
579	F	U	Working	964	94	1058
580	F	U	Working	964	94	1058
581	F	U	Working	964	94	1058
582	F	U	Working	964	94	1058
583	F	U	Working	964	94	1058
584	F	U	Working	964	94	1058
585	F	U	Working	964	94	1058
586	F	U	Working	964	94	1058
587	F	U	Working	964	94	1058
588	F	U	Working	964	94	1058
589	F	U	Working	964	94	1058
590	F	U	Working	964	94	1058
591	F	U	Working	964	94	1058

**Table 47. Direct radiation occupancy rates for adults, children and infants in the Heysham area (h y<sup>-1</sup>)**

Observation Number	Sex	Age (years)	Main activity	Indoor occupancy	Outdoor occupancy	Total occupancy
592	F	U	Working	964	94	1058
555	M	U	Working	738	72	810
556	M	U	Working	738	72	810
557	M	U	Working	738	72	810
558	M	U	Working	738	72	810
559	F	U	Working	738	72	810
560	F	U	Working	738	72	810
561	F	U	Working	738	72	810
562	F	U	Working	738	72	810
273	M	66	Shore angling	-	540	540
119	M	65	Shore angling	-	312	312
120	M	58	Shore angling	-	156	156
122	M	47	Shore angling	-	156	156
269	M	60	Shore angling	-	91	91
271	M	62	Shore angling	-	91	91
115	M	36	Shore angling	-	80	80
117	M	8	Shore angling	-	80	80
118	M	6	Shore angling	-	80	80
272	M	75	Shore angling	-	60	60
126	M	36	Shore angling	-	48	48
127	F	10	Shore angling	-	48	48
128	M	57	Shore angling	-	20	20
125	M	35	Shore angling	-	8	8
124	M	60	Shore angling	-	4	4
<b>&gt;0.5 to 1 km zone</b>						
835	F	27	Residing	7954	286	8240
838	F	1	Residing	7954	286	8240
812	F	25	Residing	7441	763	8204
257	F	23	Residing	7932	100	8032
260	F	1	Residing	7932	100	8032
826	M	3	Residing	7843	87	7930
255	M	74	Residing	7088	788	7876
256	F	74	Residing	7088	788	7876
596	F	41	Residing and working	7726	98	7824
259	M	2	Residing	7672	100	7772
819	F	44	Residing	7734	38	7771
825	F	29	Residing	7455	97	7552
836	M	6	Residing and attending school	6640	480	7120
837	F	9	Residing and attending school	6640	480	7120
823	M	14	Residing	6906	88	6994
822	F	18	Residing	6178	489	6667
598	F	20	Residing	5962	168	6130
813	M	46	Residing	5284	806	6090
820	M	42	Residing	5239	452	5691
821	M	20	Residing	5519	41	5560
258	M	25	Residing	5372	104	5476
597	M	42	Residing	5363	36	5399
816	M	4	Residing (part time)	3572	96	3668
839	F	21	Residing (part time)	3468	66	3534
824	M	19	Residing (part time)	2792	88	2880
840	M	21	Residing (part time)	2730	84	2814
184	M	U	Working	990	990	1980
185	M	U	Working	990	990	1980
186	M	U	Working	990	990	1980
187	M	U	Working	990	990	1980
188	M	U	Working	990	990	1980
172	M	45	Working	1895	41	1936
173	M	49	Working	1895	41	1936
174	F	41	Working	1895	41	1936
175	M	U	Working	1895	41	1936
176	M	U	Working	1895	41	1936

**Table 47. Direct radiation occupancy rates for adults, children and infants in the Heysham area (h y<sup>-1</sup>)**

Observation Number	Sex	Age (years)	Main activity	Indoor occupancy	Outdoor occupancy	Total occupancy
177	M	U	Working	1895	41	1936
644	M	32	Working	1816	113	1929
645	M	59	Working	1816	113	1929
646	M	63	Working	1816	113	1929
647	M	47	Working	1816	113	1929
648	M	31	Working	1816	113	1929
649	M	46	Working	1816	113	1929
603	M	60	Working	190	1706	1896
604	M	42	Working	190	1706	1896
605	M	35	Working	190	1706	1896
606	M	35	Working	190	1706	1896
42	F	U	Working	1104	736	1840
43	F	U	Working	1104	736	1840
44	F	U	Working	1104	736	1840
45	F	U	Working	1104	736	1840
46	F	U	Working	1104	736	1840
47	F	U	Working	1104	736	1840
48	F	U	Working	1104	736	1840
49	F	U	Working	1104	736	1840
50	F	U	Working	1104	736	1840
650	M	38	Working	1702	113	1815
651	M	54	Working	1702	113	1815
652	M	42	Working	1702	113	1815
653	M	38	Working	1702	113	1815
654	M	62	Working	1702	113	1815
655	M	39	Working	1702	113	1815
656	M	40	Working	1702	113	1815
657	M	43	Working	1702	113	1815
658	M	38	Working	1702	113	1815
659	M	48	Working	1702	113	1815
660	M	54	Working	1702	113	1815
661	M	34	Working	1702	113	1815
662	M	32	Working	1702	113	1815
663	M	35	Working	1702	113	1815
664	M	34	Working	1702	113	1815
665	M	60	Working	1702	113	1815
666	M	42	Working	1702	113	1815
667	M	61	Working	1702	113	1815
668	M	38	Working	1702	113	1815
669	M	51	Working	1702	113	1815
670	M	31	Working	1702	113	1815
671	M	38	Working	1702	113	1815
672	M	40	Working	1702	113	1815
673	M	56	Working	1702	113	1815
674	M	22	Working	1702	113	1815
675	M	21	Working	1702	113	1815
676	M	49	Working	1702	113	1815
677	M	37	Working	1702	113	1815
678	M	36	Working	1702	113	1815
679	M	47	Working	1702	113	1815
680	M	36	Working	1702	113	1815
681	M	61	Working	1702	113	1815
682	M	54	Working	1702	113	1815
683	M	63	Working	1702	113	1815
684	M	36	Working	1702	113	1815
685	M	50	Working	1702	113	1815
686	M	33	Working	1702	113	1815
687	M	24	Working	1702	113	1815
688	M	34	Working	1702	113	1815
689	M	45	Working	1702	113	1815
690	M	53	Working	1702	113	1815

**Table 47. Direct radiation occupancy rates for adults, children and infants in the Heysham area (h y<sup>-1</sup>)**

Observation Number	Sex	Age (years)	Main activity	Indoor occupancy	Outdoor occupancy	Total occupancy
691	M	31	Working	1702	113	1815
692	M	49	Working	1702	113	1815
693	M	47	Working	1702	113	1815
694	M	33	Working	1702	113	1815
695	M	28	Working	1702	113	1815
696	M	61	Working	1702	113	1815
697	M	28	Working	1702	113	1815
698	M	57	Working	1702	113	1815
699	M	38	Working	1702	113	1815
700	M	42	Working	1702	113	1815
701	M	51	Working	1702	113	1815
702	M	31	Working	1702	113	1815
703	M	54	Working	1702	113	1815
704	M	48	Working	1702	113	1815
705	M	52	Working	1702	113	1815
706	M	39	Working	1702	113	1815
707	M	51	Working	1702	113	1815
708	M	43	Working	1702	113	1815
709	M	56	Working	1702	113	1815
710	M	45	Working	1702	113	1815
711	M	65	Working	1702	113	1815
712	M	39	Working	1702	113	1815
713	M	39	Working	1702	113	1815
714	M	51	Working	1702	113	1815
715	M	29	Working	1702	113	1815
716	M	54	Working	1702	113	1815
717	M	57	Working	1702	113	1815
718	M	39	Working	1702	113	1815
719	M	64	Working	1702	113	1815
720	M	35	Working	1702	113	1815
721	M	33	Working	1702	113	1815
722	M	47	Working	1702	113	1815
723	M	46	Working	1702	113	1815
724	M	63	Working	1702	113	1815
725	M	44	Working	1702	113	1815
726	M	28	Working	1702	113	1815
727	M	46	Working	1702	113	1815
728	M	52	Working	1702	113	1815
751	F	62	Working	1702	113	1815
752	F	50	Working	1702	113	1815
753	F	52	Working	1702	113	1815
754	F	51	Working	1702	113	1815
755	F	37	Working	1702	113	1815
756	F	48	Working	1702	113	1815
757	F	27	Working	1702	113	1815
758	F	45	Working	1702	113	1815
759	F	42	Working	1702	113	1815
760	F	34	Working	1702	113	1815
761	F	60	Working	1702	113	1815
762	F	37	Working	1702	113	1815
763	F	31	Working	1702	113	1815
764	F	45	Working	1702	113	1815
765	F	32	Working	1702	113	1815
766	F	49	Working	1702	113	1815
767	F	56	Working	1702	113	1815
768	F	30	Working	1702	113	1815
617	M	U	Working	1762	38	1800
618	M	U	Working	1762	38	1800
189	M	52	Working	1723	37	1760
190	M	57	Working	1723	37	1760
191	M	59	Working	1723	37	1760

**Table 47. Direct radiation occupancy rates for adults, children and infants in the Heysham area (h y<sup>-1</sup>)**

Observation Number	Sex	Age (years)	Main activity	Indoor occupancy	Outdoor occupancy	Total occupancy
192	F	U	Working	1723	37	1760
193	F	U	Working	1723	37	1760
202	M	25	Working	1723	37	1760
204	F	U	Working	1723	37	1760
205	F	U	Working	1723	37	1760
206	M	U	Working	1723	37	1760
207	M	U	Working	1723	37	1760
208	M	U	Working	1723	37	1760
209	M	47	Working	1628	132	1760
210	F	22	Working	1628	132	1760
211	F	25	Working	1628	132	1760
212	F	U	Working	1628	132	1760
213	M	U	Working	1628	132	1760
214	M	U	Working	1628	132	1760
215	M	U	Working	1628	132	1760
216	M	U	Working	1628	132	1760
217	M	U	Working	1628	132	1760
218	M	U	Working	1628	132	1760
196	M	U	Working	330	1430	1760
602	F	52	Working	1667	88	1755
729	M	63	Working	1634	68	1702
730	M	48	Working	1634	68	1702
731	M	49	Working	1634	68	1702
732	M	50	Working	1634	68	1702
733	M	37	Working	1634	68	1702
734	M	52	Working	1634	68	1702
735	M	42	Working	1634	68	1702
736	M	37	Working	1634	68	1702
737	M	39	Working	1634	68	1702
738	M	41	Working	1634	68	1702
739	M	40	Working	1634	68	1702
740	M	37	Working	1634	68	1702
741	M	31	Working	1634	68	1702
742	M	43	Working	1634	68	1702
743	M	39	Working	1634	68	1702
744	M	39	Working	1634	68	1702
745	M	38	Working	1634	68	1702
746	M	45	Working	1634	68	1702
747	M	37	Working	1634	68	1702
748	M	59	Working	1634	68	1702
749	M	21	Working	1634	68	1702
769	F	28	Working	1634	68	1702
770	F	37	Working	1634	68	1702
771	F	51	Working	1634	68	1702
619	M	U	Working	1537	38	1575
620	M	U	Working	1537	38	1575
194	M	22	Working	1313	37	1350
195	M	U	Working	1313	37	1350
203	M	U	Working	1224	24	1248
814	M	13	Residing (part time)	904	196	1100
815	F	12	Residing (part time)	904	196	1100
52	F	U	Working	634	422	1056
51	F	U	Working	576	384	960
607	M	U	Working	889	31	920
609	M	U	Working	889	31	920
610	M	U	Working	889	31	920
611	M	U	Working	889	31	920
612	M	U	Working	889	31	920
613	M	U	Working	889	31	920
614	M	U	Working	889	31	920
615	M	U	Working	889	31	920

**Table 47. Direct radiation occupancy rates for adults, children and infants in the Heysham area (h y<sup>-1</sup>)**

Observation Number	Sex	Age (years)	Main activity	Indoor occupancy	Outdoor occupancy	Total occupancy
616	M	U	Working	889	31	920
750	M	65	Working	681	45	726
55	M	4	Attending nursery school	403	269	672
56	M	4	Attending nursery school	403	269	672
57	F	4	Attending nursery school	403	269	672
58	F	4	Attending nursery school	403	269	672
59	M	2	Attending nursery school	403	269	672
60	M	2	Attending nursery school	403	269	672
61	F	2	Attending nursery school	403	269	672
62	F	2	Attending nursery school	403	269	672
63	M	3	Attending nursery school	403	269	672
64	M	3	Attending nursery school	403	269	672
65	F	3	Attending nursery school	403	269	672
66	F	3	Attending nursery school	403	269	672
608	F	U	Working	530	22	552
178	M	U	Working	443	41	484
179	M	U	Working	443	41	484
180	M	U	Working	443	41	484
181	M	U	Working	443	41	484
182	M	U	Working	443	41	484
183	M	U	Working	443	41	484
197	M	U	Working	275	37	312
198	M	U	Working	275	37	312
199	M	U	Working	275	37	312
200	M	U	Working	275	37	312
201	M	U	Working	275	37	312
53	F	U	Working	172	114	286
54	F	U	Working	172	114	286
106	F	U	Dog walking	-	52	52
105	M	U	Dog walking	-	25	25
93	M	35	Bait digging and collecting shellfish	-	18	18
1	F	81	Dog walking	-	15	15
94	M	47	Bait digging	-	12	12

**Notes**

U = Unknown

**Table 48. Analysis of direct radiation occupancy rates for adults, children and infants in the Heysham area**

<b>Number of hours</b>	<b>Number of observations</b>
<b>0 to 0.25 km zone</b>	
>8000 to 8760	1
>7000 to 8000	0
>6000 to 7000	1
>5000 to 6000	0
>4000 to 5000	0
>3000 to 4000	0
>2000 to 3000	0
>1000 to 2000	18
0 to 1000	28
<b>0 to 8760</b>	<b>48</b>
<b>&gt;0.25 to 0.5 km zone</b>	
>8000 to 8760	4
>7000 to 8000	2
>6000 to 7000	0
>5000 to 6000	0
>4000 to 5000	1
>3000 to 4000	1
>2000 to 3000	29
>1000 to 2000	36
0 to 1000	23
<b>0 to 8760</b>	<b>96</b>
<b>&gt;0.5 to 1 km zone</b>	
>8000 to 8760	5
>7000 to 8000	9
>6000 to 7000	4
>5000 to 6000	4
>4000 to 5000	0
>3000 to 4000	2
>2000 to 3000	2
>1000 to 2000	184
0 to 1000	42
<b>0 to 8760</b>	<b>252</b>

**Table 49. Gamma dose rate measurements for the Heysham direct radiation survey ( $\mu\text{Gy h}^{-1}$ )**

**Residences and businesses**

Location	Indoor substrate	Indoor gamma dose rate at 1 metre <sup>a</sup>	Outdoor substrate	Outdoor gamma dose rate at 1 metre <sup>a</sup>
Residence 1	Concrete	0.133	Grass	0.097
Residence 2	-	Not taken	Concrete	0.071
Residence 3	Concrete	0.114	Soil	0.078
Residence 4	Concrete	0.119	Concrete	0.073
Residence 5	Concrete	0.110	Concrete	0.096
Residence 6	Concrete	0.119	Concrete	0.106
Residence 7	Concrete	0.118	Concrete	0.107
Residence 8	Concrete	0.108	Soil	0.073
Residence 9	Concrete	0.121	Concrete	0.074
Residence 10	Concrete	0.063	Concrete	0.076
Business 1	Wood	0.054	Grass	0.058
Business 2	Concrete	0.057	Grass	0.062
Business 3	Concrete	0.099	Grass	0.073
Business 4	Wood	0.097	Grass	0.061

**Notes**

<sup>a</sup> These measurements have not been adjusted for background dose rates.

**Backgrounds**

Location	NGR	Substrate	Background gamma dose rate at 1 metre
Background 1	Arnside	Grass	0.081
Background 2	Stodday	Grass	0.069
Background 3	West of Lancaster University	Grass	0.076
Background 4	Condor Green	Grass	0.077
Background 5	Lane Ends	Grass	0.088

Table 50. Combinations of adult pathways for consideration in dose assessments in the Heysham area

Combination number	Fish	Crustaceans	Molluscs	Wildfowl	Marine plants/algae	Saltmarsh grazed sheep meat	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Milk	Cattle meat	Pig meat	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits/hares	Honey	Wild fungi	Intertidal occupancy over mud	Intertidal occupancy over mud and sand	Intertidal occupancy over rock	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Intertidal occupancy over stones	Intertidal occupancy on board a boat resting on mud	Handling fishing gear	Handling sediment	Occupancy in water	Occupancy on water	Indoor occupancy within 1 km of the licensed site boundary	Outdoor occupancy within 1 km of the licensed site boundary			
1							X	X	X	X							X	X						X										X	X			
2											X	X						X	X			X													X	X		
3							X	X	X	X										X	X																	
4							X	X	X	X	X		X		X		X																					
5	X	X			X																				X	X	X				X	X	X					
6	X	X	X		X																		X			X					X	X	X					
7	X	X	X	X	X																					X					X	X	X		X	X		
8																										X							X					
9	X																							X		X						X						
10																										X							X					X
11																								X										X			X	
12	X						X	X	X	X	X									X	X																	
13	X						X	X	X	X	X												X															
14												X													X													
15				X												X						X	X										X					
16				X												X			X				X											X				
17	X	X	X														X	X				X	X							X	X	X						
18							X	X	X	X	X						X	X																				
19																												X						X				
20	X			X	X	X																			X													
21	X			X														X	X			X				X						X			X			
22	X						X	X	X	X																						X			X			
23	X	X	X	X																			X									X	X	X				
24	X			X	X																				X	X												
25	X			X						X	X				X		X	X							X													
26	X		X							X	X	X	X	X	X	X	X	X				X																
27																							X											X				
28	X			X																															X	X		
29	X	X	X																																X	X		
30	X	X																				X				X			X	X							X	
31	X	X	X											X		X	X	X				X			X	X				X	X						X	
32																	X		X																			
33	X																							X		X												
34	X																								X	X												
35							X	X	X		X						X																				X	X
36																											X									X		X

**Notes**

The food groups and external exposure pathways marked with a cross are combined for the corresponding combination number. For example, combination number 1 represents an individual (or individuals) from Annex 1 who had positive data for the following pathways: other vegetables, root vegetables, potato, wild/free foods, intertidal occupancy over sand, indoor occupancy and outdoor occupancy.

Annex 1. Adults' consumption rates (kg y<sup>-1</sup> or l y<sup>-1</sup>) and occupancy rates (h y<sup>-1</sup>) in the Heysham area

Observation number	Sex	Age (years)	Fish	Crustaceans	Molluscs	Wildfowl	Marine plants/algae	Saltmarsh grazed sheep meat	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Milk	Cattle meat	Pig meat	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits/hares	Honey	Wild fungi	Intertidal occupancy over mud	Intertidal occupancy over mud and sand	Intertidal occupancy over rock	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Intertidal occupancy over stones	Intertidal occupancy on board a boat resting on mud	Handling fishing gear	Handling sediment	Occupancy in water	Occupancy on water	Indoor occupancy within 1 km of the licensed site boundary	Outdoor occupancy within 1 km of the licensed site boundary
1	F	81	-	-	-	-	-	-	25.2	3.8	20.2	-	-	-	-	-	-	-	-	0.5	-	-	-	-	-	-	-	15	-	-	-	-	-	-	-	-	15
2	F	46	-	-	-	-	-	-	25.2	3.8	20.2	-	-	-	-	-	-	-	-	0.5	-	-	-	-	-	-	-	15	-	-	-	-	-	-	-	920	935
3	M	56	-	-	-	-	-	-	-	-	-	0.5	311.1	-	-	-	-	-	-	0.3	-	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	F	54	-	-	-	-	-	-	-	-	-	0.5	311.1	-	-	-	-	-	-	0.3	-	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	M	25	-	-	-	-	-	-	-	-	-	0.5	-	-	-	-	-	-	-	0.3	-	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	M	67	-	-	-	-	-	7.9	7.2	8.6	14.6	-	-	-	-	-	-	-	-	0.6	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	F	66	-	-	-	-	-	7.9	7.2	8.6	14.6	-	-	-	-	-	-	-	-	-	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	M	30	-	-	-	-	-	7.9	7.2	8.6	14.6	-	-	-	-	-	-	-	-	0.6	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	M	U	-	-	-	-	-	11.0	32.9	-	-	49.0	-	-	-	-	-	-	21.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	46	-	-	-	-	-	-	-	-	-	-
11	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	46	-	-	-	-	-	-	-	-	-	-
12	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	46	-	-	-	-	-	-	-	-	-	-
13	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	46	-	-	-	-	-	-	-	-	-	-
14	F	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-
16	F	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	156	-	-	-	-	-	-	-	-	-	-
17	M	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	5	-	-	-	-	-	-	-	-	-
18	F	58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	5	-	-	-	-	-	-	-	-	-
19	M	46	49.4	6.1	9.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	423	-	-	-	964	59	-	1560	-	-	
20	M	U	3.6	2.7	2.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	66	-	-	195	6	-	375	-	-	-	
21	M	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40	-	-	-	-	-	-	-	-	-
22	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20	-	-	-	-	-	-	-	809	1213
23	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	809	1213
24	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	809	1213
25	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	809	1213
26	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	809	1213
27	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	809	1213
28	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	809	1213
29	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	809	1213
30	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	809	1213
31	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	809	1213
32	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1820	202
33	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1820	202
34	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1820	202
35	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1820	202
36	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1820	202
37	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1820	202
38	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1820	202
39	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1820	202







Annex 1. Adults' consumption rates (kg y<sup>-1</sup> or l y<sup>-1</sup>) and occupancy rates (h y<sup>-1</sup>) in the Heysham area

Observation number	Sex	Age (years)	Fish	Crustaceans	Molluscs	Wildfowl	Marine plants/algae	Saltmarsh grazed sheep meat	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Milk	Cattle meat	Pig meat	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits/hares	Honey	Wild fungi	Intertidal occupancy over mud	Intertidal occupancy over mud and sand	Intertidal occupancy over rock	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Intertidal occupancy over stones	Intertidal occupancy on board a boat resting on mud	Handling fishing gear	Handling sediment	Occupancy in water	Occupancy on water	Indoor occupancy within 1 km of the licensed site boundary	Outdoor occupancy within 1 km of the licensed site boundary
176	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1895	41	
177	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1895	41
178	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	443	41
179	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	443	41
180	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	443	41
181	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	443	41
182	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	443	41
183	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	443	41
184	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	990	990
185	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	990	990
186	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	990	990
187	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	990	990
188	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	990	990
189	M	52	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1723	37
190	M	57	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1723	37
191	M	59	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1723	37
192	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1723	37
193	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1723	37
194	M	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1313	37
195	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1313	37
196	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	330	1430
197	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	275	37
198	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	275	37
199	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	275	37
200	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	275	37
201	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	275	37
202	M	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1723	37
203	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1224	24
204	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1723	37
205	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1723	37
206	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1723	37
207	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1723	37
208	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1723	37
209	M	47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1628	132
210	F	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1628	132
211	F	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1628	132
212	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1628	132
213	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1628	132





Annex 1. Adults' consumption rates (kg y<sup>-1</sup> or l y<sup>-1</sup>) and occupancy rates (h y<sup>-1</sup>) in the Heysham area

Observation number	Sex	Age (years)	Fish	Crustaceans	Molluscs	Wildfowl	Marine plants/algae	Saltmarsh grazed sheep meat	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Milk	Cattle meat	Pig meat	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits/hares	Honey	Wild fungi	Intertidal occupancy over mud	Intertidal occupancy over mud and sand	Intertidal occupancy over rock	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Intertidal occupancy over stones	Intertidal occupancy on board a boat resting on mud	Handling fishing gear	Handling sediment	Occupancy in water	Occupancy on water	Indoor occupancy within 1 km of the licensed site boundary	Outdoor occupancy within 1 km of the licensed site boundary		
304	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
305	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
306	M	61	-	-	-	-	-	-	49.6	15.3	19.6	88.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
307	F	54	-	-	-	-	-	-	49.6	15.3	19.6	88.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
308	F	29	-	-	-	-	-	-	1.3	0.6	0.5	3.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
309	M	28	-	-	-	-	-	-	1.3	0.6	0.5	3.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
311	M	34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	440	916		
312	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	440	916		
313	M	68	-	-	-	-	-	-	8.9	7.1	11.2	44.9	1.4	-	-	-	-	-	-	8.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
314	F	63	-	-	-	-	-	-	8.9	7.1	11.2	44.9	1.4	-	-	-	-	-	-	8.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
315	F	44	-	-	-	-	-	-	8.9	7.1	11.2	44.9	1.4	-	-	-	-	-	-	8.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
317	F	81	-	-	-	-	-	-	7.1	5.7	9.0	28.8	1.1	-	-	-	-	-	4.4	-	5.7	9.0	28.8	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
318	M	79	-	-	-	-	-	-	7.1	5.7	9.0	28.8	1.1	-	-	-	-	-	4.4	-	5.7	9.0	28.8	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
319	F	74	-	-	-	-	-	-	7.1	5.7	9.0	28.8	1.1	-	-	-	-	-	4.4	-	5.7	9.0	28.8	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
320	M	76	-	-	-	-	-	-	7.1	5.7	9.0	28.8	1.1	-	-	-	-	-	4.4	-	5.7	9.0	28.8	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
321	M	73	-	-	-	-	-	-	12.5	25.3	19.8	30.3	7.8	-	-	-	-	-	-	2.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
322	F	68	-	-	-	-	-	-	12.5	25.3	19.8	30.3	7.8	-	-	-	-	-	-	2.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
323	M	42	-	-	-	-	-	-	12.5	25.3	19.8	30.3	7.8	-	-	-	-	-	-	2.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
324	M	59	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5264	-	-	
325	F	56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5264	-	-	
326	M	73	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	280	-	-	-	100	-	-	-	-	-	
327	M	67	9.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	175	650	-	-	-	225	-	-	-	-	-	
328	M	42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	-	-	-	-	-	-	-	-	-	
329	M	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	312	-	-	-	-	-	312	-	-	-	-	
330	M	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	260	-	-	-	-	-	260	-	-	-	-	
331	M	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	260	-	-	-	-	-	260	-	-	-	-	-	
332	F	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	260	-	-	-	-	
333	F	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	83	-	-	-	-	16	-	-	-	-	
334	F	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	83	-	-	-	-	16	-	-	-	-	
335	F	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	83	-	-	-	-	16	-	-	-	-	
336	M	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	83	-	-	-	-	16	-	-	-	-	
337	M	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	83	-	-	-	-	16	-	-	-	-	
338	M	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	83	-	-	-	-	16	-	-	-	-	
339	F	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	243	-	-	-	-	-	-	-	-	-	
340	M	39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	365	-	-	-	-	-	-	-	-	-	
341	M	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	875	-	-	-	
342	M	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	875	-	-	-	
343	M	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	875	-	-	-	

Annex 1. Adults' consumption rates (kg y<sup>-1</sup> or l y<sup>-1</sup>) and occupancy rates (h y<sup>-1</sup>) in the Heysham area

Observation number	Sex	Age (years)	Fish	Crustaceans	Molluscs	Wildfowl	Marine plants/algae	Saltmarsh grazed sheep meat	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Milk	Cattle meat	Pig meat	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits/hares	Honey	Wild fungi	Intertidal occupancy over mud	Intertidal occupancy over mud and sand	Intertidal occupancy over rock	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Intertidal occupancy over stones	Intertidal occupancy on board a boat resting on mud	Handling fishing gear	Handling sediment	Occupancy in water	Occupancy on water	Indoor occupancy within 1 km of the licensed site boundary	Outdoor occupancy within 1 km of the licensed site boundary						
344	M	54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1000	-	-					
345	M	67	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
346	M	66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24	-	-	-	-	-	24	-	-	-	-	-	-				
347	M	44	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24	-	-	-	-	-	24	-	-	-	-	-	-				
348	F	41	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
349	M	35	8.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
350	F	33	8.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	150	400	-	-	-	-	-	150	-	-	-	-	-	-			
353	F	53	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
354	M	46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
355	F	45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
356	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	432	-	-			
357	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	432	-	-			
358	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	432	-	-			
359	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	432	-	-			
362	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	250	-	-			
363	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	250	-	-			
364	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	250	-	-			
365	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	250	-	-			
368	M	69	-	-	-	-	-	5.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	238	-	-		
369	F	72	-	-	-	-	-	5.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
370	F	41	-	-	-	-	-	5.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200	-	-	
371	F	44	-	-	-	-	-	5.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
372	F	36	-	-	-	-	-	5.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
373	F	34	-	-	-	-	-	5.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
374	M	53	-	-	-	-	0.3	6.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	92	-	-	
375	F	50	-	-	-	-	0.3	6.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
376	M	21	-	-	-	-	-	6.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
377	M	19	-	-	-	-	-	6.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
378	M	17	-	-	-	-	-	6.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
379	M	60	3.3	-	-	5.1	0.4	17.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	
380	F	58	3.3	-	-	5.1	-	17.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
381	M	31	3.3	-	-	5.1	-	17.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	110	-	-	
382	M	28	3.3	-	-	5.1	-	17.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
383	M	69	9.2	-	-	12.6	-	-	-	-	-	-	-	-	-	-	-	-	-	4.5	2.3	-	0.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40	-	390	-	350
384	M	64	41.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	546	-	-
385	F	62	41.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
386	M	48	10.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-	1200
387	M	51	45.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-	1200



Annex 1. Adults' consumption rates (kg y<sup>-1</sup> or l y<sup>-1</sup>) and occupancy rates (h y<sup>-1</sup>) in the Heysham area

Observation number	Sex	Age (years)	Fish	Crustaceans	Molluscs	Wildfowl	Marine plants/algae	Saltmarsh grazed sheep meat	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Milk	Cattle meat	Pig meat	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits/hares	Honey	Wild fungi	Intertidal occupancy over mud	Intertidal occupancy over mud and sand	Intertidal occupancy over rock	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Intertidal occupancy over stones	Intertidal occupancy on board a boat resting on mud	Handling fishing gear	Handling sediment	Occupancy in water	Occupancy on water	Indoor occupancy within 1 km of the licensed site boundary	Outdoor occupancy within 1 km of the licensed site boundary	
426	F	26	17.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
427	M	44	-	0.1	-	-	0.3	2.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26	26	-	-	-	-	-	-	-	-	-	-	-
428	M	44	-	0.1	-	-	0.3	2.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26	26	-	-	-	-	-	-	-	-	-	-	-
429	M	64	-	-	-	-	-	-	4.4	20.8	8.8	18.9	16.8	-	56.8	-	27.1	-	12.2	-	-	-	-	-	-	26	26	-	-	-	-	-	-	-	-	-	-	-
430	M	64	-	-	-	-	-	-	4.4	20.8	8.8	18.9	16.8	-	-	-	-	-	12.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
431	M	58	-	1.7	-	-	-	8.5	-	-	-	-	20.0	172.9	-	-	8.5	-	23.4	1.5	-	-	-	-	-	52	-	-	-	-	-	-	-	-	-	-	-	-
432	F	58	-	1.7	-	-	-	8.5	-	-	-	-	20.0	172.9	-	-	8.5	-	23.4	1.5	-	-	-	-	-	52	-	-	-	-	-	-	-	-	-	-	-	-
433	M	27	-	-	-	-	-	-	-	-	-	-	-	172.9	-	-	-	-	-	-	-	-	-	-	-	52	-	-	-	-	-	-	-	-	-	-	-	-
434	M	U	-	-	-	-	-	-	-	-	-	-	-	172.9	-	-	-	-	-	-	-	-	-	-	-	52	-	-	-	-	-	-	-	-	-	-	-	-
435	M	U	-	-	-	-	-	-	-	-	-	-	-	172.9	-	-	-	-	-	-	-	-	-	-	-	52	-	-	-	-	-	-	-	-	-	-	-	-
436	M	U	-	-	-	-	-	-	-	-	-	-	-	172.9	-	-	-	-	-	-	-	-	-	-	-	52	-	-	-	-	-	-	-	-	-	-	-	-
437	M	53	-	-	-	-	-	-	-	-	-	-	-	365.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
438	F	50	-	-	-	-	-	-	-	-	-	-	-	365.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
439	M	25	-	-	-	-	-	-	-	-	-	-	-	365.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
440	M	22	-	-	-	-	-	-	-	-	-	-	-	365.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
441	M	19	-	-	-	-	-	-	-	-	-	-	-	365.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
442	M	47	4.9	-	-	0.6	-	-	-	-	-	-	5.0	-	13.0	26.0	6.5	-	-	1.4	-	-	1.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
443	F	34	4.9	-	-	0.6	-	-	-	-	-	-	5.0	-	13.0	26.0	6.5	-	-	1.4	-	-	1.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
444	F	18	4.9	-	-	0.6	-	-	-	-	-	-	5.0	-	13.0	26.0	6.5	-	-	1.4	-	-	1.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
446	M	67	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80	-	-	-	-	-	-	720	-	-	-	-	-	-	-
447	M	52	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80	-	-	-	-	-	-	720	-	-	-	-	-	-	-
448	M	48	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	73	646	-	-	
449	F	48	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	73	646	-	-	
450	M	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	73	310	-	-	
451	M	47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	70	70	-	-	
452	M	71	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	104	-	-	-	-	-	-	-	-	-	-	-
453	F	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	110	-	-	-	-	-	-	-	-	-	-	-
454	M	42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	365	-	-	-	-	-	-	-	-	-	-	-
455	F	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	365	-	-	-	-	-	-	-	-	-	-	-
456	M	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21	-	-	-	-	-	-	21	-	-	-	-
457	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	72	-	-	-	-	-	-	72	-	-	-	-
458	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	72	-	-	-	-	-	-	72	-	-	-	-
459	M	U	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	54	-	-	54	-	-	-	-	-	-	-	-	-	54
460	M	U	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	54	-	-	54	-	-	-	-	-	-	-	-	-	54
462	M	U	2.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
463	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	176	-	-	
464	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	176	-	-	
465	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	176	-	-	

Annex 1. Adults' consumption rates (kg y<sup>-1</sup> or l y<sup>-1</sup>) and occupancy rates (h y<sup>-1</sup>) in the Heysham area

Observation number	Sex	Age (years)	Fish	Crustaceans	Molluscs	Wildfowl	Marine plants/algae	Saltmarsh grazed sheep meat	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Milk	Cattle meat	Pig meat	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits/hares	Honey	Wild fungi	Intertidal occupancy over mud	Intertidal occupancy over mud and sand	Intertidal occupancy over rock	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Intertidal occupancy over stones	Intertidal occupancy on board a boat resting on mud	Handling fishing gear	Handling sediment	Occupancy in water	Occupancy on water	Indoor occupancy within 1 km of the licensed site boundary	Outdoor occupancy within 1 km of the licensed site boundary		
466	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	176	-	-		
467	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	176	-	-	
468	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	176	-	-	
469	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	176	-	-	
470	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	176	-	-	
471	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	176	-	-	
472	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	176	-	-	
473	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	72	-	-	
474	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	72	-	-	
475	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	72	-	-	
476	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	72	-	-	
477	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	72	-	-	
478	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	72	-	-	
479	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	72	-	-	
480	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	72	-	-	
481	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	72	-	-	
482	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	72	-	-	
483	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	48	-	-	
484	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	48	-	-	
485	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	48	-	-	
486	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	48	-	-	
487	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	48	-	-	
488	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	-	-	
489	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	-	-	
490	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	-	-	
491	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	-	-	
492	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	-	-	
493	F	U	4.6	-	-	-	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	72	-	-
494	F	U	-	-	-	-	0.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
495	F	U	-	-	-	-	0.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
496	M	72	4.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
497	F	72	4.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
498	M	U	2.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
499	F	U	2.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
500	M	U	3.4	1.8	0.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40	20	-	-	
501	F	U	3.4	1.6	0.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
502	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200	-	-
503	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200	-	-

Annex 1. Adults' consumption rates (kg y<sup>-1</sup> or l y<sup>-1</sup>) and occupancy rates (h y<sup>-1</sup>) in the Heysham area

Observation number	Sex	Age (years)	Fish	Crustaceans	Molluscs	Wildfowl	Marine plants/algae	Saltmarsh grazed sheep meat	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Milk	Cattle meat	Pig meat	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits/hares	Honey	Wild fungi	Intertidal occupancy over mud	Intertidal occupancy over mud and sand	Intertidal occupancy over rock	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Intertidal occupancy over stones	Intertidal occupancy on board a boat resting on mud	Handling fishing gear	Handling sediment	Occupancy in water	Occupancy on water	Indoor occupancy within 1 km of the licensed site boundary	Outdoor occupancy within 1 km of the licensed site boundary		
504	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200	-	-		
505	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200	-	-	
506	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200	-	-	
507	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200	-	-	
508	F	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200	-	-	
509	M	35	2.3	-	-	<b>10.0</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<b>200</b>	-	-	-	-	-	-	-	-	-	200	-	200	-	-	
510	F	U	-	-	-	<b>10.0</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
511	M	28	-	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	5	-	200	-	-		
512	M	U	-	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	5	-	-	-	-		
513	F	U	-	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	5	-	-	-	-		
514	F	U	-	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	5	-	-	-	-		
515	M	60	-	0.4	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200	-	-		
516	M	38	14.9	3.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<b>360</b>	-	-	<b>759</b>	-	15	-	<b>398</b>	<b>375</b>	-	-	776	-	-		
517	F	42	14.9	3.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
519	M	U	3.8	<b>5.6</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98	-	-	-	<b>1269</b>	-	-	-	<b>672</b>	98	-	-	660	-	-	
520	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98	-	-	-	<b>1269</b>	-	-	-	<b>672</b>	98	-	-	660	-	-	
521	M	U	<b>19.3</b>	3.3	<b>4.4</b>	-	0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<b>210</b>	-	-	-	178	-	-	-	226	210	-	-	562	-	-	
522	M	43	-	-	-	-	-	<b>5.7</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
524	F	40	-	-	-	-	-	<b>5.7</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
526	M	35	12.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
527	M	47	4.7	1.1	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
528	F	18	4.7	1.1	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
529	F	17	4.7	1.1	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
531	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<b>546</b>	-	-
532	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<b>546</b>	-	-	
533	M	65	8.0	<b>10.9</b>	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27	-	-	-	126	-	-	-	126	27	-	-	756	-	-	
534	M	41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27	-	-	-	126	-	-	-	126	27	-	-	756	-	-	
535	F	63	8.0	<b>10.9</b>	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
536	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	211	1763	
537	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	211	1763	
538	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	211	1763	
539	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	211	1763	
540	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	211	1763	
541	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	211	1763	
542	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	211	1763	
543	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1034	940	
544	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1034	940	
545	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1034	940	





Annex 1. Adults' consumption rates (kg y<sup>-1</sup> or l y<sup>-1</sup>) and occupancy rates (h y<sup>-1</sup>) in the Heysham area

Observation number	Sex	Age (years)	Fish	Crustaceans	Molluscs	Wildfowl	Marine plants/algae	Saltmarsh grazed sheep meat	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Milk	Cattle meat	Pig meat	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits/hares	Honey	Wild fungi	Intertidal occupancy over mud	Intertidal occupancy over mud and sand	Intertidal occupancy over rock	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Intertidal occupancy over stones	Intertidal occupancy on board a boat resting on mud	Handling fishing gear	Handling sediment	Occupancy in water	Occupancy on water	Indoor occupancy within 1 km of the licensed site boundary	Outdoor occupancy within 1 km of the licensed site boundary	
622	F	55	-	-	-	-	-	-	30.7	30.6	7.8	18.1	22.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
623	M	60	-	-	-	-	-	-	0.2	14.1	2.4	8.2	4.8	-	-	-	-	-	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
624	F	64	-	-	-	-	-	-	0.2	14.1	2.4	8.2	4.8	-	-	-	-	-	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
625	F	28	-	-	-	-	-	-	0.2	14.1	2.4	8.2	4.4	-	-	-	-	-	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
627	M	30	-	-	-	-	-	-	0.2	16.3	2.4	8.2	4.4	-	-	-	-	-	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
628	F	28	-	-	-	-	-	-	0.2	14.1	2.4	8.2	4.4	-	-	-	-	-	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
630	F	44	-	-	-	-	-	-	17.0	22.5	10.3	29.4	0.2	-	-	-	-	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
631	M	44	-	-	-	-	-	-	17.0	22.5	10.3	29.4	0.2	-	-	-	-	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
632	M	17	-	-	-	-	-	-	17.0	22.5	10.3	29.4	0.2	-	-	-	-	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
633	F	17	-	-	-	-	-	-	17.0	22.5	10.3	29.4	0.2	-	-	-	-	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
634	M	67	-	-	-	-	-	-	20.5	14.6	2.7	29.0	5.8	-	-	-	-	-	0.3	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
635	M	65	-	-	-	-	-	-	20.5	14.6	2.7	29.0	7.0	-	-	-	-	-	0.3	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
636	F	35	-	-	-	-	-	-	6.9	8.0	0.8	9.7	5.0	-	-	-	-	-	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
637	M	41	-	-	-	-	-	-	6.9	8.0	0.8	9.7	5.0	-	-	-	-	-	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
640	M	42	-	-	-	-	-	-	5.1	6.0	0.5	7.3	2.6	-	-	-	-	-	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
641	F	39	-	-	-	-	-	-	3.6	6.0	0.4	7.3	2.6	-	-	-	-	-	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
644	M	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1816	113	
645	M	59	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1816	113	
646	M	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1816	113	
647	M	47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1816	113	
648	M	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1816	113	
649	M	46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1816	113	
650	M	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113	
651	M	54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113	
652	M	42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113	
653	M	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113	
654	M	62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113	
655	M	39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113	
656	M	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113	
657	M	43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113	
658	M	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113	
659	M	48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113	
660	M	54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113	
661	M	34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113	
662	M	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113	
663	M	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113	
664	M	34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113	
665	M	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113	

Annex 1. Adults' consumption rates (kg y<sup>-1</sup> or l y<sup>-1</sup>) and occupancy rates (h y<sup>-1</sup>) in the Heysham area

Observation number	Sex	Age (years)	Fish	Crustaceans	Molluscs	Wildfowl	Marine plants/algae	Saltmarsh grazed sheep meat	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Milk	Cattle meat	Pig meat	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits/hares	Honey	Wild fungi	Intertidal occupancy over mud	Intertidal occupancy over mud and sand	Intertidal occupancy over rock	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Intertidal occupancy over stones	Intertidal occupancy on board a boat resting on mud	Handling fishing gear	Handling sediment	Occupancy in water	Occupancy on water	Indoor occupancy within 1 km of the licensed site boundary	Outdoor occupancy within 1 km of the licensed site boundary	
666	M	42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113	
667	M	61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
668	M	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
669	M	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
670	M	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
671	M	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
672	M	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
673	M	56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
674	M	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
675	M	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
676	M	49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
677	M	37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
678	M	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
679	M	47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
680	M	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
681	M	61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
682	M	54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
683	M	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
684	M	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
685	M	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
686	M	33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
687	M	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
688	M	34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
689	M	45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
690	M	53	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
691	M	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
692	M	49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
693	M	47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
694	M	33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
695	M	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
696	M	61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
697	M	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
698	M	57	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
699	M	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
700	M	42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
701	M	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
702	M	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113
703	M	54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1702	113







Annex 1. Adults' consumption rates (kg y<sup>-1</sup> or l y<sup>-1</sup>) and occupancy rates (h y<sup>-1</sup>) in the Heysham area

Observation number	Sex	Age (years)	Fish	Crustaceans	Molluscs	Wildfowl	Marine plants/algae	Saltmarsh grazed sheep meat	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Milk	Cattle meat	Pig meat	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits/hares	Honey	Wild fungi	Intertidal occupancy over mud	Intertidal occupancy over mud and sand	Intertidal occupancy over rock	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Intertidal occupancy over stones	Intertidal occupancy on board a boat resting on mud	Handling fishing gear	Handling sediment	Occupancy in water	Occupancy on water	Indoor occupancy within 1 km of the licensed site boundary	Outdoor occupancy within 1 km of the licensed site boundary		
830	F	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
831	M	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
832	M	45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	60	-	-	-	-	-	-	-	-	-	-	-	-	
833	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	840	-	-	-	-	-	-	840	-	-	-	-	-	
834	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	336	-	-	-	-	-	-	336	-	-	-	-	-	
835	F	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7954	286		
839	F	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3468	66		
840	M	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2730	84		
841	M	78	<b>19.9</b>	-	-	-	<b>2.3</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	179	-	-	-	30	-	-	-	-	-	-	-	
842	F	86	<b>19.9</b>	-	-	-	<b>2.3</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
843	M	65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	38	-	-	-	-	-	-	-	-	-	-	-	-
844	M	77	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	38	-	-	-	-	-	-	-	-	-	-	-	-
845	M	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	75	-	-	-	-	-	-	-	-	-	-	-	-
846	M	U	4.8	0.5	-	<b>11.4</b>	-	-	-	-	-	-	-	-	-	-	<b>11.3</b>	<b>20.7</b>	<b>6.8</b>	0.2	-	-	-	-	<b>520</b>	48	-	-	-	<b>436</b>	-	-	500	-	-	-	-	-	
847	F	U	4.8	0.5	-	<b>11.4</b>	-	-	-	-	-	-	-	-	-	-	<b>11.3</b>	5.9	<b>2.3</b>	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
848	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	300	-	-	300	-	-	-	-	
849	M	59	<b>18.2</b>	3.3	2.6	6.2	<b>1.7</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	30	-	-	290	10	-	260	1820	232	-	-		
850	F	55	<b>18.2</b>	3.3	2.6	6.2	<b>1.7</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
851	F	20	<b>18.2</b>	3.3	2.6	6.2	<b>1.7</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

**Notes**

Emboldened observations are the high-rate individuals.

U = Unknown

Annex 2. Children's and infants' consumption rates (kg y<sup>-1</sup> or l y<sup>-1</sup>) and occupancy rates (h y<sup>-1</sup>) in the Heysham area

Observation number	Sex	Age (years)	Fish	Crustaceans	Wildfowl	Saltmarsh grazed sheep meat	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Milk	Cattle meat	Pig meat	Sheep meat	Eggs	Wild/free foods	Wild fungi	Intertidal occupancy over mud and sand	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Intertidal occupancy over stones	Occupancy on water	Indoor occupancy within 1 km of the licensed site boundary	Outdoor occupancy within 1 km of the licensed site boundary	
<b>Child age group (6 - 15 years old)</b>																											
15	F	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-
69	F	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	-	-	-	-	-	-
71	M	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24	-	-	-	-	-	-
72	F	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24	-	-	-	-	-	-
117	M	8	<b>6.7</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80	
118	M	6	<b>6.7</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80	
127	F	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	48	
158	F	13	-	-	-	-	3.2	<b>8.8</b>	1.1	-	0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
165	M	8	-	-	-	-	<b>4.5</b>	2.9	4.5	1.0	3.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
166	M	12	-	-	-	-	<b>7.5</b>	<b>4.8</b>	<b>7.4</b>	1.7	<b>5.0</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
229	F	14	-	-	-	-	<b>8.1</b>	<b>9.0</b>	1.4	-	<b>5.9</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
235	F	15	0.7	-	-	-	2.0	<b>10.8</b>	1.4	8.9	<b>5.0</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
236	F	7	0.5	-	-	-	1.4	<b>7.7</b>	1.0	6.4	3.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
245	F	10	-	-	-	-	<b>5.6</b>	<b>3.6</b>	<b>6.2</b>	6.6	1.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
246	M	8	-	-	-	-	<b>5.6</b>	<b>3.6</b>	<b>6.2</b>	6.6	1.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
267	F	15	-	-	-	-	<b>10.3</b>	<b>7.2</b>	<b>16.8</b>	12.1	<b>5.1</b>	-	-	-	-	<b>7.9</b>	-	-	-	-	-	-	-	-	-	-	-
276	M	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8
277	F	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8
316	M	14	-	-	-	-	<b>8.9</b>	<b>7.1</b>	<b>11.2</b>	<b>44.9</b>	1.4	-	-	-	-	<b>8.9</b>	-	-	-	-	-	-	-	-	-	-	-
351	F	9	<b>6.7</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
352	M	6	<b>6.7</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
360	M	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	432	-	-	-
361	F	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	432	-	-	-
366	M	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	250	-	-	-
367	F	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	250	-	-	-

**Annex 2. Children's and infants' consumption rates (kg y<sup>-1</sup> or l y<sup>-1</sup>) and occupancy rates (h y<sup>-1</sup>) in the Heysham area**

Observation number	Sex	Age (years)	Fish	Crustaceans	Wildfowl	Saltmarsh grazed sheep meat	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Milk	Cattle meat	Pig meat	Sheep meat	Eggs	Wild/free foods	Wild fungi	Intertidal occupancy over mud and sand	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Intertidal occupancy over stones	Occupancy on water	Indoor occupancy within 1 km of the licensed site boundary	Outdoor occupancy within 1 km of the licensed site boundary	
445	F	15	4.9	-	0.6	-	-	-	-	-	5.0	-	13.0	26.0	6.5	-	1.4	1.7	-	-	-	-	-	-	-	-	
461	F	12	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	54	-	54	-	-	-	-	54	
523	M	12	-	-	-	5.7	-	-	-	-	-	-	-	-	-	-	-	-	-	127	221	-	-	-	-	-	
525	F	14	-	-	-	5.7	-	-	-	-	-	-	-	-	-	-	-	-	-	30	30	-	-	-	-	-	
530	F	12	4.7	1.1	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
638	M	6	-	-	-	-	1.7	0.8	-	2.4	11.5	-	-	-	-	0.7	-	-	-	-	-	-	-	-	-	-	
639	M	8	-	-	-	-	1.7	0.3	-	2.4	11.5	-	-	-	-	0.7	-	-	-	-	-	-	-	-	-	-	
642	F	11	-	-	-	-	4.7	6.0	0.5	7.3	9.8	-	-	-	-	0.7	-	-	-	-	-	-	-	-	-	-	
643	M	13	-	-	-	-	4.7	6.0	0.5	7.3	11.5	-	-	-	-	0.7	-	-	-	-	-	-	-	-	-	-	
776	F	6	-	-	-	-	2.2	3.1	3.0	9.6	4.3	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	
784	M	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	58	-	-	-	
814	M	13	-	-	-	-	4.3	6.0	2.3	-	1.2	-	-	-	-	3.0	-	-	-	-	-	-	-	-	904	196	
815	F	12	-	-	-	-	4.3	0.9	2.3	-	1.2	-	-	-	-	3.0	-	-	-	-	-	-	-	-	904	196	
823	M	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	156	-	6906	88	
828	M	13	-	-	-	-	-	-	-	-	-	-	-	-	2.8	-	-	-	-	-	-	-	-	-	-	-	
829	F	15	-	-	-	-	-	-	-	-	-	-	-	-	2.8	-	-	-	-	-	-	-	-	-	-	-	
836	M	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6640	480	
837	F	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6640	480	
<b>Infant age group (0 - 5 years old)</b>																											
55	M	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	403	269
56	M	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	403	269
57	F	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	403	269
58	F	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	403	269
59	M	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	403	269
60	M	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	403	269
61	F	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	403	269

**Annex 2. Children's and infants' consumption rates (kg y<sup>-1</sup> or l y<sup>-1</sup>) and occupancy rates (h y<sup>-1</sup>) in the Heysham area**

Observation number	Sex	Age (years)	Fish	Crustaceans	Wildfowl	Saltmarsh grazed sheep meat	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Milk	Cattle meat	Pig meat	Sheep meat	Eggs	Wild/free foods	Wild fungi	Intertidal occupancy over mud and sand	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Intertidal occupancy over stones	Occupancy on water	Indoor occupancy within 1 km of the licensed site boundary	Outdoor occupancy within 1 km of the licensed site boundary	
62	F	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	403	269	
63	M	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	403	269
64	M	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	403	269
65	F	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	403	269
66	F	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	403	269
148	F	3	-	-	-	-	-	-	-	-	0.5	<b>207.4</b>	-	-	-	-	<b>0.2</b>	<b>0.1</b>	-	-	-	-	-	-	-	-	-
230	M	2	-	-	-	-	0.7	1.8	0.3	-	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
237	M	4	-	-	-	-	1.0	<b>5.4</b>	0.7	<b>4.4</b>	<b>2.2</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
238	M	2	-	-	-	-	-	-	-	-	0.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
259	M	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7672	100
260	F	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7932	100
266	M	3	-	-	-	-	<b>10.3</b>	<b>7.2</b>	<b>16.8</b>	<b>12.1</b>	<b>5.1</b>	-	-	-	-	<b>7.9</b>	-	-	-	-	-	-	-	-	-	-	-
310	F	1	-	-	-	-	0.2	-	-	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
518	M	3	<b>7.5</b>	<b>1.8</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
626	F	1	-	-	-	-	-	0.4	0.5	1.2	0.6	-	-	-	-	0.5	-	-	-	-	-	-	-	-	-	-	-
629	M	2	-	-	-	-	-	0.7	0.4	1.6	0.9	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-
777	F	4	-	-	-	-	1.4	2.1	2.0	<b>6.4</b>	<b>2.9</b>	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-
781	M	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
802	M	2	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
816	M	4	-	-	-	-	1.1	1.4	0.5	-	<b>2.5</b>	-	-	-	-	0.4	-	-	-	-	-	-	-	-	-	3572	96
826	M	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7843	87
838	F	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7954	286

**Notes**

Emboldened observations are the high-rate individuals.

### Annex 3. Qualitative and estimated data for use in dose assessments

Details of activity	Exposure pathways involved	Estimated rate
None identified	None identified	Not applicable

### Annex 4. Ratios for determining consumption and occupancy rates for infants and children

Group	Ratio <sup>a</sup>	
	Infant <sup>e</sup> /adult	Child <sup>e</sup> /adult
Fish <sup>b</sup>	0.050	0.200
Crustaceans <sup>b</sup>	0.050	0.250
Molluscs <sup>b</sup>	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 <sup>c</sup>	0.110	0.490
Game <sup>d</sup>	0.140	0.500
Honey	0.789	0.789
Wild fungi	0.150	0.450
Freshwater fish <sup>b</sup>	0.050	0.250
External exposure over intertidal substrates	0.030	0.500

#### Notes

<sup>a</sup>Excepting notes b and c, consumption ratios were derived from Byrom et al., (1995) which presented data for infants aged 6 to 12 months and children aged 10 to 11 years.

<sup>b</sup>Ratios were derived from Smith and Jones, (2003) which presented data for infants and children of unspecified ages.

<sup>c</sup>Ratios were derived from FSA data for wild fruit and nuts for infants and 10-year-old children.

<sup>d</sup>Game includes rabbits/hares and venison.

<sup>e</sup>Note that the age ranges within the age groups in this table do not correspond exactly with the age ranges within the age groups used throughout the rest of this report.













**Annex 5. Consumption rates (kg y<sup>-1</sup> or l y<sup>-1</sup>) and occupancy rates (h y<sup>-1</sup>) for women of childbearing age<sup>a</sup> in the Heysham area, for use in foetal dose assessments**

Observation number	Sex	Age (years)	Fish	Crustaceans	Molluscs	Wildfowl	Marine plants/algae	Saltmarsh grazed sheep meat	Green vegetables	Other vegetables	Root vegetables	Potato	Domestic fruit	Milk	Cattle meat	Pig meat	Sheep meat	Eggs	Wild/free foods	Rabbits/hares	Wild fungi	Intertidal occupancy over mud and sand	Intertidal occupancy over rock	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Handling sediment	Occupancy in water	Occupancy on water	Indoor occupancy within 1 km of the licensed site boundary	Outdoor occupancy within 1 km of the licensed site boundary
809	F	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	81	-	-	-	-	3164	304
812	F	25	-	-	-	-	-	-	4.3	6.0	2.3	-	1.2	-	-	-	-	3.0	-	-	-	-	-	-	-	-	-	-	-	7441	763
817	F	43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	-	-	-	-	1007	603
819	F	44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7734	38	
822	F	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	156	-	-	-	6178	489
825	F	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.0	-	-	-	-	-	-	-	-	-	-	-	7455	97
829	F	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
830	F	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
835	F	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7954	286
839	F	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3468	66
847	F	U	4.8	0.5	-	11.4	-	-	-	-	-	-	-	-	-	-	11.3	5.9	-	2.3	0.2	-	-	-	-	-	-	-	-	-	-
851	F	20	18.2	3.3	2.6	6.2	1.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

**Notes**

U=Unknown

<sup>a</sup> Based on National Statistics guidelines women were deemed to be of childbearing age if they were between 15 and 44 years old. Women of unknown age were included as they were potentially women of childbearing age.

Annex 6. Summary of profiles for adults in the Heysham area

Profile Name	Pathway Name																												
	Number of individuals	Crustacea	Direct <sup>a</sup>	Eggs	Fish - Sea	Fruit - Domestic	Fruit and nuts - Wild	Gamma ext - Salt marsh	Gamma ext - Sediment <sup>b</sup>	Honey	Marine plants/algae	Meat - Cow	Meat - Game <sup>c</sup>	Meat - Pig	Meat - Poultry	Meat - Salt Marsh Grazed Sheep	Meat - Sheep	Milk	Molluscs	Mushrooms	Occupancy IN water	Occupancy ON water	Plume (IN; 0-0.25km) <sup>d</sup>	Plume (MID; >0.25-0.5km) <sup>d</sup>	Plume (OUT; >0.5-1.1km) <sup>d</sup>	Vegetables - Green	Vegetables - Other Domestic	Vegetables - Potatoes	Vegetables - Root
Crustacean consumers	8	10.6	-	-	12.7	-	-	<1	270	-	0.06	-	-	-	-	-	-	-	1.2	-	-	780	-	-	-	-	-	-	-
Occupants for direct radiation	368	<0.01	1.0	0.05	0.48	<0.01	<0.01	-	3	-	<0.01	-	0.02	-	-	-	-	-	0.01	-	-	1	140	460	1240	0.02	0.17	0.11	0.03
Egg consumers	24	0.30	-	14.3	1.3	6.0	0.42	24	3	0.02	-	2.4	0.76	-	-	0.71	2.3	40.3	0.17	0.11	-	130	-	-	-	3.2	4.9	8.7	4.4
Sea fish consumers	23	1.0	0.22	-	27.2	-	-	1	78	-	0.44	-	1.4	-	-	-	-	-	1.1	-	-	210	75	100	-	-	-	-	-
Domestic fruit consumers	4	-	-	5.6	0.09	43.9	-	-	-	0.06	-	-	-	-	-	-	-	-	-	0.11	-	-	-	-	-	22.5	36.4	10.7	23.9
Wild fruit and nut consumers	6	0.53	-	5.9	6.0	3.9	2.9	-	12	-	-	-	2.5	-	-	-	-	-	0.66	0.48	-	490	-	-	-	6.2	12.7	15.2	9.9
Occupants for exposure - Salt marsh	4	0.14	-	5.2	1.2	-	-	510	12	-	-	-	4.5	-	-	-	2.8	-	-	0.06	-	130	-	-	-	-	-	-	-
Occupants for exposure - Sediment	10	1.0	-	-	8.9	-	-	-	810	-	-	-	0.01	-	-	-	-	-	-	-	-	260	-	-	-	-	-	-	-
Honey consumers	2	-	-	-	-	-	-	-	-	9.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Marine plant/algae consumers	7	1.4	0.14	-	13.5	-	-	4	31	-	1.6	-	2.7	-	-	-	-	-	1.1	-	-	37	-	290	-	-	-	-	-
Cattle meat consumers	1	-	-	12.2	-	16.8	-	-	-	-	-	56.8	-	-	-	-	27.1	-	-	-	-	-	-	-	-	4.4	20.8	18.9	8.8
Game meat consumers	6	0.18	-	4.4	3.5	-	0.76	87	71	-	-	-	15.0	-	0.30	-	3.8	-	-	0.23	-	180	-	-	-	-	-	-	-
Pork meat consumers	3	-	-	-	4.9	5.0	1.4	-	-	-	-	13.0	0.55	26.0	-	-	6.5	-	-	1.7	-	-	-	-	-	-	-	-	-
Poultry meat consumers	1	-	-	-	-	-	-	-	140	-	-	-	23.5	-	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Salt marsh grazed sheep meat consumers	19	0.18	-	2.5	0.69	2.1	0.16	45	13	-	0.05	-	1.1	-	-	8.6	0.89	18.2	-	-	-	-	-	-	-	-	-	-	-
Sheep meat consumers	3	0.37	-	13.0	3.2	5.6	-	170	16	-	-	18.9	10.6	-	-	-	16.6	-	-	0.15	-	170	-	-	-	1.5	6.9	6.3	2.9
Milk consumers	17	0.20	-	2.8	-	2.4	0.21	11	-	0.08	-	-	-	-	-	1.0	1.0	247.9	-	0.02	-	-	-	-	-	-	-	-	-
Mollusc consumers	2	4.7	-	-	34.3	-	-	410	-	0.30	-	-	-	-	-	-	-	-	6.7	-	-	1060	-	-	-	-	-	-	-
Mushroom consumers	6	0.53	-	5.9	8.4	2.5	2.4	-	12	-	-	6.5	2.7	13.0	-	-	3.3	-	0.66	1.3	-	490	-	-	-	-	-	-	-
Occupancy IN water	5	-	-	-	-	-	-	-	170	-	-	-	-	-	-	-	-	-	-	-	330	-	-	-	-	-	-	-	-
Occupancy ON water	3	4.3	-	-	3.6	-	-	<1	31	-	0.17	-	-	-	-	-	-	-	-	-	-	4110	-	-	-	-	-	-	-
Occupants for plume pathways (inner area)	2	-	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7680	-	-	-	-	-	-
Occupants for plume pathways (mid area)	8	-	1.0	-	-	-	0.09	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7000	-	-	-	-	-
Occupants for plume pathways (outer area)	18	-	1.0	1.0	-	0.14	-	-	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6310	0.48	0.66	-	0.26
Green vegetable consumers	16	-	-	0.19	-	12.7	0.03	-	-	-	-	-	-	-	-	-	-	-	-	0.03	-	-	-	-	-	28.6	25.1	34.3	20.0
Other domestic vegetable consumers	23	-	0.09	2.1	0.07	15.5	0.34	-	17	0.01	-	2.5	-	-	-	1.2	-	-	0.06	-	-	-	81	<1	17.4	27.6	25.2	16.4	
Potato consumers	23	-	-	1.2	2.1	11.8	0.30	-	15	-	-	-	-	-	-	-	-	-	0.04	-	34	-	-	-	-	14.8	17.0	48.7	23.6
Root vegetable consumers	17	-	-	0.02	2.8	13.8	0.40	-	-	-	-	-	-	-	-	-	-	-	0.03	-	46	-	-	-	-	18.3	18.6	49.2	30.0

Notes

<sup>a</sup>Expressed as the proportion of the profile members who are exposed to direct radiation.

<sup>b</sup>Gamma ext - sediment includes occupancy over sand; sand and stones; mud; stones; mud and sand; and boats on mud. Occupancy time over boats on mud has been halved to reflect shielding from the boat's hull.

<sup>c</sup>Game meat includes rabbits/hares and wildfowl.

<sup>d</sup>Plume times are the sums of individuals' indoor and outdoor times.

The means of the high-rate groups are determined by the 'cut-off' method and are highlighted on the diagonal.

**Annex 7. Summary of profiles for the child age group (6 - 15 years old) in the Heysham area**

Profile Name	Number of individuals	Pathway Name																					
		Crustacea kg	Direct <sup>a</sup> -	Eggs kg	Fish - Sea kg	Fruit - Domestic kg	Fruit and nuts - Wild kg	Gamma ext - Salt marsh h	Gamma ext - Sediment <sup>b</sup> h	Meat - Cow kg	Meat - Game <sup>c</sup> kg	Meat - Pig kg	Meat - Salt Marsh Grazed Sheep kg	Meat - Sheep kg	Mushrooms kg	Occupancy ON water h	Plume (IN; 0-0.25km) <sup>d</sup> h	Plume (MID; >0.25-0.5km) <sup>d</sup> h	Plume (OUT; 0.5-1km) <sup>d</sup> h	Vegetables - Green kg	Vegetables - Other Domestic kg	Vegetables - Potatoes kg	Vegetables - Root kg
Crustacean consumers	1	1.1	-	-	4.7	-	-	-	-	0.11	-	-	-	-	-	-	-	-	-	-	-	-	
Occupants for direct radiation	11	-	1.0	0.55	1.4	0.22	-	-	24	-	-	-	-	-	-	6	19	2130	0.78	0.63	-	0.42	
Egg consumers	4	-	0.50	5.7	-	2.2	-	-	-	-	-	-	-	-	-	-	-	550	6.9	5.3	14.3	8.2	
Sea fish consumers	6	0.18	0.33	-	6.1	0.83	0.23	-	-	2.2	0.11	4.3	-	1.1	0.28	-	-	27	-	-	-	-	
Domestic fruit consumers	10	-	-	1.1	0.56	7.5	0.14	-	-	1.3	0.06	2.6	-	0.65	0.17	-	-	-	-	4.3	4.8	5.2	3.1
Wild fruit and nut consumers	1	-	-	-	4.9	5.0	1.4	-	-	13.0	0.55	26.0	-	6.5	1.7	-	-	-	-	-	-	-	
Occupants for exposure - Salt marsh	1	-	-	-	-	-	-	130	220	-	-	-	5.7	-	-	-	-	-	-	-	-	-	
Occupants for exposure - Sediment	3	-	0.67	-	0.54	-	-	42	160	-	-	-	1.9	-	-	18	-	2330	-	-	-	-	
Cattle meat consumers	1	-	-	-	4.9	5.0	1.4	-	-	13.0	0.55	26.0	-	6.5	1.7	-	-	-	-	-	-	-	
Game meat consumers	1	-	-	-	4.9	5.0	1.4	-	-	13.0	0.55	26.0	-	6.5	1.7	-	-	-	-	-	-	-	
Pig meat consumers	1	-	-	-	4.9	5.0	1.4	-	-	13.0	0.55	26.0	-	6.5	1.7	-	-	-	-	-	-	-	
Salt marsh grazed sheep meat consumers	2	-	-	-	-	-	-	79	130	-	-	5.7	-	-	-	-	-	-	-	-	-	-	
Sheep meat consumers	3	-	-	-	1.6	1.7	0.45	-	-	4.3	0.18	8.7	-	4.1	0.57	-	-	-	-	-	-	-	
Mushroom consumers	1	-	-	-	4.9	5.0	1.4	-	-	13.0	0.55	26.0	-	6.5	1.7	-	-	-	-	-	-	-	
Occupancy ON water	4	-	-	-	-	-	-	-	-	-	-	-	-	-	340	-	-	-	-	-	-	-	
Occupants for plume pathways (inner area)	1	-	1.0	-	1.6	-	-	-	110	-	-	-	-	-	-	54	-	-	-	-	-	-	
Occupants for plume pathways (mid area)	3	-	1.0	-	4.5	-	-	-	-	-	-	-	-	-	-	-	69	-	-	-	-	-	
Occupants for plume pathways (outer area)	3	-	1.0	-	-	-	-	-	52	-	-	-	-	-	-	-	-	7080	-	-	-	-	
Green vegetable consumers	11	-	0.18	2.2	-	4.4	-	-	-	-	-	-	-	-	-	-	-	200	6.2	5.2	7.9	5.4	
Other domestic vegetable consumers	12	-	0.08	1.8	0.10	4.4	-	-	-	-	-	-	-	-	-	-	-	92	5.5	6.7	8.5	4.7	
Potato consumers	1	-	-	8.9	-	1.4	-	-	-	-	-	-	-	-	-	-	-	-	8.9	7.1	44.9	11.2	
Root vegetable consumers	5	-	-	3.4	-	3.1	-	-	-	-	-	-	-	-	-	-	-	-	7.6	5.3	14.4	9.6	

**Notes**

<sup>a</sup>Expressed as the proportion of the profile members who are exposed to direct radiation.

<sup>b</sup>Gamma ext - sediment includes occupancy over sand; sand and stones; stones; mud and sand.

<sup>c</sup>Game meat includes wildfowl.

<sup>d</sup>Plume times are the sums of individuals' indoor and outdoor times.

The means of the high-rate groups are determined by the 'cut-off' method and are highlighted on the diagonal.

## Annex 8. Summary of profiles for the infant age group (0 - 5 years old) in the Heysham area

Profile Name	Number of individuals	Pathway Name													
		Crustacea kg	Direct <sup>a</sup> -	Eggs kg	Fish - Sea kg	Fruit - Domestic kg	Fruit and nuts - Wild kg	Gamma ext - Sediment <sup>b</sup> h	Milk l	Mushrooms kg	Plume (OUT; 0.5-1km) <sup>c</sup> h	Vegetables - Green kg	Vegetables - Other Domestic kg	Vegetables - Potatoes kg	Vegetables - Root kg
Crustacean consumers	1	1.8	-	-	7.5	-	-	-	-	-	-	-	-	-	-
Occupants for direct radiation	17	-	1.0	0.02	-	0.15	-	-	-	-	2570	0.06	0.08	-	0.03
Egg consumers	1	-	-	7.9	-	5.1	-	-	-	-	-	10.3	7.2	12.1	16.8
Sea fish consumers	1	1.8	-	-	7.5	-	-	-	-	-	-	-	-	-	-
Domestic fruit consumers	4	-	0.25	2.1	-	3.2	-	-	-	-	920	3.5	4.0	5.7	5.0
Wild fruit and nut consumers	1	-	-	-	-	0.45	0.23	-	207.4	0.08	-	-	-	-	-
Occupants for exposure - Sediment	1	-	-	-	-	-	-	4	-	-	-	-	-	-	-
Milk consumers	1	-	-	-	-	0.45	0.23	-	207.4	0.08	-	-	-	-	-
Mushroom consumers	1	-	-	-	-	0.45	0.23	-	207.4	0.08	-	-	-	-	-
Occupants for plume pathways (outer area)	5	-	1.0	0.08	-	0.51	-	-	-	-	7130	0.21	0.27	-	0.11
Green vegetable consumers	1	-	-	7.9	-	5.1	-	-	-	-	-	10.3	7.2	12.1	16.8
Other domestic vegetable consumers	2	-	-	4.0	-	3.7	-	-	-	-	-	5.7	6.3	8.3	8.7
Potato consumers	3	-	-	2.7	-	3.4	-	-	-	-	-	4.3	4.9	7.6	6.5
Root vegetable consumers	1	-	-	7.9	-	5.1	-	-	-	-	-	10.3	7.2	12.1	16.8

### Notes

<sup>a</sup>Expressed as the proportion of the profile members who are exposed to direct radiation.

<sup>b</sup>Gamma ext - sediment includes occupancy over sand and over stones.

<sup>c</sup>Plume times are the sums of individuals' indoor and outdoor times.

The means of the high-rate groups are determined by the 'cut-off' method and are highlighted on the diagonal.

Annex 9. Summary of profiles for women of childbearing age in the Heysham area, for use in foetal dose assessments

Profile Name	Number of individuals	Pathway Name																										
		Crustacea kg	Direct <sup>a</sup> -	Eggs kg	Fish - Sea kg	Fruit - Domestic kg	Fruit and nuts - Wild kg	Gamma ext - Salt marsh h	Gamma ext - Sediment <sup>b</sup> h	Marine plants/algae kg	Meat - Cow kg	Meat - Game <sup>c</sup> kg	Meat - Pig kg	Meat - Salt Marsh Grazed Sheep kg	Meat - Sheep kg	Milk l	Molluscs kg	Mushrooms kg	Occupancy IN water h	Occupancy ON water h	Plume (IN; 0-0.25km) <sup>d</sup> h	Plume (MID; >0.25-0.5km) <sup>d</sup> h	Plume (OUT; >0.5-1.1km) <sup>d</sup> h	Vegetables - Green kg	Vegetables - Other Domestic kg	Vegetables - Potatoes kg	Vegetables - Root kg	
Crustacean consumers	1	12.9	-	-	10.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Occupants for direct radiation	86	-	1.0	0.05	-	0.01	-	3	-	-	-	-	-	-	-	-	-	-	-	160	610	1350	0.05	0.07	-	0.03		
Egg consumers	6	0.09	0.17	7.9	0.79	2.0	0.04	-	-	-	2.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Sea fish consumers	7	0.99	-	-	21.5	-	-	-	0.24	-	0.89	-	-	1.9	17.3	-	0.05	-	-	-	-	-	1260	4.9	3.6	11.5	7.5	
Domestic fruit consumers	12	-	-	1.4	1.3	5.9	0.34	-	-	3.3	0.14	6.5	-	1.6	-	-	0.43	-	-	-	-	-	-	5.7	6.4	8.6	6.1	
Wild fruit and nut consumers	3	-	-	-	4.9	5.0	1.4	-	-	13.0	0.55	26.0	-	6.5	-	-	1.7	-	-	-	-	-	-	-	-	-	-	
Occupants for exposure - Salt marsh	1	-	-	-	-	-	-	200	-	-	-	-	5.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Occupants for exposure - Sediment	4	-	0.25	-	1.1	-	-	240	0.05	-	-	-	-	-	-	-	-	1	18	-	-	1670	-	-	-	-	-	
Marine plant/algae consumers	3	1.1	-	-	6.1	-	-	-	1.1	-	2.1	-	-	-	-	0.88	-	-	-	-	-	-	-	-	-	-	-	
Cattle meat consumers	3	-	-	-	4.9	5.0	1.4	-	-	13.0	0.55	26.0	-	6.5	-	-	1.7	-	-	-	-	-	-	-	-	-	-	
Game meat consumers	3	1.3	-	2.0	7.7	-	-	-	0.56	-	10.0	-	-	3.8	-	0.88	0.08	-	-	-	-	-	-	-	-	-	-	
Pork meat consumers	3	-	-	-	4.9	5.0	1.4	-	-	13.0	0.55	26.0	-	6.5	-	-	1.7	-	-	-	-	-	-	-	-	-	-	
Salt marsh grazed sheep meat consumers	5	-	-	-	-	-	-	46	6	-	-	-	5.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Sheep meat consumers	4	0.14	-	1.5	4.9	3.8	1.0	-	-	9.8	3.8	19.5	-	7.7	-	-	1.3	-	-	-	-	-	-	-	-	-	-	
Milk consumers	1	-	-	10.7	-	0.45	0.23	-	-	-	-	-	-	-	103.7	-	0.08	-	-	-	-	-	-	-	-	-	-	
Mollusc consumers	2	1.7	-	-	13.6	-	-	-	0.83	-	3.1	-	-	-	-	2.5	-	-	-	-	-	-	-	-	-	-	-	
Mushroom consumers	3	-	-	-	4.9	5.0	1.4	-	-	13.0	0.55	26.0	-	6.5	-	-	1.7	-	-	-	-	-	-	-	-	-	-	
Occupancy IN water	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	260	-	-	-	-	-	-	-	-	-	
Occupancy ON water	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	270	-	-	-	-	-	-	-	-	
Occupants for plume pathways (inner area)	8	-	1.0	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	1580	-	-	-	-	-	-	-	
Occupants for plume pathways (mid area)	2	-	1.0	-	-	-	-	40	-	-	-	-	-	-	-	-	-	-	-	-	5430	-	-	-	-	-	-	
Occupants for plume pathways (outer area)	9	-	1.0	1.0	-	0.14	-	17	-	-	-	-	-	-	-	-	-	-	-	-	-	7110	0.48	0.66	-	0.26		
Green vegetable consumers	12	-	-	2.2	-	4.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.3	10.8	16.5	9.4		
Other domestic vegetable consumers	12	-	-	0.19	0.11	4.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.2	13.1	12.7	5.0		
Potato consumers	5	-	-	2.1	-	4.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.0	14.3	30.7	11.9		
Root vegetable consumers	9	-	-	2.9	-	4.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.2	10.6	21.0	12.1		

**Notes**

<sup>a</sup>Expressed as the proportion of the profile members who are exposed to direct radiation.

<sup>b</sup>Gamma ext - sediment includes occupancy over sand and stones; sand; mud and sand.

<sup>c</sup>Game meat includes rabbits/hares and wildfowl.

<sup>d</sup>Plume times are the sums of individuals' indoor and outdoor times.

The means of the high-rate groups are determined by the 'cut-off' method and are highlighted on the diagonal.

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