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Food waste in schools

A report on the findings of a research project to better understand the nature and types of food waste in schools; the reasons why food is wasted in schools and the impact of interventions developed to help schools to reduce this waste.

Research date: September 2009 – April 2010   **Date:** January 2011

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Front cover photography: [A child scraping food waste into a container]

Executive Summary

Why is food waste from schools an important issue?

In 2007/08, WRAP (Waste & Resources Action Programme) produced a report into the types and quantities of waste produced by schools in England. A key finding was that food waste was a major component of waste from schools, estimated to account for almost half of the waste, by weight, from primary schools in England and almost a third of waste, by weight, from secondary schools in England. A copy of the report can be found here: http://www.wrap.org.uk/downloads/Report_into_the_Nature_and_Scale_of_Waste_produced_by_schools_in_England.2f3077e3.5723.pdf

Food waste can be seen as a particularly significant issue because, when food is wasted in schools:

■ the embedded energy from growing, transporting, storing and preparing food is also wasted;

■ the money spent on buying and preparing the food is wasted and costs are incurred in treating and disposing of it; and

■ perhaps most importantly in the context of schools, children are not gaining the nutritional benefit of the wasted food.

Therefore, in order to identify what could be done to reduce food waste in schools, WRAP commissioned this study to better understand the composition of the food waste and the behaviours and practices which lead to it being wasted.

However, food waste is not the only issue to be considered in any study of food in schools – health and nutrition are arguably even more important, although they were not the focus of this study. This should be borne in mind when considering possible solutions to food waste; approaches will not be desirable if they impact negatively on health and nutrition, regardless of any benefit on reducing food waste.

What was the aim of this study?

The specific aims of this study were to:

■ Better understand:

  ○ the nature of food waste produced by schools (i.e. cooked or uncooked, whole or part consumed);
  ○ the types of food being wasted; and
  ○ the point at which the waste arises (e.g. service waste from the kitchen, plate waste, food waste from packed lunches, food waste from break time snacks).

■ Understand the range of reasons why food waste is produced in schools.

■ Identify interventions that could be effective in reducing food waste in schools, and to assess the impact of implementing them.

■ Produce a toolkit to help those responsible to implement initiatives to reduce food waste in schools.

Consistent with the previous study, the objective was to analyse the waste stream coming out of schools; not the amount of food going in. It was not, therefore, the intention of this report to quantify the percentage of food served in school canteens or food brought into school that was wasted.[1]

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[1] Information on plate waste from school lunches in primary schools is available in research from the School Food Trust at http://www.schoolfoodtrust.org.uk/school-cooks-caterers/reports/primary-school-food-survey-2009

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What methodology was used?

There were 3 parts to the study:

■ Compositional analysis to understand the nature of food waste from schools, the types of food being wasted and the point at which the waste arises, consisting of 39 schools (30 primary and 9 secondary) from 4 local authority areas in England. Schools were selected so as to ensure a geographical spread, with a mix of urban / rural and socio-economic status, a mix of catering arrangements, and a range of school sizes. The study took place over a period of three weeks, to cover a full school menu cycle, and waste was collected and sorted daily during this period.

■ Qualitative research with a range of stakeholders to understand the reasons why the food is wasted:

  o Research in schools, via a mix of interviews and focus groups, talking to a range of school staff and pupils in 16 of the schools that took part in the compositional analysis to explore their awareness of food waste and understanding of the reasons for it.

  o A workshop involving a wide range of stakeholders involved in setting policy, delivering services, or providing support relating to food and / or waste in schools.

  o Telephone interviews with local authority and commercial catering managers, food enforcement and monitoring officers and individual caterers in schools from across 9 local authority areas.

■ Trialling a range of interventions identified as being likely to have a positive impact on reducing food waste in schools. Interventions were identified based on the findings from the first two stages, and trialled in twelve schools (most of which, but not all, were also involved in the earlier stages). Six of these also received communications support. There were also an additional four control schools. Attitudinal surveys were carried out with staff and pupils before and after the interventions, and schools weighed their own waste daily recording that produced in the kitchen and canteen areas throughout the trial period.

Summary of Compositional Findings: What food is being thrown away?

Quantity of food waste produced

This study suggests that over a school year (40 weeks) a total of 55,408 tonnes of food waste is generated by primary schools in England and 24,974 tonnes by secondary schools, giving a total food waste weight of 80,382 tonnes.

Food waste was found to be statistically significantly different by school type, with primary schools producing 72 grams per pupil per day and secondary schools 42 grams per pupil per day.

Composition of food waste produced

Fruit, vegetables [2] and "mixed (non sandwich)" were found to be the dominant fractions of the food waste streams for both primary and secondary schools. Fruit and vegetable categories accounted for almost half of food waste (by weight) from primary schools and more than a third of food waste (by weight) from secondary schools. The category "mixed (non sandwich)" refers to meals such as pizza, cottage pie and spaghetti bolognaise which incorporate a number of food stuffs. This category was found to account for approximately 17% of food waste (by weight) from primary schools and 19% from secondary schools (where it was the highest category).

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[2] *Note, potatoes are included in the "vegetables" category, and represent 46% and 40% of the vegetable waste in primary and secondary schools respectively.*

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Figure 1: Primary school food waste composition (% by kg sorted)

Primary School food waste

Headline category
Vegetables
Fruit
Mixed (non-sandwich)
Bakery
Dried foods/powders
Meat & Fish
Drinks
Salads
Sandwiches
Dairy
Confectionary & snacks
Condiments, sauces, herbs
Desserts

Values: 25.3%, 23.7%, 16.7%, 8.3%, 7.4%, 5.6%, 5.6%, 2.7%, 2.3%, 1.4%, 0.5%, 0.4%, 0.2%
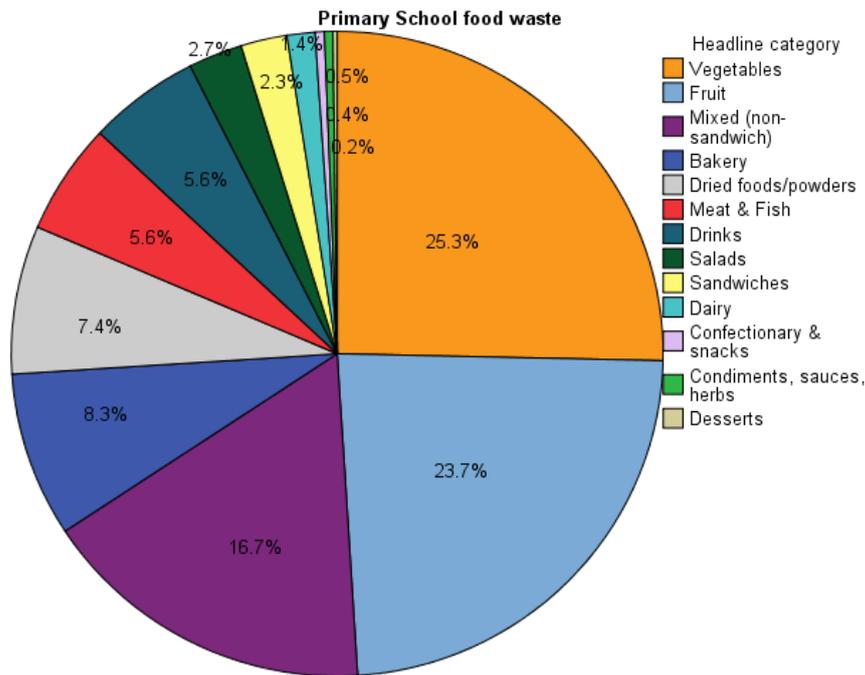
Figure 2: Secondary school food waste composition (% by kg sorted)

Secondary School food waste

Headline category
Mixed (non-sandwich)
Fruit
Vegetables
Drinks
Bakery
Dried foods/powders
Sandwiches
Meat & Fish
Salads
Dairy
Confectionary & snacks
Condiments, sauces, herbs
Desserts

Values: 19.2%, 18.3%, 18.1%, 9.7%, 9.3%, 8.1%, 6.9%, 4.5%, 1.8%, 1.8%, 1.3%, 0.7%, 0.5%
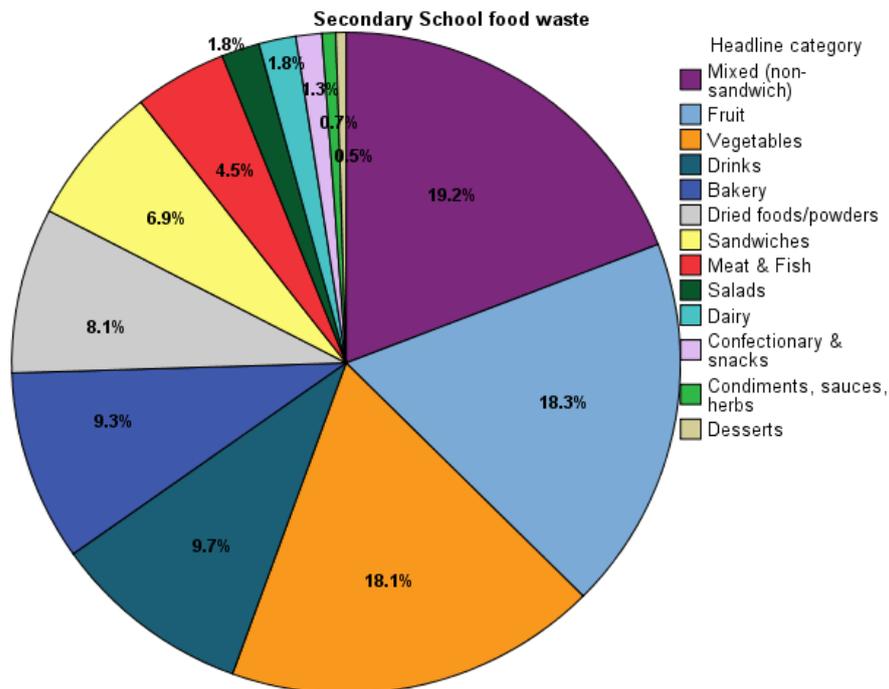
Proportion of avoidable food waste

The majority of food waste in both secondary (77%) and primary (78%) schools was found to be avoidable (see section 3.2 of the main report for definitions of "avoidable", "possibly avoidable" and "unavoidable" food waste).

Avoidable food waste contained all the food categories, with the largest proportions being made up of vegetables, mixed (non sandwich) and fruit. There was more avoidable vegetable waste, by weight, than any other category, suggesting that more vegetables are being prepared than are currently being eaten in both school types. The food category with the largest proportion of unavoidable waste was fruit, with approximately half of the fruit waste categorised as unavoidable.

Where is this food waste coming from?

For both primary and secondary schools, the kitchen and canteen areas were found to produce the majority of the total food waste and this is assumed to represent the waste generated by food that is prepared, but not served (kitchen) and served, but not eaten (canteen). In primary schools the total produced in these two areas was 72%, with an equal split between kitchen (36%) and canteen (36%). Classrooms produced 14% and the playground 8%, with the remainder from other areas, or unknown. In secondary schools the kitchen area generated 38% and the canteen area 21%, a total of 59%. Classrooms generated 18%, and the playground 9%, with the remainder from other areas or unknown.

Food waste from the kitchen and canteen areas contained a high proportion of vegetables and mixed meals (e.g. pizza, pasta bake, quiche etc.) suggesting that it was generated from school meals. All food waste generated in the kitchen area is assumed to come from school meals. Due to the state of the food waste produced in the canteen, it was difficult to differentiate between plate scrapings and packed lunch waste, however school policies would suggest that the majority of this waste comes from school meals: primary schools in the sample where packed lunches were eaten in the canteen usually required pupils to take their waste home and in most secondary schools in the sample, packed lunches were eaten outside the canteen, often in the classroom.

In both primary and secondary schools, fruit accounts for the majority of waste generated in the classrooms and playground areas. In these areas, the wastes generated are assumed to come from break time snacks and packed lunches.

Food waste produced in "all other areas" accounts for less than 10% of the food waste produced in both school types. The majority of this is assumed to come from the staff room.

Summary of Qualitative Findings: Why is food wasted?

Reasons identified by those interviewed within schools

Findings from this part of the research were grouped into three categories: operational (relating to catering provider policies on food and school meals and to systems at a school level), situational (relating to broader issues not directly connected to food, such as rushed lunch hours or the canteen environment) and behavioural (relating to individual choices and preferences).

■ Operational reasons resulting in food being prepared, but not served, include:

- ○ Absence of ordering systems for school meals leading to kitchens catering for unknown total numbers of pupils (Secondary);
- ○ Lack of flexibility to adapt centrally planned menus to meet the preferences of pupils in individual schools;
- ○ Kitchens over-cater to ensure pupils have the meal option of their choice (specifically at Primary);
- ○ Second helpings disallowed; and
- ○ Limited opportunities for re-using unserved food.

■ Operational reasons resulting in food being served, but not eaten, include:
- ○ Inflexible portion sizes leading pupils being "over-faced" with food;
- ○ Fixed food combinations, e.g. pupils have to have a pudding whether they want one or not;

- Pupils at the end of the queue do not get the meal option of their choice and may be served with food they do not like; and
- Pupils do not know what meal options are available.

■ Situational reasons identified, largely related to food being served but not eaten, include:
- Unpleasant canteen environment, e.g. noisy, crowded;
- Rushed meal times with pupils spending long times queuing and/ or being hurried along to allow other pupils into the dining hall, or because it needs to be cleared for afternoon lessons; and
- Practical difficulties with eating the food served such as inability to cut up food with cutlery provided.

■ Behavioural reasons resulting in food being prepared, but not served, include:
- Pupils are not hungry by lunch time;
- Pupils buy a cheaper snack rather than a full meal (specific to secondary); and
- Some meal options are less popular.

■ Behavioural reasons resulting in food being served, but not eaten, include:
- Pupils reject food due to:
  - Food is unfamiliar;
  - Food looks unappealing;
  - Pupils don't want to eat healthy foods;
  - Strange combinations of foods; and
  - Fussy eaters.
- Children do not finish food due to a desire to finish meals quickly (to socialise with friends/ go out to play etc).

Communications (or the lack of them) between catering providers, school staff and pupils were also important, and cut across the categories above.

Reasons for food waste from sources other than school meals (i.e. packed lunches and break time snacks) and from food preparation were rarely mentioned by respondents.

When asked about any policies and procedures that had already been adopted as an attempt to reduce food waste, those interviewed reported a range of actions, including changing menus to suit pupils' preferences, encouraging pupils to "eat up", using leftover foods and making improvements to the canteen system. It should be stressed that although these actions were perceived to reduce the amount of food wasted, the schools involved had not monitored any effect on food waste. Interviewees also suggested ideas to reduce food waste which they had not tried and most of these suggestions related to educating both pupils and staff on food issues and providing pupils with more information and more choice about their meals.

Comparison of reasons identified by those interviewed within schools, participants at stakeholder workshop and catering providers

The stakeholder workshop largely supported the findings of the schools based research in recognising operational, situational and behavioural reasons for food waste. In addition, it highlighted a lack of awareness of food waste as an issue at the local level. Some of those attending the stakeholder workshop also expressed the view that the particular form of some of the national regulations and associated guidance relating to school food could lead to food being wasted, or limit the opportunities to reduce this waste.

Both the school level research and the stakeholder workshop highlighted concerns relating to both unserved and uneaten food. In contrast, research with catering providers showed that their awareness of food waste was largely limited to unserved food. Unserved food represents a cost to the catering provider, and thus there is a clear financial driver to minimise it. They have less reason to be concerned with food that is served, but not eaten, since that has already been budgeted and paid for and perceive that their ability to influence plate waste is limited by the specific form of the nutrient and food based standards. The absence of a financial driver and perceived inability to influence plate waste would be likely to act as a barrier to engaging caterers in reducing this food waste. In contrast to the other two groups, catering providers typically identified only "operational" reasons for food waste arising, but within this category they identified a range of national, local and school-level causes.

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Interestingly, however, it was apparent across all groups interviewed that there were significant differences in how national standards – both on nutrition and food safety – were interpreted in local policies and subsequently how local policies were implemented in practice within individual school kitchens. This, combined with confusion identified at a school level about what practices were permitted (e.g. use of seconds, flexible portion sizes and leftovers) suggests that some avoidable food waste may arise from overzealous application, or simple misunderstanding of policies.

Summary of Interventions: How might food waste be reduced?

The following interventions were selected to trial in schools as they were identified as the most likely to positively address key causes of food waste in schools and therefore the most likely to help to reduce food waste. These are described below.

Meals cooked to order

This intervention aimed to reduce food waste by introducing a system to supply school meal service providers (i.e. kitchens either on the school premises or elsewhere) with information on exactly how many portions of each meal option to prepare that day, thereby:

■ eliminating the need for over-catering practices adopted in some schools to allow the majority of pupils to have their preferred choice of meal (reducing unserved food); and

■ preventing children who are last to come into the dining hall from missing out on the meal option of their choice and being served with a meal option they did not choose and may not like, in schools where the practice is to prepare just one portion of food per child (reducing uneaten food).

Pupils received information on menu options in advance. Menu choices were recorded during registration each day and this information was communicated to the kitchen staff by 9.30am every morning. Pupils were given a coloured wrist band identifying their meal choice so there was no confusion at lunch time. This intervention requires a pre-pay system for meals within the school, as well as an efficient way to record and communicate student meal choices in a timely manner.

Improving the dining experience

This intervention aimed to reduce uneaten food waste arising in the canteen by making it more enjoyable for students to spend time in the canteen and/ or less pressing for them to leave by addressing issues relating to:

■ the canteen environment, e.g. noise levels, crowding, poor ambience; and

■ time pressures, e.g. pupils may spend so long queuing that they do not have enough time to eat all of their meal, or may be hurried along at the end of a sitting to allow other pupils into the dining hall, or to enable the space to be cleared for afternoon lessons.

Schools trialling this intervention typically formed an action group to identify priorities, plan activities, implement and communicate the changes. Actual activities implemented varied depending on the key issues in individual schools, but were generally taken from the following options: measures to shorten queues, make better use of space, reduce noise and crowding, or extend eating time available.

Improving familiarity and appreciation of school meals

This intervention aimed to reduce food waste by offering small 'tasters' of new foods in order to encourage pupils to try, rather than reject, unfamiliar foods and make informed food choices (rather than prejudging whether they will like something). It also aimed to encourage greater appreciation of school meals amongst pupils (e.g. by seeing how the food is prepared) and also amongst parents who may be unfamiliar with the quality of school meals and whose influence could have a positive impact on their children's eating habits.

Again activities varied depending on the key issues in individual schools and availability of resources. They included greater scope for pupil feedback, taster sessions and kitchen visits as well as engagement with parents (both to make them aware of the range and quality of contemporary school dinners and engage them in encouraging their children to appreciate them).

What were the results of the trials?

- In terms of impact on quantities of food waste, no clear trend was found across schools trialling the interventions during the trial period (a half term). Self weighed data from some schools participating in the trials did, however, show a reduction in quantities of food waste during the trial period.

- Across all interventions trialled, a positive impact on staff and pupil awareness of food waste was reported. Non waste specific benefits were also reported by some schools, including greater pupil engagement with food and improved behaviour due to shorter queues. Increased uptake in school meals was also expected in some schools.

- All interventions would have benefitted from more time for in-school planning and implementation. This was a particular issue for schools working on improving their dining experience, where it was often not possible to make the key changes identified by the school during the trial period, particularly where funding was required.

- Perceptions of positive impacts on quantities of food waste were greatest in schools trialling the meals cooked to order intervention. 83% of management respondents and 71% of all respondents rated the intervention as "highly successful" or "successful". This may have been because the actions the school needed to take were clearly mapped out in this intervention, whereas the other two interventions required more input from the schools as they needed to identify the priorities for their particular circumstances which could take more time. This intervention also required the greatest level of joint working between catering provider and school, which might be expected to have a greater impact.

- All schools expressed an interest in continuing with the changes made, or planned, after the trial period. It is planned to work with these schools to understand any impact the changes may have over a longer period.

Conclusions

A large proportion of the food waste in schools was found to originate from school meals, and this is a source of food waste upon which a school might be expected to have most opportunity to intervene to bring about changes.

Those interviewed in the research identified a range of reasons why they perceived this food is wasted. Some of these can be changed at the level of the school, and others at a local level with schools and catering providers working in partnership to make changes. Equally, some of the reasons identified relate to national standards and legislation, and there may be little scope to address these at a local level. Additionally, food waste, and solutions to it, should not be looked at in isolation from other critical factors relating to school food, such as pupil health and nutritional intake.

The trial interventions suggest school-level changes can positively impact on food waste, without any negative implications for nutrition – indeed, many of these interventions might improve nutritional intake, if students are happier eating different and more varied foods, or less inclined to leave meals unfinished. Interventions also raise the profile of food waste as an issue. All the schools involved in the trial reported plans to continue with and progress the activities they had undertaken during the trial. However, given the practical constraints involved and the short time span of the trials, measurable impacts were difficult to achieve. Certain interventions clearly take longer to become established than others.

The actions that were identified through this study as being likely to reduce food waste often correspond with actions associated with other benefits. Nutritional benefits are mentioned above, and these might also be expected to improve concentration. Reduced time spent queuing and a more relaxed canteen environment might improve behaviour. However, neither of these factors was measured in the course of this study.

Action to address some of the causes of food waste identified through this research can be effective; but the aim of reducing food waste should not be viewed in isolation. Activities which might seem optimal from a waste

management point of view, such as preparing less of the food types which are wasted most, would not be optimal when looking at food in schools holistically, since this could compromise compliance with nutritional guidance, or the educational value of introducing new and different foods. We can encourage pupils to waste less of these, but it may not be desirable to seek to reduce the amount offered. This is consistent with the findings of the School Food Trust's Primary school food survey 2009 which suggested more needs to be done to encourage pupils to eat the fruit and vegetables served.

As a result, whilst there is a clear and important role for food waste prevention, waste management options, such as composting and food waste collections, should also be seen as important in minimising the negative impacts of food waste in a school environment.

Next steps - What can schools that are interested in reducing food waste do?

Materials for schools and catering providers to help to identify and address issues that may be causing food to be wasted in your school can be found here: www.recyclenow.com/schoolsfoodwaste
These cover:

- Background to food waste issues and why this is an important area for schools
- Details of activities that can be undertaken, and practical suggestions for their implementation
- Advice on communicating messages within the school to ensure success of the activities
- Links to other relevant materials

Further work to help schools to reduce food waste is planned by WRAP in partnership with the School Food Trust.

Contents

Acknowledgements

1.0   Introduction

1.1   Background

In 2007/08, WRAP (Waste & Resources Action Programme) commissioned a study to understand better the types and quantities of waste produced by schools in England. The waste produced over the course of a week from 12 primary and 12 secondary schools (three of each in four different local authority areas) was analysed. Based on the findings, primary schools were estimated to generate 45kg of waste per pupil per academic year (40 weeks) on average and secondary schools 22kg per pupil per academic year. A copy of the report can be found here:
http://www.wrap.org.uk/downloads/Report_into_the_Nature_and_Scale_of_Waste_produced_by_schools_in_England.2f3077e3.5723.pdf

A key finding of the study was that food waste was a major component of waste from schools, estimated to account for almost half of the waste, by weight, from primary schools in England and almost a third of waste, by weight, from secondary schools in England. The study did not gather details on the nature (cooked or uncooked, whole or part consumed) or type of food waste, nor the point at which the food waste was generated (e.g. in the canteen or playground) or the reasons why this waste was generated.

Therefore, in order to identify what could be done to reduce food waste in schools, WRAP commissioned this study to establish the composition of the food waste and the behaviours and practices which lead to it being wasted.

1.2   Aims and objectives

The main aims of the project were:

- To understand better:
    - the nature of food waste produced by schools (i.e. cooked or uncooked, whole or part consumed);
    - the types of food being wasted; and
    - the point at which the waste arises (e.g. service waste from the kitchen, plate waste, food waste from packed lunches, food waste from break time snacks)
- To understand the range of reasons (behavioural or otherwise) why food waste is produced in schools.
- To identify interventions that can effectively reduce food waste in schools and to measure the impact of implementing them.
- To produce a toolkit for key stakeholders to help them to implement initiatives identified to reduce food waste in schools.

These aims related to food waste from primary and secondary schools in England.

Consistent with the previous study, the objective was to analyse the waste stream coming out of schools; not the amount of food going in. This piece of work is not a materials flow analysis, although the data gathered could be used as part of such an exercise.

Resource Futures was commissioned by WRAP in May 2009 to deliver a research-based project which would deliver these aims.

1.3   Report Structure

The research findings are divided into three main parts in this report which correspond with the three main research aims identified above.

■ The first part, comprising section 3 covers the detailed compositional analysis of food waste from schools performed to better understand the nature of this food waste, the types of food being wasted and the point at which the waste arises.

■ The second part, comprising sections 4 and 5 covers the qualitative research carried out with school staff and pupils (section 4) and stakeholders external to the school e.g. policy makers and catering providers (section 5) to understand the range of reasons why the food we find in the school waste stream is wasted.

■ The third part, section 6, covers the range of interventions that were identified as being likely to have a positive impact on reducing food waste in schools and the effect these had on the attitudes and behaviours of staff and pupils and on amounts of food wasted in the schools that trialled them.

Sections 7, 8 and 9 cover comparisons between reducing food waste in households and schools, conclusions and recommendations respectively.

A toolkit to promote food waste reduction in schools was developed using the feedback from the interventions. This suite of materials does not form part of this report, it is available online at: www.recyclenow.com/schoolsfoodwaste

2.0   School selection

2.1   Selecting Local Authorities
The brief for this piece of research was to select multiple local authorities to participate in the research and, within these authorities, identify and recruit primary and secondary schools. The local authorities recruited needed to cover a number of variables:

■ geographical spread;
■ urban and rural locations;
■ located in a range of socio-economic areas; and
■ catering provided by local authority catering services, catering companies and kitchens run directly by the school.

At an early stage it was decided that the target geographical areas would be: North East, South West and London, with a mix of urban and rural locations. The local authorities of Bath & North East Somerset, East Riding of Yorkshire, Sheffield, Islington and Hackney were contacted initially.

2.1.1   Waste departments
The first stage of the recruitment process was to gain commitment from the local authority waste department; both waste disposal and waste collection authorities where relevant. This was done via telephone and email. This was necessary to facilitate relationships with the collection contractors and for the disposal of the waste once it had been analysed. All the partner authorities also provided depot space to undertake the sorting of the waste.

2.1.2   Catering providers
Once commitment had been received from the waste department, permissions were required from other relevant stakeholders, particularly those responsible for catering. It was important to clarify catering arrangements and establish if catering was delivered by the local authority, an external contractor or the individual schools.

The devolution of budgets to schools to provide their own catering has resulted in a range of different models for catering provision across England, typically including:

■ Local authority caterers
Schools using a local authority caterer will have access to a centrally planned menu. The food safety guidance for these schools is developed centrally in consultation with local Environmental Health Departments. Training and supervision of catering staff is carried out by the caterer's operational team. The local authority will have an independent team of officers monitoring catering services, who may be employed directly by the Children's Services directorate of the local authority.

■ Commercial Contract Caterers
Schools using a commercial contract caterer will have access to a centrally planned menu. The food safety guidance for these schools will be developed centrally in consultation with the environmental health department in which the main office of the caterer is based (this is not necessarily the same department responsible for the area in which the school is sited). Staff training and the monitoring of processes and standards will be carried out by an operational team.

■ Catering staff employed directly by the school
The school caterer will develop the menu and food safety processes in consultation with the local Environmental Health Department. Each school may buy in additional services from a local authority monitoring team for help with procurement policies, training, food safety and nutritional analysis advice.

Although these models formed the basis of selection, there were two significant variations within the sample: two schools with no hot meal provision (which might be expected to impact on the composition of the food waste as well as the quantity as food preparation did not take place on site), and three schools which supplied other schools off-site with catering (and which we might therefore expect to have higher levels of food waste).

Local authorities' Departments of Children and Families were contacted to establish:

■ how school kitchens and food distribution for both school meals and fruit were organised;
■ any relevant local authority policies e.g. support of Eco schools which might affect schools' interest in the project;
■ whether kitchens were just producing food for their own school, other schools in the area, or producing for social services too;
■ whether kitchens were managed by council staff or contracted out to commercial catering companies; and
■ who was responsible for authorising engagement with the kitchen / catering staff and, where this was not at a school level, ensuring the relevant authorisation was obtained.

2.1.3   Local Authorities selected
Following this process four out of the five authority areas, initially contacted, agreed to take part in the project. These authorities were:

■ East Riding of Yorkshire;
■ Islington;
■ Hackney; and
■ Bath & North East Somerset (B&NES).

2.2   Selecting Schools

Schools were recruited to cover a mix of the following variables:
- school type - primary or secondary;
- school size (measured in terms of number of pupils on roll);
- school catering service provider (see section 2.1.2 above); and
- socio economic status (measured in terms of proportion of students receiving free school meals).

Schools were contacted during June, July and September to request their consent to take part in the study in order for waste collection and analysis to begin in October. A target of forty schools was set, to be spread evenly across the four areas. School recruitment was carried out by telephone and email by staff who were experienced at communicating with schools and identifying the appropriate decision maker/s within the school. A number of telephone calls and emails were required with each school to secure their participation in the project.

As well as outlining the details of the project, potential benefits to schools were highlighted. These included the provision of accurate data on their residual waste stream, potential long-term cost savings from reducing residual waste collections, and availability of the toolkit to support the implementation of waste reduction strategies. The links to Healthy Schools, Sustainable Schools and Eco-Schools were also emphasised.

A list detailing all schools within each area was obtained and the recruitment process ran as follows:
- A shortlist of schools was identified covering the mix of variables detailed above. Any unknown information was gained by contacting the schools or researching on the internet.
- A phone call was made to shortlisted schools to outline the project and establish the appropriate point of contact and their email address.
- Further phone calls and emails were sent to appointed contacts in each school and the project explained in detail to the relevant people (caretakers, cooks, head teachers, eco-coordinators). The benefits to the school were emphasised in order to encourage participation in the project.
- Some shortlisted schools did not respond and others were unable to participate. When this occurred schools with similar features (e.g., size, location, catering arrangements) were identified and contacted.
- Once a school had verbally confirmed their participation a confirmation email was sent providing written details about the project. The head teacher was asked to sign and return a Memorandum of Understanding to Resource Futures. See appendix 1.
- Further phone calls were made to gather the relevant information required for smooth-running of the waste collections and interviews.

Recruited schools all signed up for the first phase of the project (the collection and analysis of their school's waste) with the possibility of participating in one or more of the subsequent phases:

- Qualitative research via a school visit (interviewing adults only).
- Qualitative research via a school visit (interviewing adults and doing a focus group with pupils).
- Trialling an intervention to reduce food waste.

A total of 41 schools agreed to participate in the waste analysis part of the project. However two schools dropped out resulting in a final sample size of 39.

The schools included in the study were classified as follows:
- By type: Primary or Secondary.

■ By size: number of pupils registered on school roll compared to the national mean (239 pupils for primary schools and 975 for secondary schools). Schools were classified as small or large depending on whether the number of pupils was less than or more than the national mean.

■ By deprivation: this was calculated as a percentage of Free School Meals: number of free schools meals prepared as a percentage of total pupil numbers. The values were ranked for each school type with the bottom quartile classified as low (0-7.39%), the second and third quartiles classified as med (7.4-33.9%) and the top quartile classified as high (>34%). The percentage of pupils on FSM was ranked for each school and depending on which quartile they fell in classified as L, M or H. Note that this was not assumed to be a factor influencing waste, merely to be a proxy for socio-demographic make-up.

■ By catering provision:
   ○ Local authority caterer
   ○ Commercial contract caterer
   ○ Catering staff employed directly by the school

Table 1: Summary of schools by type included in the study

	Type	Size		FSM	Food production
B&NES	8 x Primary	Small: 7		5 x Low	6 x LA (1x no hot meal)
		Large: 1		6 x Med	4 x school
	4 x Secondary	Small: 2		1 x High	1 x commercial
		Large: 2			
East Riding	7 x Primary	Small: 2		5 x Low	6 x LA (1x no hot meal)
		Large: 5		4 x Med	2 x school
	2 x Secondary	Small: 1		0 x High	1 x commercial
		Large: 1			
Hackney	11 x Primary	Small: 4		1 x Low	0 x LA
		Large: 7		5 x Med	5 x school
	1 x Secondary	Small: 1		6 x High	7 x commercial
		Large: 0			
Islington	4 x Primary	Small: 1		0 x Low	0 x LA
		Large: 3		3 x Med	2 x school
	2 x Secondary	Small: 2		3 x High	4 x commercial
		Large: 0			

* Following the fieldwork it was ascertained that one of the schools that had been recruited as a primary school actually had a mixed site of primary and secondary pupils and the waste included in the study included both sets of school waste. This school has been excluded from the analysis when the data has been split between primary and secondary schools.

3.0   Quantitative research in schools

3.1   Aim
To understand better the nature of food waste produced by schools, the types of food wasted and the point at which the waste arises.

3.2 Methodology

Table 2: Summary of the methodology employed in conducting the food waste composition analysis

Operation	Methodology

Planning and Preparation	■ Development of a bag tagging system to identify the:
	
	    o school producing the waste
	    o day of collection
	    o area where the waste was produced -coloured tags used to identify:
	        • playground/grounds
	        • canteen/dinner hall
	        • classrooms
	        • kitchens
	        • all other areas
	
	■ Management and caretakers briefed about requirements.
	
	■ Provision of alternative bins for schools using skips for waste disposal
	
	■ Briefing of kitchen and cleaning staff on the tag system and requesting that material normally put through a waste disposal unit or sent for composting was to be presented for analysis.
	
	■ Cancellation of usual waste collection for duration of the project

Waste collections	■ Collections were conducted over a 3 week period ■ Schools presented residual waste daily, bagged and tagged ■ Waste was collected daily in a non-compacting vehicle ■ Daily liaison with caretakers and replenishing of coloured tags as required ■ A few days of waste from individual schools in Islington and Hackney was not collected due to the normal crew not suspending their collections. In these instances a reminder was sent to the school and waste collection contractor. Missing data is taken account of in the analysis. ■ Dry recyclables collected by schools was not analysed as part of this study but collected in the normal way. ■ A total of 9.6 tonnes of food waste from primary schools was collected and sorted during the project and 4.4 tonnes of food waste from secondary schools. (A further 472 kg of waste was collected and sorted from the mixed site school referenced in the footnote to Table 1).
Waste sorting	All waste collected was hand sorted by a team of experienced operatives in accordance with the methodology used in WRAP's Household food and drink waste in the UK: www.wrap.org.uk/retail/case_studies_research/report_food_waste_2.html

Operation	Methodology
	All waste was pre-sorted prior to analysis to remove non-food waste

The following analysis was carried out for each item of food waste and recorded on data sheets:
■ A brief description (e.g. boiled egg, chicken sandwich).

■ Whether it was in packaging, and if so whether the packaging had been opened.

■ Whether it was in or out of its Best Before and Use By dates, if these were visible.

■ Whether it was raw or cooked

■ Whether it was uneaten or partially eaten

■ Whether it was positively identifiable as plate scrapings

■ The number of items, where counting was practical

■ The net weight of the items (any packaging was removed). |
| Data entry | The WRAP methodology of splitting food waste into 14 broad groups was used to categorise the waste from the data sheets and these were used on the data entry sheets.
Headline food categories used were:
    1. Bakery
    2. Meat and fish
    3. Dairy
    4. Dried foods and powders
    5. Fruit
    6. Salads
    7. Vegetables
    8. Confectionary and snacks
    9. Drinks
    10. Condiments, sauces, herbs and spices
    11. Desserts
    12. Mixed Foods (non sandwich)
    13. Mixed Foods (sandwich)
    14. Other
Information was also recorded as to whether the food waste was 'avoidable', 'possibly avoidable' or 'unavoidable' where:

■ **'avoidable'** refers to any food waste item typically intended for consumption. Food that is not edible because it has gone off or been damaged is still classified as avoidable because it was, at some point prior to disposal, edible. Examples include half-eaten sandwiches, part-eaten dinners, uneaten fruit, unopened or partially eaten yoghurts, dinners that have not been served etc.

■ **'possibly avoidable'** refers to items that are eaten by some people but not by others for reasons of personal taste, and to waste items that are the result of a particular method of preparation. Examples of possibly avoidable food waste are edible vegetable peelings, potato skins, apple skins, bread crusts etc. |

Operation	Methodology
	■ **'unavoidable'** refers to all waste from food that one would not expect people to eat; it is mostly composed of food preparation waste. Examples include egg shells, meat and fish bones, orange and banana skins, tea bags, coffee grounds etc. Food that is inedible because it has gone off is not classified as unavoidable, because the waste could have been avoided by using the product before this time.

3.3   Quantitative data: headline results

The headline results below are drawn from the detailed results in Section 3.4 below.

■ Quantity of food waste produced

This study suggests that over a school year (40 weeks) a total of 55,408 tonnes of food waste is generated by primary schools in England and 24,974 tonnes by secondary schools, giving a total food waste weight of 80,382 tonnes. This figure has been arrived at by taking the g/pupil/day from this study and normalising the data for variables where national data are available: number of pupils and number of free school meals provided and using a regression model to give estimates of national arisings. A description of this process can be found in Appendix 2.

It was found that grams per pupil per day (g/pupil/day) was the most meaningful way to compare data from different schools. When expressed in these units, there was less variation between schools in the quantities of food waste generated than when the data were expressed as kg/school or g/meal/day. This is explored in detail in Appendix 2.

The regression model estimated that primary schools produce more food waste than secondary schools: the mean amount of food waste from primary schools was 72g/pupil/day and from secondary schools 42g/pupil/day.

■ Composition of food waste produced

This study showed that for the total waste analysed, nearly 50% of primary school food waste was categorised as either vegetables (25%) or fruit (24%). The other significant categories were mixed (non sandwich) (17%) and bakery (8%). In secondary schools 36% of waste was categorised as either vegetables (18%) or fruit (18%). The mixed (non sandwich) category of 19% was similar to the primary school figure.

In both types of school, a high proportion of vegetable waste was potatoes and mixed vegetables. Included within this mixed vegetable category were vegetable stews and sauces where it was not possible to separate the individual vegetables. The mixed (non sandwich) category includes plate scrapings which were not always possible to split out into different elements (e.g. crumble from pasta bake).

■ Food waste by area within the school

For both primary and secondary schools, the kitchen and canteen areas were found to produce the majority of the total food waste and this is assumed to represent the waste generated by food that is prepared, but not served (kitchen) and served, but not eaten (canteen). In primary schools the total produced in these two areas is 72%, with an equal split between kitchen (36%) and canteen (36%). In secondary schools the total is 59%, with the kitchen area generating 38% and the canteen area 21%. In secondary schools, the classroom area was found to produce a similar proportion of food waste to the canteen area (18%). The waste generated in the canteen area is assumed to originate from school meals and in the classroom area primarily from packed lunches and break time snacks.

The kitchen and canteen areas had a high proportion of vegetables and mixed meals (e.g. pizza, pasta bake, quiche etc.) assumed to be generated from school meals. All food waste generated in the kitchen area is assumed to come from school meals. Due to the state of the food waste produced, it was difficult to differentiate between plate scrapings and packed lunch waste in the canteen; but school policies would suggest that the majority of this waste comes from school meals: in primary schools where packed lunches were eaten in the canteen pupils were required to take their waste home and in most secondary schools in the sample, packed lunches were eaten outside the canteen, often in the classroom.

In both primary and secondary schools, fruit accounts for the majority of waste generated in the classrooms and playground areas. In these areas the wastes generated are assumed to come from break time snacks and packed lunches.

■ Avoidable food waste

Avoidable food waste (as defined in Section 3.2 above) accounted for the majority of food waste in both secondary (77%) and primary (78%) schools. This compares with 62% of food waste from households that was classified as 'avoidable' in WRAP's "Household food and drink waste in the UK" report[3].

Avoidable food waste contained all the food categories with the largest proportions being made up of mixed (non sandwich), vegetables and fruit. There was more avoidable vegetable waste, by weight, than any other category, suggesting that significantly more vegetables are being prepared than are currently being eaten in both school types. Whilst fruit waste was the next largest food waste category, by weight, it is interesting to note that less than half of this waste was categorised as avoidable.

■ Influence of size of school
Analysis showed that for both school types, larger schools produce less food waste per pupil than smaller schools.

Small primary schools produce more food waste per pupil in the kitchen and playground compared to other areas within the school. Small secondary schools produce more food waste per pupil in the kitchen and canteen compared to other areas within the school.

■ Influence of catering provider
Analysis of the data by catering provider suggests that external provision of catering (by either local authority or commercial catering providers) is associated with a decrease in waste production in primary schools. The effect suggested for secondary schools is in the opposite direction, but is not statistically significant. (See Appendix 2, table 9 for full analysis).

The two schools where only packed lunches were provided produced the lowest quantities of food waste (see Appendix 3 for actual weights by school).

■ Eaten state
It was only possible to categorise 20% of the food waste by eaten state (see Section 3.4.2 for explanation). Of this, fruit accounted for more than half of the partially eaten and approximately a third of the uneaten food waste in primary schools. In secondary schools fruit and drinks each accounted for approximately a quarter of the partially eaten food and fruit and sandwiches each accounted for more than a quarter of the uneaten food.

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[3] http://www.wrap.org.uk/retail/case_studies_research/report_food_waste_2.html

wrap Material change for a better environment

■ Free fruit and vegetable scheme in primary schools

In primary schools the free fruit scheme was seen to have an effect on the quantity and composition of the fruit waste produced, with evidence of more fruit by type being thrown away on the day it is distributed as part of the scheme. This was tested for apples (Monday's fruit) and bananas (Thursday's fruit).

3.4   Quantitative data: detailed results

3.4.1   Food waste composition

This section analyses in more detail by school type the composition of the food waste. The following two figures (5 and 6) show the composition of the food waste sorted by school type. The composition profile obtained from the sorted sample of food waste has been used to provide estimates for the sub-fractions of food types produced annually for each school type in subsequent sections.

Figure 5: Primary school food waste composition (% weight)
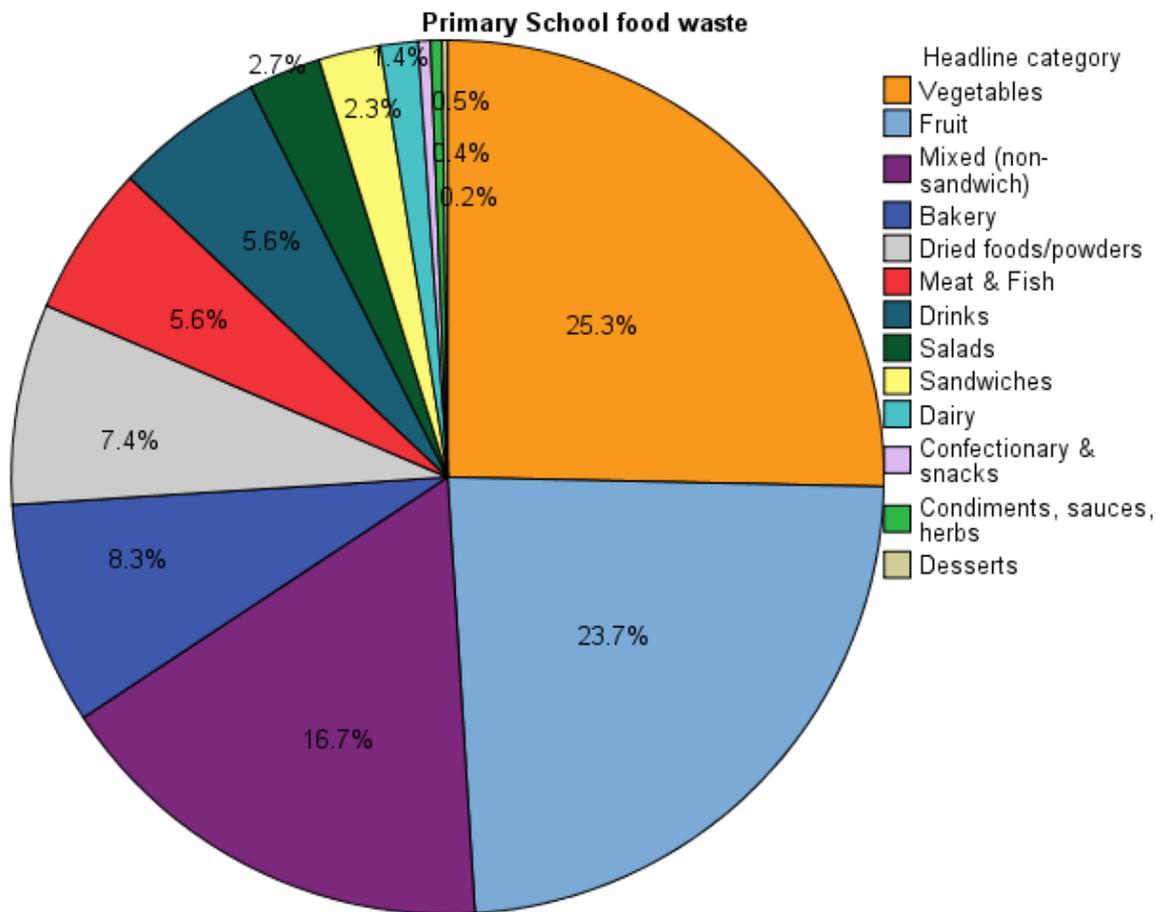
Source: Chart created by Resource Futures

Nearly 50% of primary school food waste was categorised as either vegetables (25%) or fruit (24%). The other significant categories were mixed (non sandwich) (17%) and bakery (8%).

Figure 6: Secondary school food waste composition (% weight)

Secondary School food waste

Headline category
Mixed (non-sandwich)
Fruit
Vegetables
Drinks
Bakery
Dried foods/powders
Sandwiches
Meat & Fish
Salads
Dairy
Confectionary & snacks
Condiments, sauces, herbs
Desserts
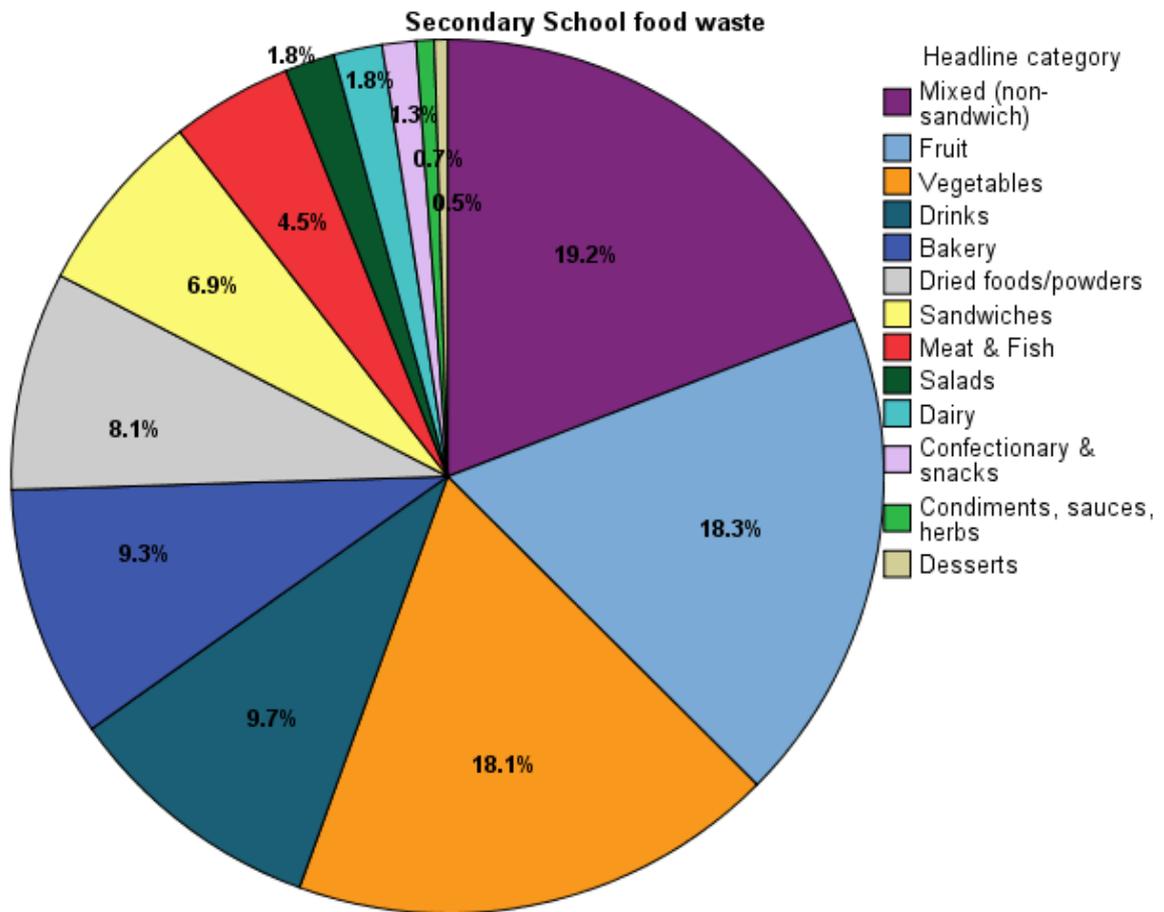
Source: Chart created by Resource Futures

As with primary schools, the major food waste categories from secondary schools were vegetables (18%), fruit (18%) and mixed (non sandwich) (19%). Fruit and vegetables accounted for 36% of secondary school food waste compared with 49% in primary schools.

Data on food waste composition at the individual school level is presented in Appendix 4 (Figures 5 & 6).

Figure 7: Composition of fruit waste in primary and secondary schools (% weight)
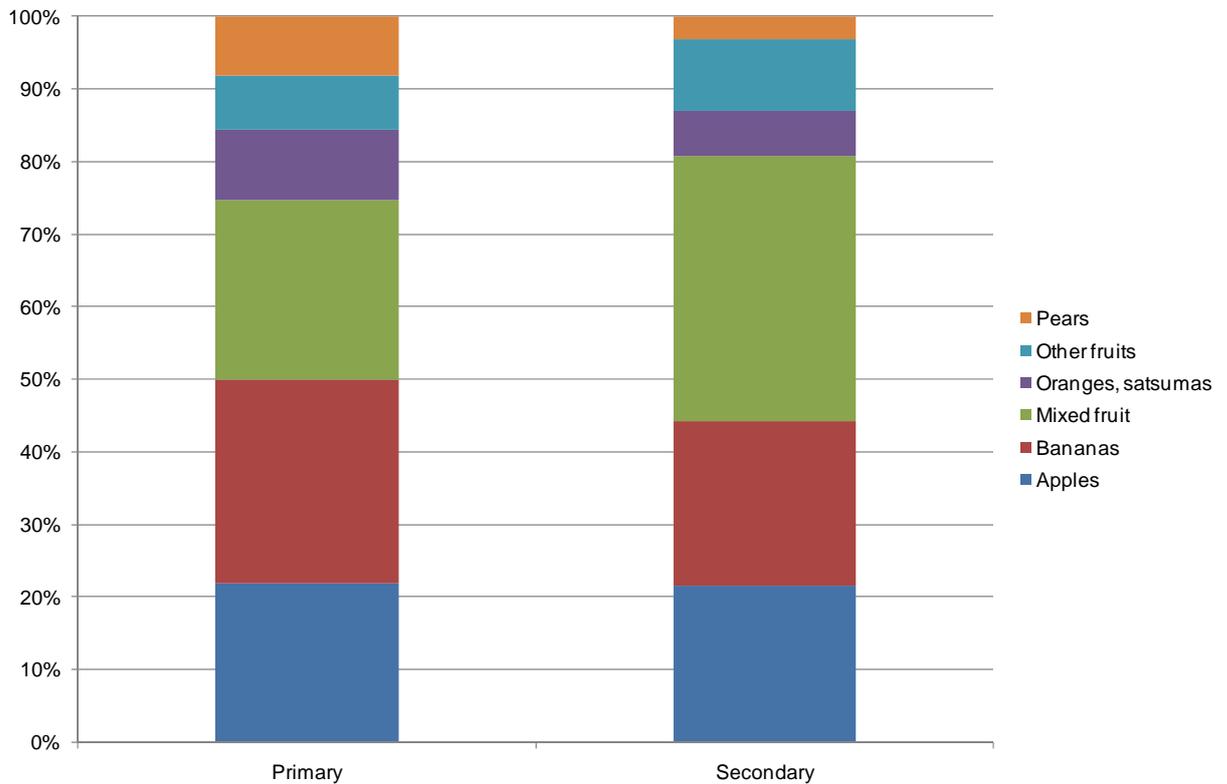
Source: Chart created by Resource Futures

Based on the weight of fruit waste sorted, an estimated 13,132 tonnes of fruit waste is produced by primary schools in England per 40 week school year and a further 4,570 tonnes of fruit waste by secondary schools. This includes all fruit waste, "avoidable", "possibly avoidable" and "unavoidable" (see Figure 14 for analysis of food type by avoidability).

The proportion of fruit waste which includes the types of fruit provided as part of the free fruit and vegetable scheme in primary schools (i.e. apples, pears and bananas) represents 58% of the total fruit wasted as compared with 48% in secondary schools where the scheme does not operate. Section 3.4.7 provides further analysis of the effect of the free fruit scheme.

Figure 8: Composition of vegetable waste in primary and secondary schools (% weight)
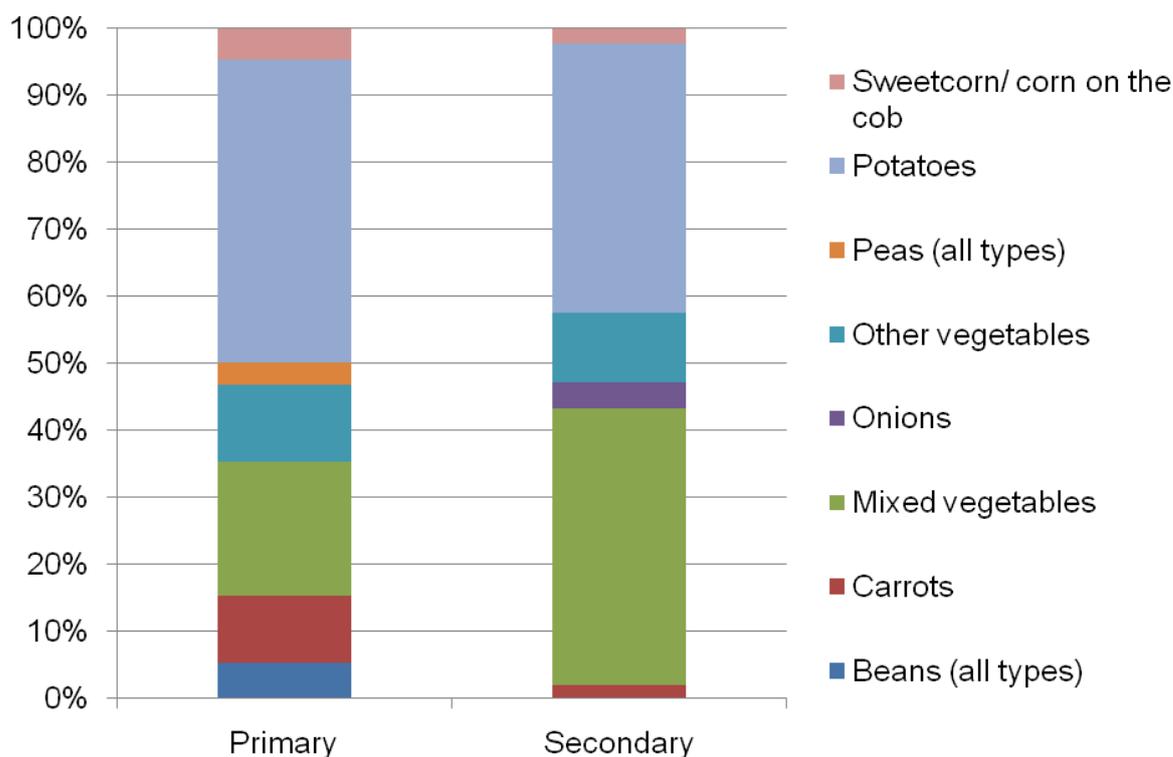
Source: Chart created by Resource Futures

Both school types have a high proportion of potatoes and mixed vegetables. Included within this mixed vegetable category were vegetable stews and sauces where it was not possible to separate the individual vegetables.

3.4.2   Analysis of the nature of the food waste

3.4.2.1   By eaten state

There was an attempt to identify foods that had been partly eaten and uneaten, but this was made difficult due to the way in which the waste was presented. For example, identifying whether an apple or sandwich found in a school's waste stream has been partly eaten or uneaten is relatively straightforward; but identifying whether individual portions of mixed meals, such as pasta, are partly eaten or untouched is much more difficult, especially when presented as plate scrapings mixed with other food types. Only 20% of the waste sorted was categorised in this way due to these difficulties.

Of the food waste that was categorised by eaten state, fruit accounted for more than half of the partially eaten and approximately a third of the uneaten waste in primary schools. In secondary schools fruit and drinks each accounted for approximately a quarter of the partially eaten food and fruit and sandwiches each accounted for more than a quarter of the uneaten food.

3.4.2.2   By cooked or uncooked state

■ **Meat and fish**
Of the 5.6% (3,103 tonnes) of meat and fish waste in primary schools 97% (3,010 tonnes) was categorised as cooked.

Of the 4.5% (1,124 tonnes) of meat and fish waste in secondary schools, 86% (966 tonnes) was categorised as cooked.

■ **Vegetables**
Of the 25.3% (14,018 tonnes) of vegetable waste in primary schools 78% was categorised as cooked (10,934 tonnes). Of the 22% raw vegetable waste, 26% was carrots (802 tonnes) and 11% was potatoes (339 tonnes). Of the 78% of cooked vegetable waste, 58% were potatoes (6,342 tonnes).

Of the 18.1% (4,520 tonnes) of vegetable waste in secondary schools, 57% was categorised as cooked (2,577 tonnes). Of the 43% raw vegetable waste, 10% was potatoes (194 tonnes). Of the 57% of cooked vegetables 64% was potatoes (1,649 tonnes).

3.4.2.3   By Best Before and Use By dates

Only 4% of the food waste by weight in primary schools and 6% by weight in secondary schools was identified as foods which could be categorised as being in or out of best before and use by dates because they were in packaging which was date stamped. These consisted of items such as drinks, and yoghurts.

Of the 4% of food waste from primary schools which could be categorised as being in or out of best before and use by dates, 14% was past its use by date and 27% was past its best before date. Of the 6% food waste from secondary schools, 16% was past its use by date and 9% past its best before date. The proportion of food and drink waste that had past a best before or use by date is low and this is indicative of the fact that food is mainly brought into schools for consumption in the near future and that school kitchens operate commercially and therefore have stock control processes in place. This contrasts with food waste in households, where a significantly higher proportion of food waste is discarded because it is not used in time.

3.4.3   Avoidable food waste

Based on the food item description and where the food waste was generated, it was categorised as being "avoidable", "unavoidable" or "potentially avoidable". (Definitions of these categories are described in section 3.3 above). Figure 9 presents the mean data for primary and secondary schools based on whether the food waste was categorised as avoidable.

Figure 9: Food waste categorised by whether it was avoidable or not (tonnes / year (rounded))
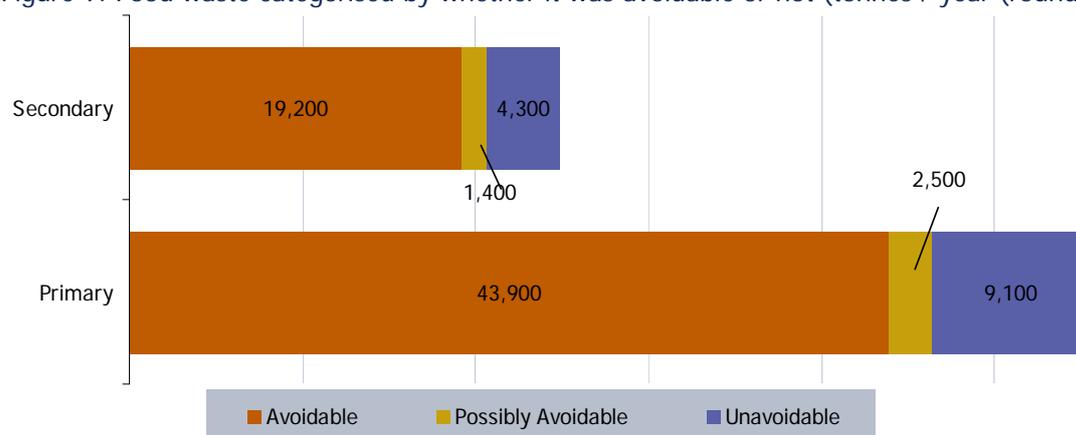
Figure 9 above clearly shows that the vast majority of food waste in both school types was classified as avoidable. At the individual primary school level, food waste that was categorised as avoidable ranged between 54% -86%, the proportion classified as unavoidable was between 11% - 35%. The proportion of secondary school waste that was categorised as avoidable ranged from 64% - 89%,

unavoidable ranged from 6% - 26%. Data on food waste avoidability at the individual school level is presented in Appendix 4 (Figures 7 & 8).

3.4.3.1 Avoidability by food type

The data was analysed to see what the composition of the three 'avoidable' food waste categories were for each headline food category. The results are presented in figure 10 below.

This figure shows that the food category with the largest proportion of unavoidable waste was fruit - around half of all fruit waste is classified as unavoidable. Banana skins, orange or satsuma peelings and fruit pips or stones would be included in this category. The other headline food categories with notable proportions of unavoidable food waste are vegetables, drinks and meat & fish. For vegetables the "unavoidable" category was made up of skins and peelings from food preparation, for drinks it was tea bags and coffee grounds and for meat & fish it was predominantly bones.

The food categories accounting for most of the avoidable waste by weight were vegetables, mixed (non sandwich and fruit. Whilst the avoidable fruit waste is likely to be made up of waste from school meals, packed lunches and break time snacks; the majority of the avoidable vegetable and mixed (non sandwich) categories are likely to come from waste from school meals.

Figure 10: Breakdown of food type by "avoidability" for all English schools (tonnes / year)
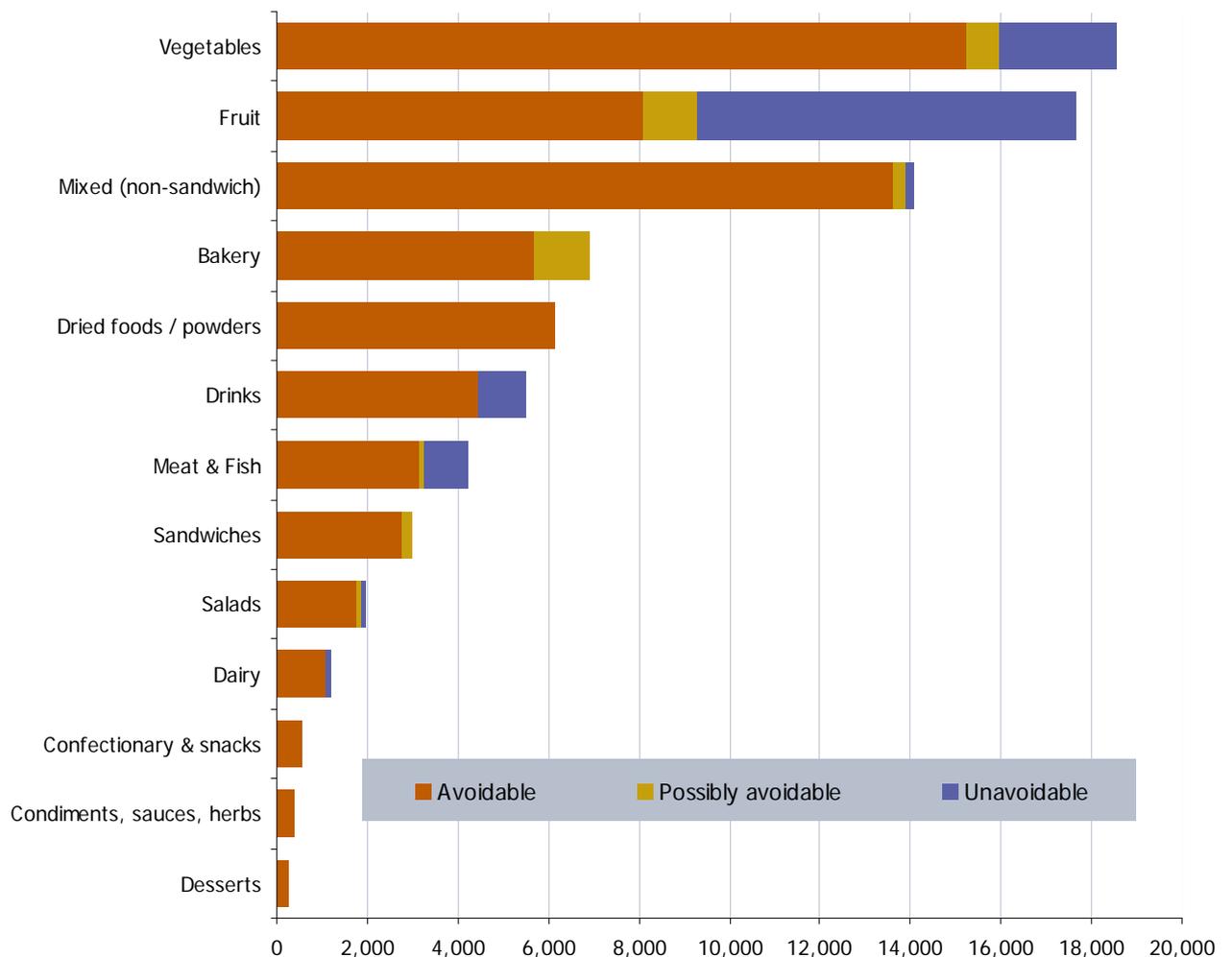
Table 3: Food type by "avoidability" (tonnes per year (rounded))

Food type	Avoidable	Possibly Avoidable	Unavoidable	Total
Vegetables	15200	740	2580	18600
Fruit	8090	1230	8360	17700
Mixed (non-sandwich)	13600	270	170	14100
Bakery	5650	1250	<100	6910
Dried foods / powders	6140	<100	<100	6140
Drinks	4440	<100	1060	5490
Meat & Fish	3140	<100	980	4210
Sandwiches	2770	220	<100	2990
Salads	1760	<100	<100	1940
Dairy	1060	<100	150	1210
Confectionary & snacks	570	<100	<100	570
Condiments, sauces, herbs	400	<100	<100	400
Desserts	240	<100	<100	240
	63100	**3900**	**13400**	**80400**

3.4.3.2   Avoidability by point of origin

Figure 11 below shows the proportion of avoidable food waste by point of origin in the school. For both school types the highest proportions of avoidable food waste are produced in the canteen and kitchen areas. The areas not associated so closely with the production of food i.e. classroom and playground had lower proportions of avoidable food waste. As the composition of waste from these areas was found to contain a high proportion of fruit waste, fruit skins etc. can be assumed to account for much of this unavoidable food waste.

Figure 11: Potential to avoid food waste by point of origin (% weight)
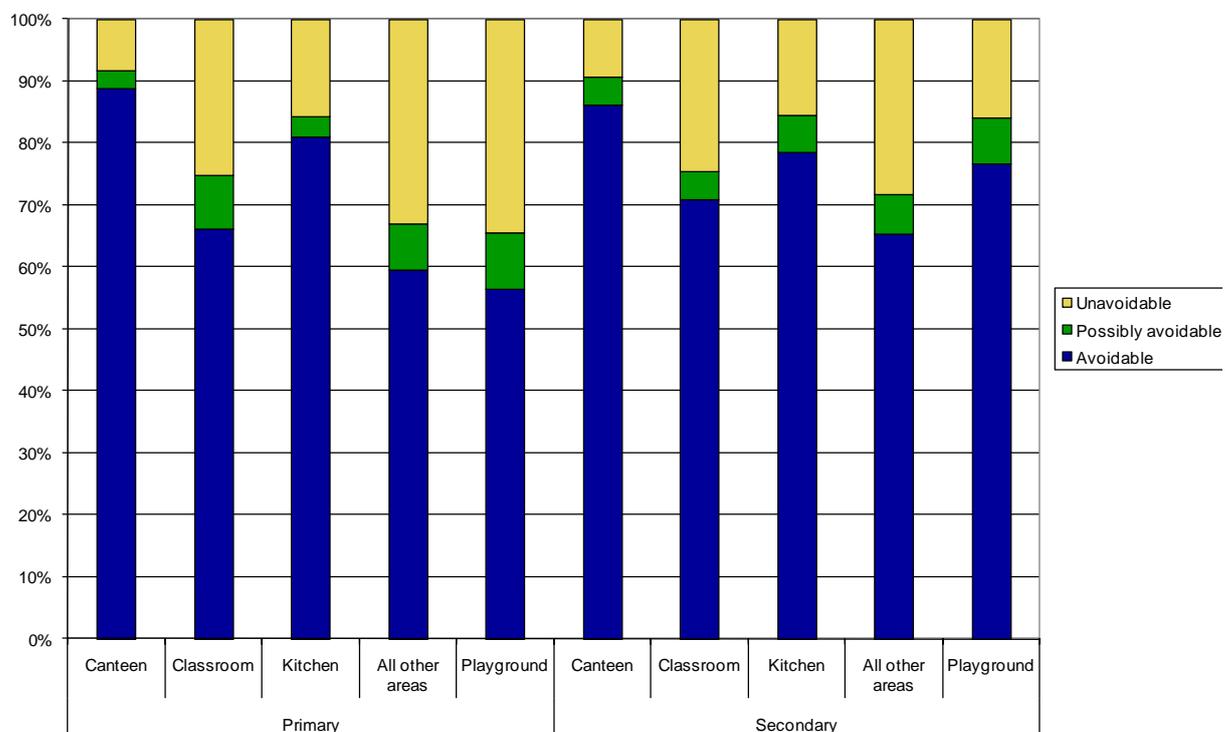
Source: Chart created by Resource Futures

3.4.4   Food waste by area within the school

As part of the project, schools tagged their waste according to the area of the school in which it was generated. Any waste for which the point of origin is categorised as 'unknown' relates waste that was presented by the school without a tag, or the where the tag was lost in transit.

Figure 12 below shows the mean amount of waste generated by area for each school type. For both school types it is clear to see that the kitchen and canteen produce a significant proportion of the food waste generated in schools. For secondary schools, canteens and classrooms account for roughly the same proportion of the food waste.

Figure 12: Food waste by school type and by area within the school (% weight)
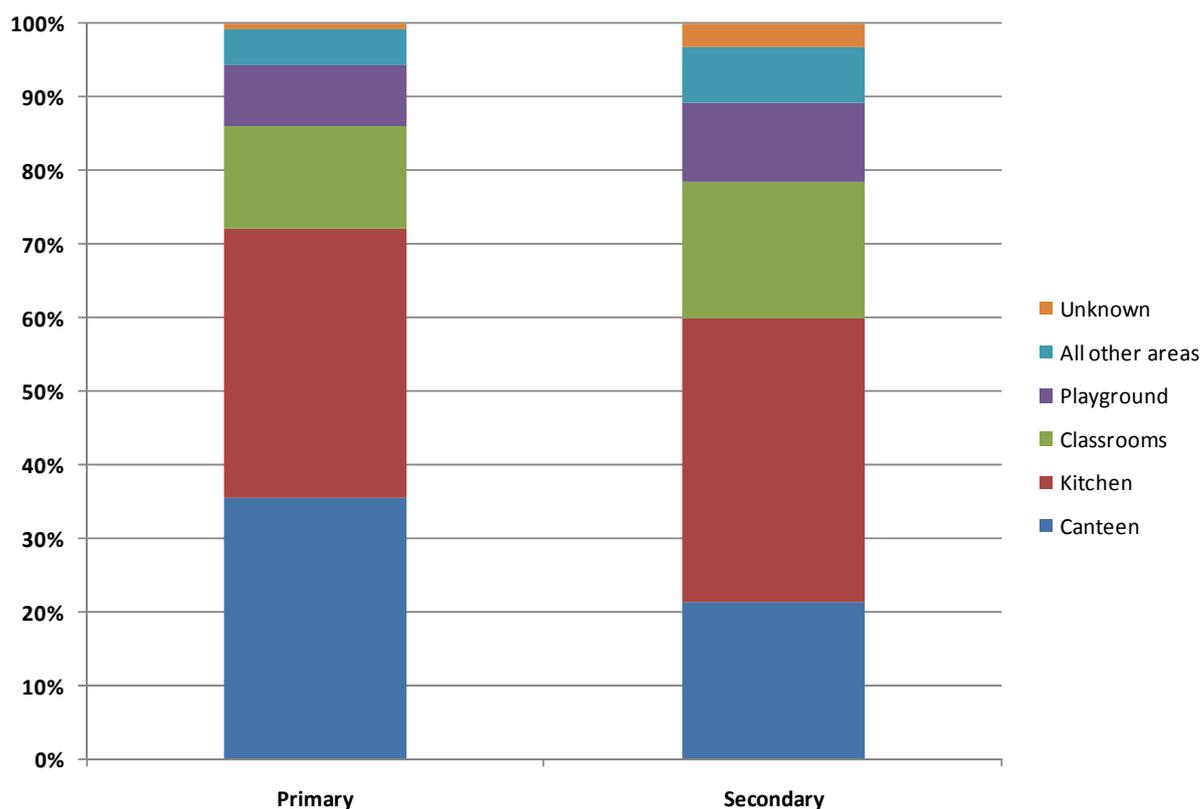
Source: Chart created by Resource Futures

Data on food waste by point of origin at the individual school level is presented in Appendix 4 (Figures 9 & 10).

3.4.4.1   Composition by area of the school

The data were also analysed to see what the composition of the waste arisings were in each area within the school. The two figures below present the data by school type, due to the small amounts of waste presented without a tag and classified as 'unknown' the data has not been plotted below. For primary schools it is interesting to note the fact that, for classroom and playground areas, fruit accounts for a majority of the waste generated. This would seem intuitive i.e. that these are the areas where fruit from break time snacks and packed lunches are consumed and therefore where fruit waste is generated. It is likely that the waste from the National School Fruit Scheme for 4 to 6 year olds is included in this result. Drinks accounted for proportionally more of the waste in the classroom and playground, again suggesting that this is where the children are part consuming the drinks they bring in from home or buy from the tuck shop or shops elsewhere e.g. on the way to school. The figure shows that vegetables and mixed food are predominantly generated in the kitchen and canteen. This would suggest that in the kitchen these food groups are the result of preparation waste and unserved food. In the canteen a logical assumption to make would be that this is uneaten food from school meals.

Figure 13: Composition of the food waste by area within primary schools (% weight)
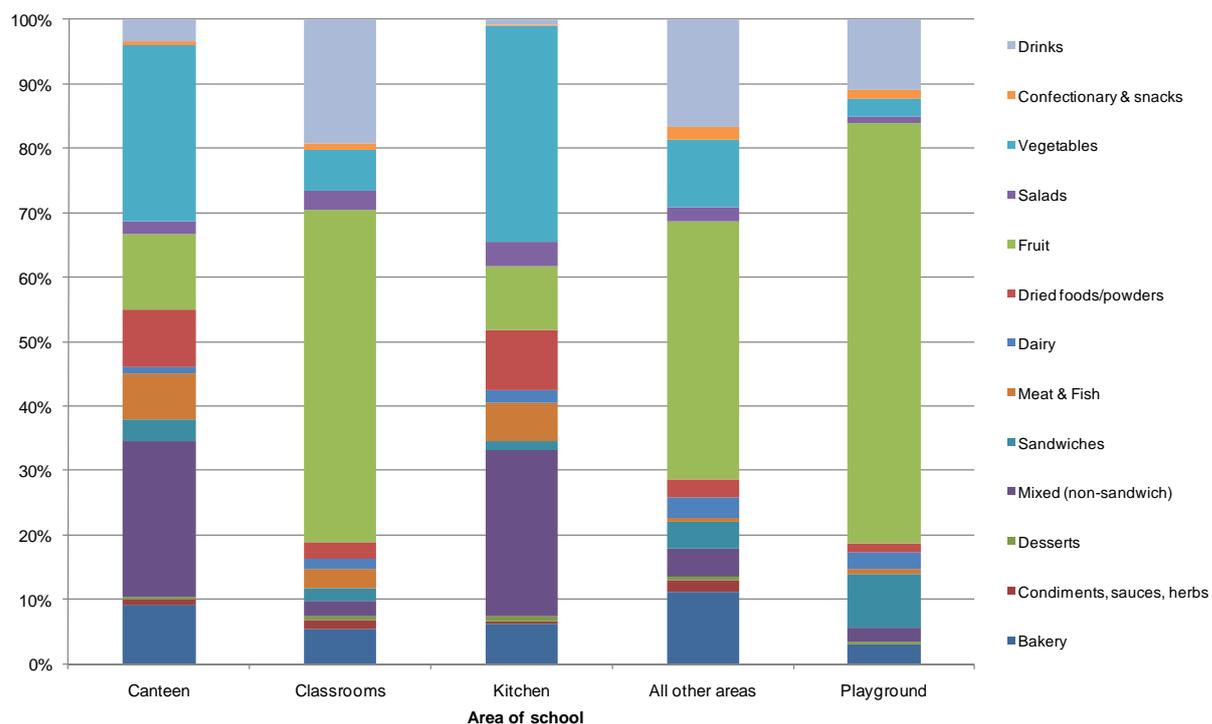
Source: Chart created by Resource Futures

For secondary schools, fruit is also significant in the classroom, playground and 'all other' areas. This would suggest that pupils and staff are either bringing in their own fruit and eating it at break and lunchtimes or taking fruit purchased in the canteen outside of the canteen. Interestingly, sandwiches account for approximately 20% of the playground and approximately 10% of the classroom and 'all other' area waste, indicating that this is where the sandwiches are being part eaten and discarded. The sandwiches could have been brought from home or bought in the canteen.

It is worth noting that the staff room would have been included in the 'all other area' category. The canteen, where the pupils ate their school meals, had a high proportion of vegetables and mixed food waste. This would indicate that portions are being served and not eaten. In the kitchen, vegetables and mixed food account for a large proportion of the waste, this is likely to be a mix of food preparation waste (unavoidable) and un-served food.

Figure 14: Composition of the waste arisings by area within secondary schools (% weight)

Legend (top to bottom):
- Drinks
- Confectionary & snacks
- Vegetables
- Salads
- Fruit
- Dried foods/powders
- Dairy
- Meat & Fish
- Sandwiches
- Mixed (non-sandwich)
- Desserts
- Condiments, sauces, herbs
- Bakery

X-axis: Area of school — Canteen, Classrooms, Kitchen, All other areas, Playground
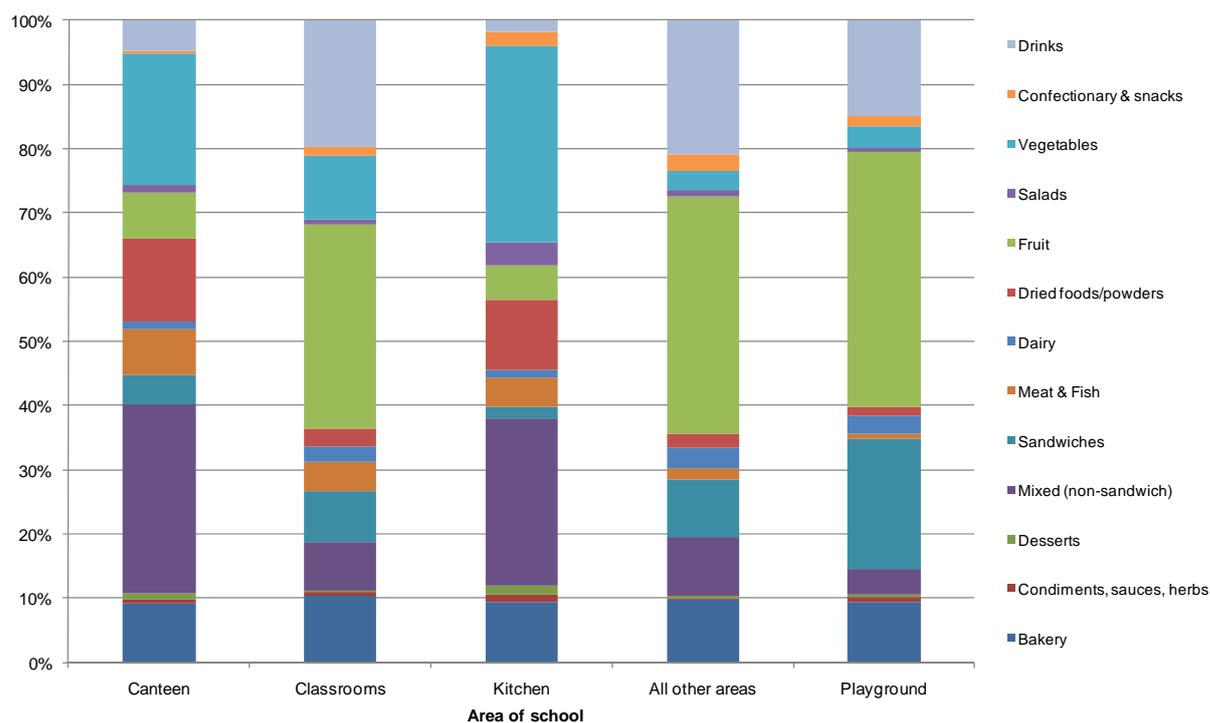
Source: Chart created by Resource Futures

3.4.5 School fruit and vegetable scheme

From the data it was possible to derive some estimates for the mean weight of key fruit items.

- ■ Apple   110 grams
- ■ Banana   120 grams
- ■ Pear   100 grams
- ■ Satsuma   80 grams
- ■ Carrot   50 grams
- ■ Tomato   37 grams

These are of interest in the light of the School Fruit and Vegetable Scheme which entitles all four to six year old children in LEA maintained infant, primary and special schools to a free piece of fruit or vegetable each school day.

The information provided to Resource Futures on the free fruit and vegetables scheme was that the following items are supplied each day to all schools:

- ■ Monday   apples
- ■ Tuesday   pears
- ■ Wednesday   carrot
- ■ Thursday   bananas
- ■ Friday   tomatoes

However, it was ascertained through the interviews that there are several variables which potentially affect this in practice. Local suppliers occasionally substitute on the basis of what's available / in good condition etc. This substitution may be different for different schools. Some schools mix and match so as to give the children a choice and use the fruit / vegetables when at its best, meaning they won't

necessarily give it to the children in the 'official' order. To complicate things further, individual teachers within the same school might give their children different combinations. It is not possible to say how widespread these practices are in the schools involved in this project.

The data was scrutinised to see if there was any obvious impact of the free fruit in the amount of fruit waste being produced by schools. Figures 7 and 9 above give a breakdown of the composition of fruit and vegetable waste in primary schools. In addition to this analysis data from several infant schools, the target age group, were looked at in respect to the weight of apples and banana waste thrown out each day. Anecdotal feedback from the sort teams was that on some days the waste from infant/primary schools would clearly have a bag containing discarded half eaten free fruit i.e. a sack full of half eaten apples all of the same small size and the vast majority with just a couple of very small bites taken out of them.

Figure 15 below shows the mean weight of apples and bananas per pupil per day across all primary schools included in the study. Monday (shaded bar) is the stated day for apples being given out through the fruit scheme and Thursday (shaded bar) is the stated day for banana. The figure clearly shows that the mean weight per pupil of these two fruit types is highest on the respective day that they are handed out through the free fruit and vegetable scheme.

Figure 15: Mean weight (g) per pupil per day of apples and bananas discarded in primary schools
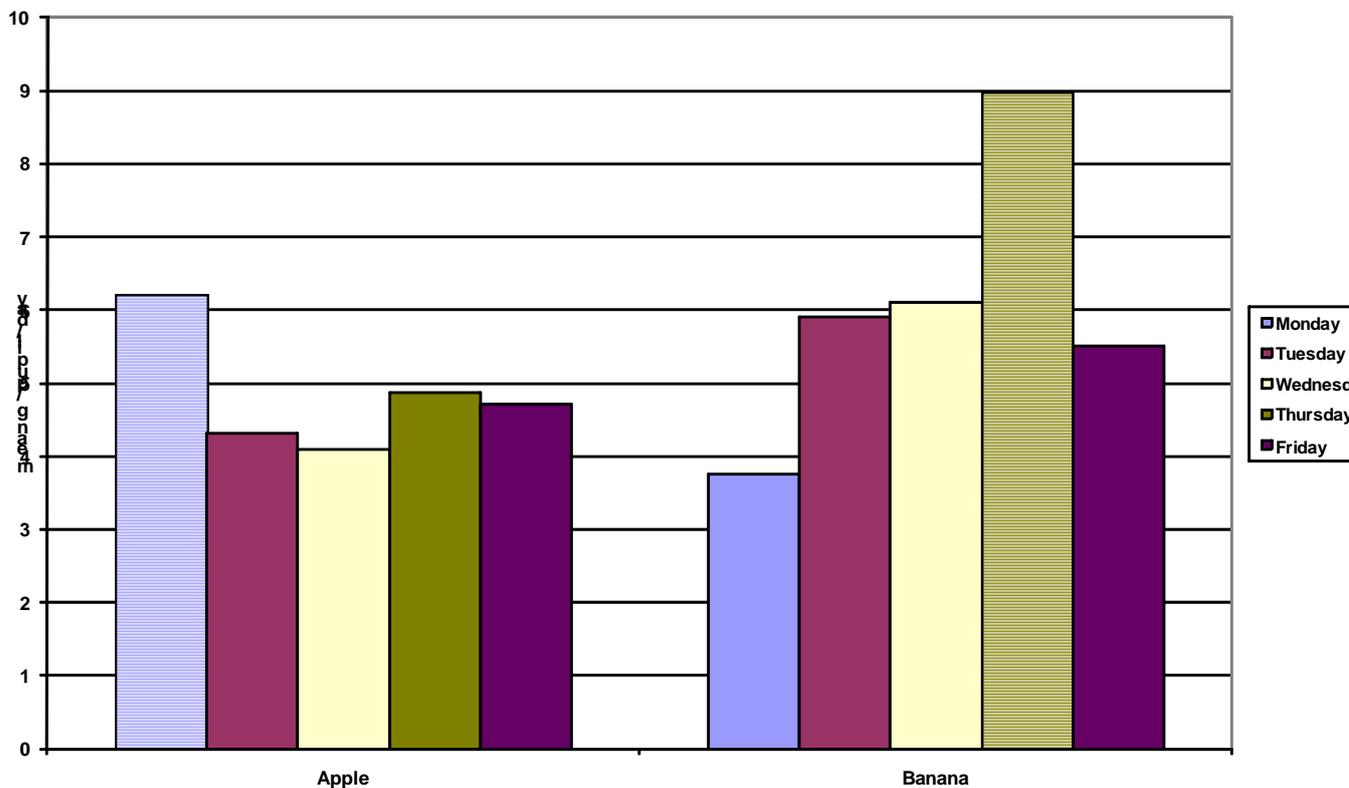
Source: Chart created by Resource Futures

The figure above indicates that the free fruit scheme is having an impact on the amount of fruit waste discarded at primary schools.

3.4.6   Food waste and measure of deprivation

Based on the number of free school meals as a proportion of pupils on roll, the data was split into three groups. The bottom quartile schools were classified as low, quartiles 2 and 3 were classified as medium and the top quartile was given a 'high' classification. Based on this ranking the data was

analysed to see the mean amounts of food waste produced by each group, the data is presented in Figure 16 below.

Figure 16: Mean weight (g) of food waste arising per pupil per day and estimation of deprivation
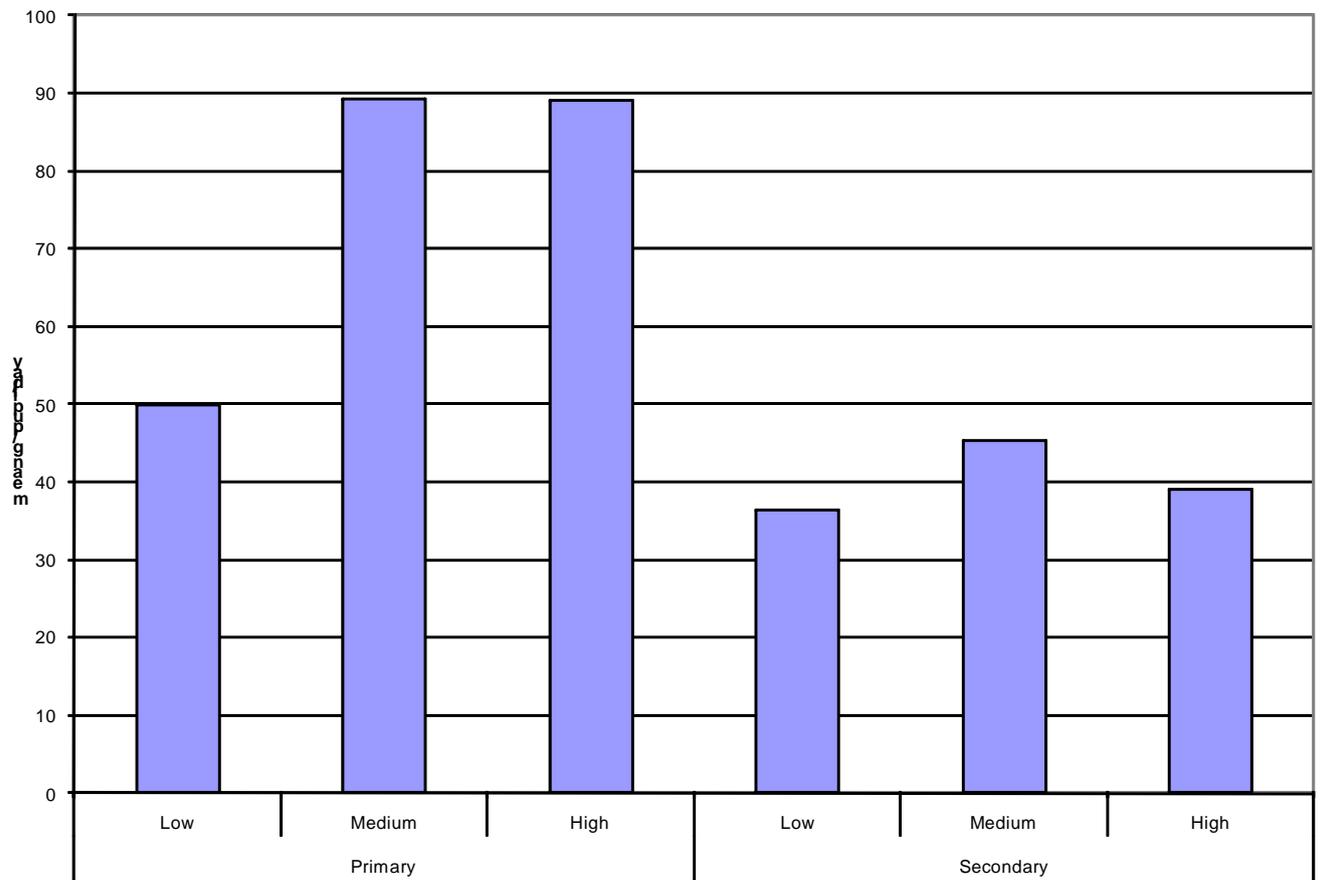
Source: Chart created by Resource Futures

Figure 16 shows that less food waste is produced in schools with lower levels of deprivation (low number of free school meals as a percentage of pupils) compared with schools with medium and high levels. Appendix 2 shows there is evidence of a statistically significant increase in food waste with deprivation for secondary schools, but not primary schools.

3.4.7   Food waste arising and school size (number of pupils on roll)

The data was also analysed based on whether the school was classified as bigger or smaller than the national mean, the data is presented in Figure 17 below.

Figure 17: Mean weight (g) of food waste per pupil per day in relation by size of school shown relative to national mean school sizes
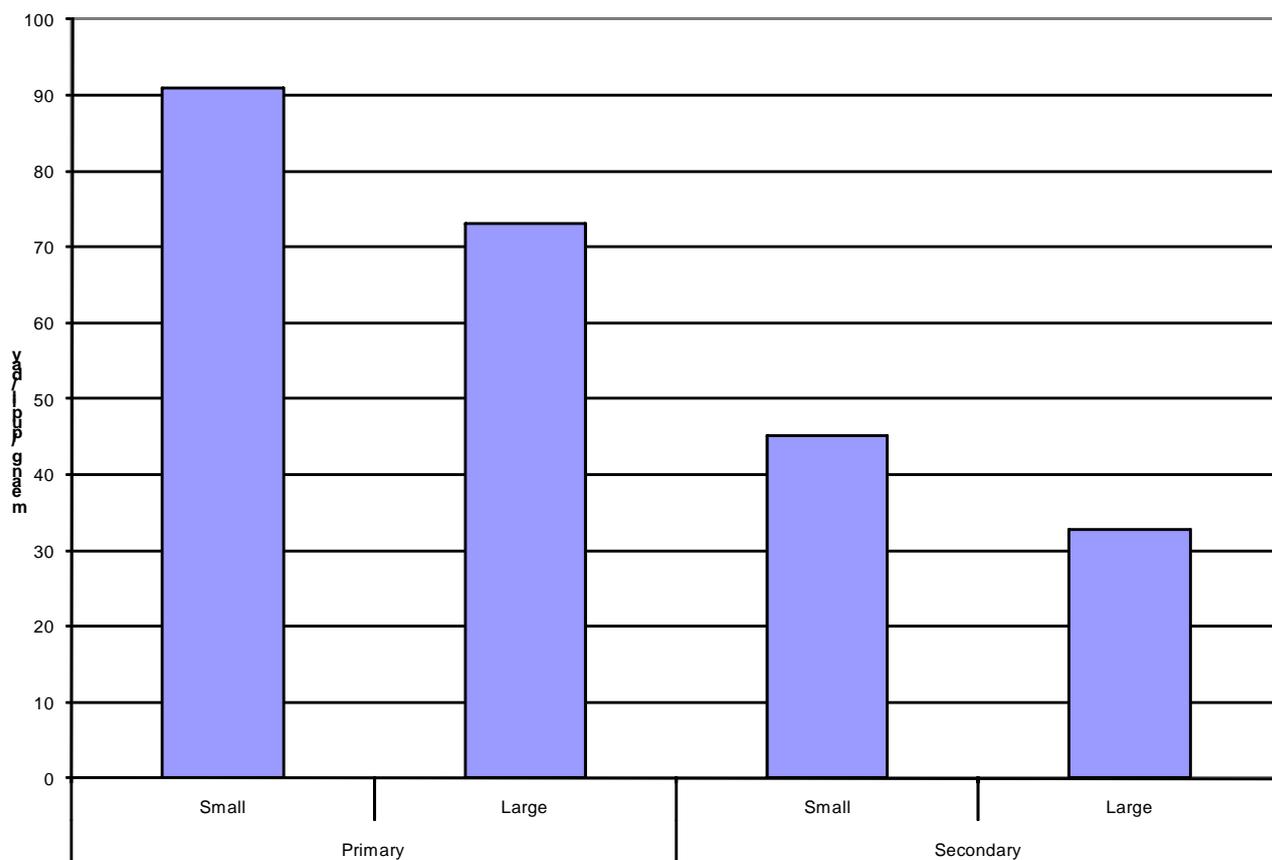
Source: Chart created by Resource Futures

Figure 17 shows that for both school types those larger than the national mean produce less food waste per pupil than the smaller schools. The data suggest a relationship between food waste per pupil and size of school and that there are 'economies of scale' arguments that would logically support this relationship. This relationship is explored further in the regression model described in Appendix 2 and found to be statistically significant for both primary and secondary schools. Our projections for food waste in schools across the whole of England have assumed that school size and associated economies of scale with larger schools, is an influencing factor on total food waste.

The data was further investigated to see where within the smaller schools the waste was being generated.

Figure 18: Mean weight (g) per pupil per day split by school size and food waste point of origin
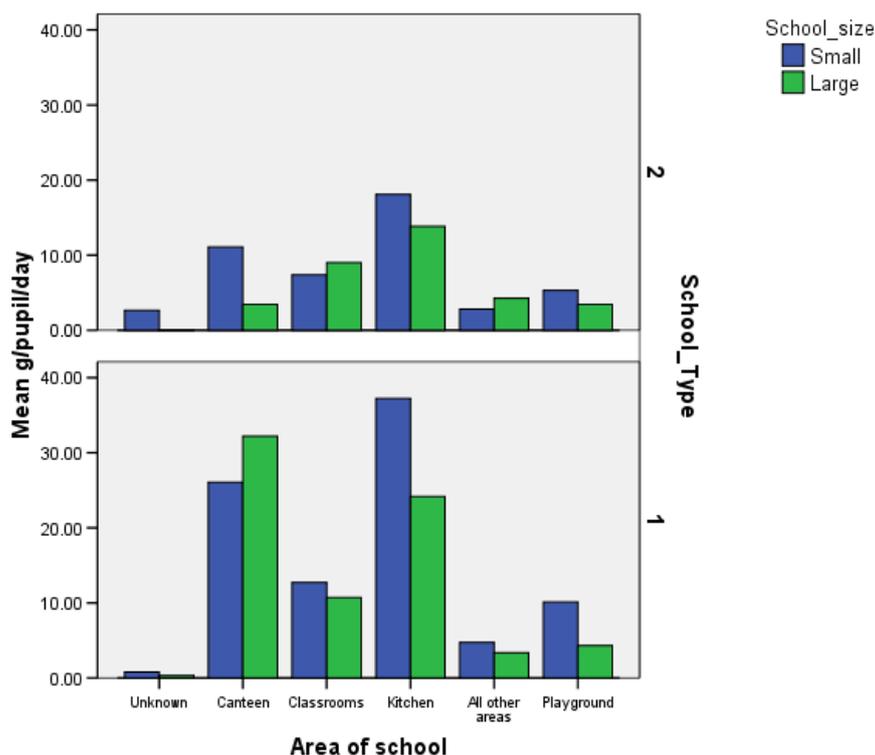
1 = Primary and 2 = Secondary.
Source: Chart created by Resource Futures

Figure 18 above shows that the small primary schools are producing more waste per pupil per day in the kitchen and playground; however, canteens in larger primary schools produce more food waste per pupil per day than the smaller schools. Small secondary schools produced more food waste in the kitchen and canteen than their larger counterparts.

The small and large school type data was analysed by the catering provision. Of the 13 primary schools classified as small, 8 had the catering provided by the local authority, 2 by their own catering staff and 3 by commercial catering contractors, the 16 large primary schools had 5 local authority, 6 own catering staff and 5 commercial catering contractors providing the catering. The six small secondary schools had three own catering staff and three commercial catering contractors; the three large secondary schools had 1 of each type of catering provision.

Figure 19: Mean weight (g) per pupil per day split by school size and catering provision
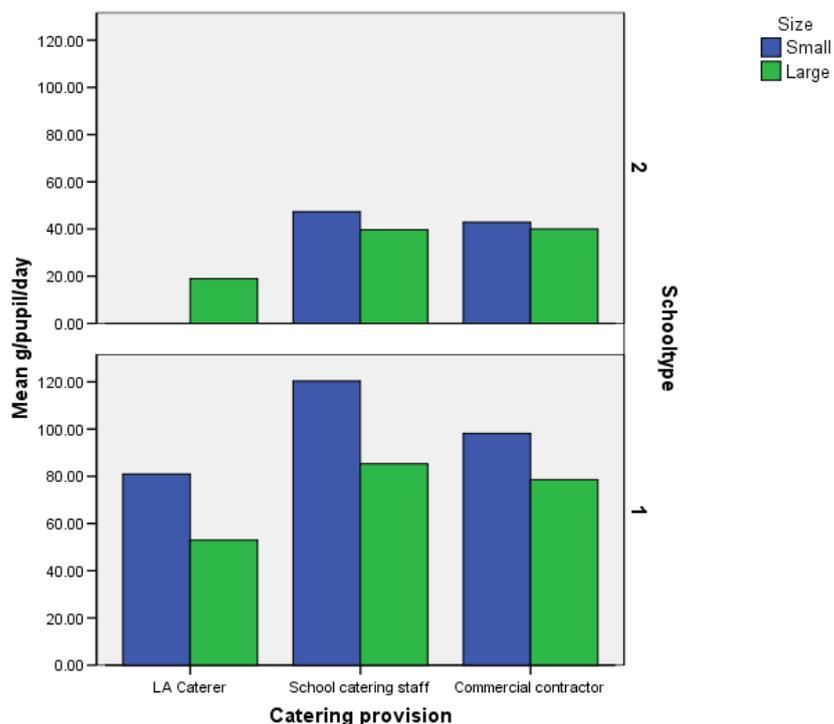
1 = Primary and 2 = Secondary.
Source: Chart created by Resource Futures

There were no strong trends in the data looking at school type and size and catering provisions however some observations can be made regarding the small differences. Small primary schools produced more waste in all three types of catering provision and the small secondary schools produced slightly more food waste that their larger counter parts this is consistent with the findings regarding the influence on school size on food waste produced. Local authority caterers produced less food waste than both school catering staff and commercial contractors in both primary and secondary schools. Primary schools with their own catering provider produced more food waste than either those where the catering was provided by the local authority or a commercial contractor.

The data was also analysed to see if the composition of the food waste varied by food waste provider. This data is shown in the figure below. The composition is different when analysed by the different catering providers, however, there are no obvious trends in the composition by provider type between schools.

Further analysis on the statistical significance of these differences can be found in Appendix 2.

Figure 20: Composition by school type and catering provision (% weight)
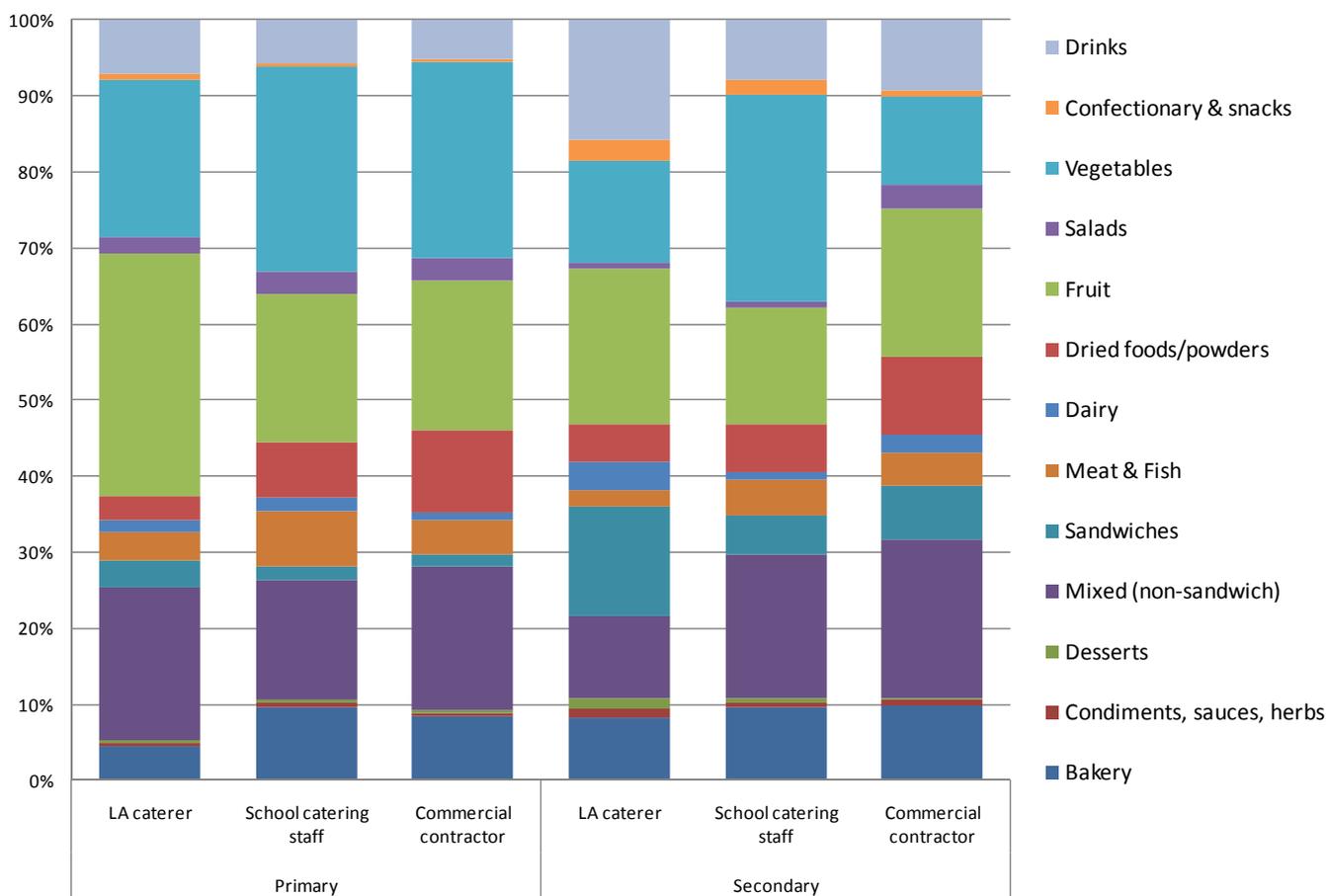
Source: Chart created by Resource Futures

4.0   Qualitative research in schools

4.1   Aim

The aim of the qualitative research was to understand the range of reasons (behavioural or otherwise) why food waste is produced in schools.

4.2   Key Findings

The qualitative research with interviewees in schools identified a large number of possible reasons for food waste. The majority of the reasons identified by those interviewed relate to food waste from school meals. This should not, however, be interpreted as meaning that these reasons are in fact the most significant and the later stages of qualitative work covered in section 5 provide some additional context.

Analysis of the in-school interviews grouped reported reasons for food waste into three categories – operational, situational and behavioural, as defined below:

- Operational reasons include policies and practices relating to school meals and catering, as set by catering providers (e.g. policies on portion sizes flexibility and allowing second helpings), and to systems at a school level (e.g. the existence of systems to record and communicate numbers of pupils having school meals each day).

- Situational reasons relate to the broader environment in which school meals and catering services operate, rather than to food-specific issues. For example the structure of the school day and the physical constraints of individual school canteens.

- Behavioural reasons relate to individual behaviours reported to result in unserved and uneaten food. For the purposes of this analysis we have combined reported behaviours and the attitudes that drive them. Thus for a single behaviour, such as pupils rejecting food, there may be a number of attitudes identified as leading to this outcome.

Some other key points to highlight are:

- Secondary schools showed more concern and awareness of the importance of food waste as a problem, particularly the financial burden of wasting food.

- Pupils demonstrated a wide range of concerns about food waste from environmental to social, 3 out of the 4 groups of pupils who mentioned these concerns came from secondary schools.

- 13 of the 16 schools stated that they had already taken some actions to reduce food waste, although it was not generally considered to be a major issue. Of course, these two facts may be linked, if it is seen as a problem that has already been addressed, then it will be less of a concern now. However, responses showed confusion between waste management and waste prevention – measures listed as prevention included recycling and composting, which, while positive behaviours, are not as beneficial to waste prevention.

- Food waste production is a complex issue in schools, in which numerous stakeholders both internal and external to the school itself play a part. A lack of effective feedback mechanisms between pupils, school staff and catering providers was cited as a reason for food waste being generated in some schools. The presence of effective feedback mechanisms was also reported to minimise food waste in others, ensuring school meals prepared meet demand.

- All schools had ideas for measures to reduce food waste, and these came from both staff (46 suggestions in total) and pupils (19 suggestions). Many of these were new ideas for the interviewees. This may suggest that the process of being questioned and prompted to think about food waste encouraged a deeper level of engagement with the issue than had previously been the case. The ideas relating to improving familiarity of food and improving menu planning within the school were trialled as part of the interventions trialled (see Section 6).

4.3   Methodology

In-depth interviews with staff, and focus groups with pupils, were conducted in a sample of schools participating in the waste analysis.

4.3.1 School Sample

Sixteen schools across the four local authority areas took part in the qualitative research. Schools were selected with the aim of ensuring coverage of the range of variables described in section 4.2 (i.e. school type, school size, school catering service provider, socio-economic status). However, willingness to participate was also a significant factor in determining which schools took part. Perhaps as a result, schools participating in this stage of the research appear to have a high level of interest in the environment, with 12 out of 16 signed up to be Eco-schools. (Of schools participating in the quantitative research only, 4 out of 23 were signed up to be Eco-schools).

Nonetheless, on the research criteria, a range of schools were successfully involved, as indicated in the table below.

Table 6: Schools participating in the qualitative research

Area	Type and Number	Size	% Free School Meals	Catering arrangements
B&NES	Primary x 3	Small x 2	Low x 1	School x 1
		Large x 1	Medium x 2	Local authority x 2
	Secondary x 3	Small x 1	Low x 1	Local authority x 3
		Large x 2	Medium x 2	
East Riding	Primary x 2	Small x 1	Medium x 2	Local authority x 2
		Large x 1		
	Secondary x 2	Small x 1	Large x 2	Local authority x 1
		Large x 1		Commercial x 1
Hackney	Primary x 3	Large x 3	Medium x 2	School x 3
			High x 1	
	Secondary x 1	Small x 1	High x 1	School x 1
Islington	Primary x 1	Small x 1	High x 1	Commercial x 1
	Secondary x 1	Large x 1	Medium x 1	School x 1

(See Section 2.2 for details of definitions of Small/Large schools and L/M/H % Free School Meals)

4.3.2 The interview process

School staff

Specific groups of staff, based on roles and responsibilities relating to food, were targeted for interviews, and questions were varied accordingly. These are outlined in Table 6.

A date for interviews was agreed with the school and interviewees were pre-booked into interview slots at times to suit them.

Interviews were conducted with the aid of a topic guide. All interviews included an introduction to the research and some warm up questions relating to views about the types and quantities of food thrown away and whether food waste is an issue for the school. These were then followed up by specific questions relating to interviewee role, as shown in Table 7. All staff were asked for their views on the reasons food is wasted, their opinions on what could be done to reduce food waste in the school, and what (if any) actions their team had already taken.

Table 7: Areas of questioning for staff

Staff Category	Area of questioning
Catering staff	■ At what stage is food wasted e.g. during preparation, food that is cooked, but not served, food that is served but not eaten? ■ What are the main causes of food waste? ■ What is the % served meals compared with % of packed lunches ■ Does the amount of food wasted vary day by day? ■ Is sufficient time given for serving the food/for eating the food? ■ Are you permitted to: offer second helpings; cook with leftovers; alter menus? ■ Whether they have noticed any trends/changes over time in the amounts of food waste generated? ■ Can you offer feedback to the catering company and Head?
midday meal supervisors	■ What are the main reasons for school dinners and packed lunches not being eaten? ■ Is it school policy to encourage pupils to eat up food? If so do they have the time and resources to do so? ■ What is their role in encouraging food to be eaten? ■ Are you able to offer feedback to the caterers and/or Head?

School Management Head/Deputy/ Bursar	■ What the school policies are on:
	
	    o Pre-ordering of school meals;
	    o Permitted areas within the school to consume food;
	    o Leaving school premises at lunchtime (secondary schools);
	    o Role of, and training for Midday Meal Supervisors (primary only)
	    o Disposal of waste from packed lunches
	    o Encouragement for school dinners/break time fruit to be eaten;
	■ Whether the school actively promotes recycling, composting, healthy eating

Teachers	■ Why food waste is generated in the: canteen, school grounds and classrooms. ■ Primary teachers only were asked additional questions regarding the fruit provided at break time including:

	o the quality and quantity of fruit provided; o whether fruit is prepared for younger pupils; o whether pupils are given a choice in what fruit they receive.
Caretakers	■ Which areas in the school generate the most food waste? ■ What are the main causes of food waste? ■ Does the amount of food wasted vary day by day or at different times of the year? ■ Whether they have noticed any trends/changes over time in the amounts of food waste generated?

School pupils

In addition focus groups were held to ascertain the views of pupils. These focused on the following issues:

- Whether they perceived food waste to be an issue in the school;
- Whether they thought food waste should be a priority for the school and why;
- What food they throw away and why;
- Their thoughts on how schools' food waste could be reduced.

The meetings were carried out by CRB checked individuals with extensive experience of working in schools. In most schools the interviewer met with an existing group of pupils such as the School Council or Eco Team which usually comprise pupils representing the full age profile of the school. However, pupils involved in these groups will not necessarily be representative of the wider pupil population in terms of their knowledge of school policies, procedures and opinions. Members of the School Council will be drawn from pupils who have a particular interest in participating in discussions about school policy and practice, and putting their opinions forward, whilst members of Eco Teams will have a particular interest in environmental issues.

Number of interviews conducted

When the school visits were undertaken it was not always possible to interview the full range of staff due to competing priorities on the day, and in such cases researchers interviewed other available staff. Table 8 below identifies the number and type of interviews conducted in each school.

Table 8: Interviews conducted in each school

School code	Caretaker	Catering staff	School management	Teaching staff	Midday meal supervisors	Other staff	Pupils
1	1	1	2				Yes
3	1	1	1		1		
4	1	1	1		1	1[1]	Yes
8	1	1	1		1		
11	1	1*	1		1*		Yes
12	1	1	1		1*		Yes
13	1	1	1				
14	1	1	1		1*		
18	1	1	1		1		
19	1	1			1	1[2]	
27	1	1	1	1	1		Yes
30	1	1	1		1	2[3]	Yes
33		1	1	1	1		Yes
35		1	1	1*	1		Yes
36	1	1		1*	1		Yes
40	1	1			1	1	Yes
Total	14	16+	14	5+	12+	4	10 groups

*More than one member of staff spoken to
[1] Administrative officer
[2] Breakfast club and after schools club organisers
[3] Breakfast club organiser

4.4   Qualitative results and analysis

An analysis of the qualitative interviews was undertaken to draw out the following:

■ staff and pupils' understanding of food waste issues in terms of quantities, composition, where food waste is generated within the school, and perceptions of the importance of food waste issues to the school. For each of these areas the qualitative findings are analysed to identify whether or not perceptions were consistent with the actual observed food waste analysed in the quantitative research;
■ reported reasons food is wasted, and whether they are operational, situational or behavioural
■ reported policies or procedures introduced to reduce food waste in schools; and
■ suggested policies and procedures to reduce food waste in schools.

Analysis also investigated whether there were discernable differences in comments between primary and secondary schools, or across different types of interviewee.

In the results presented throughout this section of the report the following terminology will apply:

- "School" – where a number of individual respondents, both staff and pupils within the same school have expressed the same opinion, and we thus are happy to categorise this view as being broadly consistent across the institution.
- "Respondent" – represents an individual response, which was not supported by other responses within the same institution (although this does not mean there is necessarily disagreement). The type of respondent is indicated in these cases.

4.4.1 Understanding of food waste issues

Amount of food waste in schools

Very few respondents thought that their school throws away a lot of food, with several commenting that the amount is 'average' or not much in relation to the number of meals cooked. There was no discernable difference in responses from different types of staff. The uniformity of responses to this question does not mirror the variances identified in the quantitative research, which showed significant differences across schools - for example the significantly higher levels of food waste at primary schools when compared to secondary schools.
However this qualitative research did indicate that schools have taken a wide range of measures to address the problems of food waste, and the perception the problem had been addressed may have influenced perception of the scale of the issue.

Composition of food waste

With regard to the types of food waste thrown away the most frequently mentioned items were:
- vegetables (including peelings), un-served meals and plate scrapings (14 of the 16 schools interviewed)
- fruit peelings and cores (8 schools)
- crusts from pizzas and sandwiches (4 schools)

By contrast meat was only mentioned by 3 schools and fish by only 2

These answers were unprompted and they do reflect the compositional analysis, which showed that fruit and vegetables accounted for 49% of waste in primary schools and 39% of waste in secondary schools. Meat and fish accounted for just 5.6% in primary and 4.5% in secondary schools.

It was noticeable that the most comprehensive answers to the question relating to types of food waste were given by catering staff, midday meal supervisors and pupils; this is unsurprising as we might expect them to be closest to the generation of waste.

Origins of food waste within the school

The canteen was highlighted by 15 out of 16 schools as generating the majority of food waste, primarily plate scrapings from school lunches not eaten by pupils. In some schools interviewees also felt significant amounts of food waste would be found in playground bins.

This contrasts with the observed quantitative data where more waste came from kitchens than the canteen. Two reasons for this discrepancy might be:
- those responsible for catering do not perceive that they are "wasting" food, and, in particular may not perceive unavoidable waste during meal preparation (e.g. vegetable peelings) as such (see definitions in Section 3.3); or
- that uneaten food in the canteen is more visible to a wider range of staff and pupils and consequently is perceived to be the cause of the majority of food waste.

The importance of food waste to the school

Views on the importance of the issue varied by type of school and staff role within a school. The table below summarises the range of views expressed, broken down by role.

Table 9: Views of the importance of food waste to the school by respondent type

Views	Care-taker		Catering staff		School manage-ment		Midday meal supervisors		Pupil groups		Total	
	S	P	S	P	S	P	S	P	S	P	S	P
Food waste is not a priority												
Competing demands of 'healthy eating'					1						1	
Competing demands of building work					1							1
Not as important as other waste streams e.g. furniture	1					1					1	1
Not as important as packaging waste	1										1	
Not a problem in this school	1	1	5					3			1	9
Total	3	1	5		2	1		3			4	11
Food waste is important												
Need to reduce waste to landfill					1	2			1	1	2	3
Waste food costs money	1		2								3	
Not good for children not to eat up their food				1				1			2	
It is a health and safety issue food waste ends up on the floor	1										1	
Other people don't have enough food									1	1	1	1
People work hard to produce food and meals									1		1	
Main meal for some children				1		1						2
It is a problem no reason given			1	1				1				3
Total	2		3	3	1	3		2	3	2	11	6

S = Primary School
P = Secondary School

The following conclusions can be drawn from Table 9 above.

■ Respondents from secondary schools think that food waste is a more important issue than respondents from primary schools. These views may be because food waste is more visible in

secondary schools, perhaps as they produce a higher absolute tonnage. The quantitative research showed that the mean weight sorted over the duration of the compositional study for primary schools was 330kg, compared to 486kg for secondary schools. It is an interesting contrast to the quantitative findings regarding food waste generated per pupil per day, which showed that in practice this is much higher in primary school, 82 g/pupil/day as opposed to 41 g/pupil/day for secondary schools.

Secondary school staff were more likely to demonstrate concern about the effect that food waste has on budgets. Primary school staff were most likely to demonstrate concern about ensuring that children get enough to eat.

■ School managers are concerned about a wide range of competing demands, and food waste may not be a priority. As an example:

> *"I'm not going to get worked up about eight jacket potatoes going in the bin when we're about to move into a new building and almost all of our furniture and equipment has to be binned as part of Building Schools for the Future!"* *(Secondary school bursar)*

■ Pupils in both primary and secondary schools show a concern for food waste, both on environmental and social grounds.

4.4.2   Reasons why food is wasted in schools

The research explicitly asked about perceived causes of waste in schools, and a number of different reasons were identified. These have been categorised as operational, situational or behavioural (as defined in Section 4.2) and grouped as resulting in food that is prepared, but not served; or served, but not eaten.

In addition, the role of communications between catering providers, schools staff and pupils has been presented separately as reported issues sit across the categories above - relating for example to the existence of communications channels as well as individual behaviours.

The responses given relate predominantly to food waste from school meals, either at the point where the food has been prepared, but not served; or served, but not eaten. However, it is important to remember that this emphasis does not necessarily reflect the relative importance of food waste from this source.

Food preparation was rarely mentioned as a source of food waste by interviewees, but it is worth remembering that the only people who will have direct experience of this are the catering staff. When food waste from preparation was mentioned, interviewees typically only referred to trimmings from fresh fruit and vegetables, not waste from other causes (for example burning). Food waste from packed lunches, break time snacks, breakfast clubs, etc was also rarely mentioned by interviewees as a source of food waste.

Operational reasons for food waste: food that is prepared, but not served

■ Lack of flexibility in centrally planned menus.

This issue is specific to schools with external catering providers (local authority and commercial) and relates to menus being developed centrally by catering providers not reflecting the preferences of the pupils at an individual school level, resulting in food waste. The inflexibility of menus was raised by 2 schools (1 primary and 1 secondary both from the same authority but with different catering

arrangements) as a factor that contributed to the generation of food waste. In one school catering staff reported feeling demoralised at having to prepare food that they knew would not be eaten by their pupils. The way that nutrient and school based standards are translated into menus that are used across a number of schools was reported to result in a lack of flexibility to adapt menus at an individual school level. For example:

> "*We trialled the new menus and then had a meeting with our catering company to discuss. Sometimes changes were made, but could be based on feedback from other schools and so not reflect likes / dislikes of our children. (For example rice pudding was taken off the menu at the request of other schools, but our children loved it!)*" (Primary school cook)

Although this issue is only mentioned by 2 schools as a contributory factor to why food is wasted a much larger number (7) commented that they don't have much opportunity to feedback to caterers about the menu and this included some schools with their own catering staff (see also "communications" below).

■ Kitchens over-cater to ensure pupils have the meal option of their choice (Primary)

Although primary schools had a range of systems in place to allow pupils to order a school meal either on a termly, weekly or daily basis, staff reported challenges in predicting the amount of each meal option that would be required. Some primary school kitchens reported over-catering (typically by 10%) to allow as many pupils as possible to have the meal of their choice. Though this can reduce the amount of uneaten food left on the plate (see "Some pupils do not get the meal option of their choice" p 54) this policy is likely to result in more food left unserved.

The policy on whether school kitchens over-cater to allow as many pupils as possible to have the meal option of their choice is typically set by the catering provider.

■ Second helpings disallowed

In some schools, staff reported policies of not allowing the serving of second helpings (3 primaries and 1 secondary). One secondary school only served seconds if pupils paid for them, an obvious disincentive, and likely to increase food waste at the end of session. Another did not allow second servings as it was seen as taking too long. There was no mention of a belief by staff that second helpings contravening nutritional compliance and/or government policy on healthy eating/obesity.

■ Limited opportunities for re-using unserved food

The initial reaction of many catering staff when asked about re-using unserved food was that this was not acceptable due to Health and Safety regulations and not permitted by their local authority / catering company. Some staff applied this rule to all food, while others explained legislation about specific food types and the speed with which food is chilled. For example:

> "*The council will not allow us to freeze leftover food or use any leftovers. Left over sandwiches have to been thrown away, we are not allowed to take it home or give it to the teachers.*" (Secondary school cook)

There was some confusion amongst staff interviewed as to what foods they were allowed to re-use. Some catering staff did report reusing some food types if left unserved, but those who did so were often unclear about whether this practice was permitted. Two primary school cooks reported not being supposed to reuse leftovers by that they did give left over cake to after-school clubs.

■ Absence of ordering systems for school meals (Secondary)

The secondary schools involved in this research did not have booking systems to provide school kitchens with information on total numbers eating school dinners each day. One Business Manager reported the lack of a booking system as the main cause of food waste within the school.
Those with a swipe card payment system were able to use this data to inform their planning based on previous demand; but this was not always found to be a reliable indicator.

Demand for school meals in secondary schools was reported to fluctuate depending on factors ranging from the weather to school trips; accurate prediction was felt to be extremely challenging. School policies on pupils leaving the premises and the availability of local shops and take always also impacted on demand, and added potential sources of variability. As in primary schools, staff reported difficulties in predicting the amount of each meal choice that would be required.

Operational reasons for food waste: food that is served, but not eaten

■ Inflexible portion sizes leading to pupils being served more food than they want

When asked about the main reasons for food waste in the canteen, a total of 3 out of the 7 secondary schools and 6 out of the 9 primary schools cited portion sizes as a cause of food waste. Year 6 pupils from one primary school complained that they were automatically given larger helpings to use up surplus food, whether they wanted them or not. For younger pupils, it was reported that sometimes when faced with portions that they found too large, they might choose not to eat anything. The majority of staff comments on this issue came from midday meal supervisors and catering staff. 6 pupils also commented.

■ Fixed food combinations

Another issue raised by both pupils and staff related to rules imposed on combinations of food that pupils could access from the menu. For example, in some schools all pupils had to have a pudding, whether or not they wanted it. Many schools required pupils to have certain items in combination in order to create a balanced meal.

■ Some pupils do not get the meal option of their choice (Primary)

The challenges of predicting the amount of each meal option that will be required are described in the "kitchens over-cater" section above.

Just as problematic in terms of food waste generation were school kitchens where the catering provider did not permit over-catering, and therefore staff cooked for the exact number of pupils ordering a school meal (plus a few portions to allow for spillage). Pupils in some primary schools complained that, having consulted the menu and decided which option they would like, their chosen meal had run out by the time they reached the front of the queue. Being served with food that they have not chosen, and may not like, was reported to result in uneaten food.

■ Pupils do not know what meal options are available

Menus in all schools were planned and published in advance, and in many schools pupils were encouraged to consult the menu in advance (including with parents at home) and decide whether or not to have a school meal on the basis of the dishes on offer. However in several schools pupils were not able to access the menu so arrived in the canteen with no idea of the food available. Interviewees suggested that this increased the likelihood of pupils being served with food that they did not want and would not eat.

Concerns were also raised by respondents about the accessibility of menus to pupils, especially the youngest primary children. The layout of some menus made it difficult for pupils, and sometimes parents, to work out what meals were on offer on a particular day. Some of the language used, while suitable for adults, was considered too complicated and wordy for young children.

Situational reasons for food waste: food that is served, but not eaten

■ Unpleasant canteen environment

The canteen environment itself was commonly cited as a reason food is wasted. Noise levels, a crowded or unfamiliar environment and even dirty cutlery were reported as contributing to this. Pupils, particularly in secondary schools, commented that canteens can be noisy, smelly and crowded with long queues. This environment is not conducive to enjoying a relaxing meal. For example:

"After half an hour queuing you are in a rush to eat quickly and get outside" (Secondary pupil)

■ Rushed meal times

Staff reported that the demands of serving everyone during the lunch period led to lunchtime being an exercise in logistics rather than a pleasant sociable experience where food is valued and enjoyed. Rushed meal times were reported in 8 of the schools, with no significant difference between primary and secondary schools. The need to rush pupils through the canteen due to time restrictions was a particular issue in secondary schools where staff felt pressured to get large numbers through the canteen in a small period of time. Sometimes pupils spend so long queuing that they do not have enough time to eat all of their meal. At the end of a sitting, pupils may have to be hurried along to allow other pupils into the dining hall, or because it needs to be cleared for afternoon lessons.

In schools with younger pupils, some staff reported having insufficient time to interact with children to help them with meal choices, or to encourage them to eat their food, which was reported to result in food being wasted. In secondary schools, staff supervising pupils during the lunch hour don't have time to engage with pupils to encourage eating up as they are focusing on queue management and discipline. The exception was pupils who were known to have eating disorders who were monitored closely.

■ Practical difficulties with eating the food served

In some schools pupils reported practical difficulties which led to them not being able to eat all of their food, with one example given where the knives provided would not cut meat, making it very difficult to eat. In other schools midday meal supervisors in primary schools also reported not having enough time to assist young pupils who may be struggling with their food, e.g. by cutting it up for them.

Behavioural reasons for food waste: food that is prepared, but not served

There are number of behaviours which cause the demand for food at the point of sale to fluctuate, which are reported to result in unserved food.

■ Pupils are not hungry by lunch time

This issue was raised by staff in secondary schools, where pupils can buy substantial snacks at break time.

■ Pupils buy a cheaper snack rather than a full meal (secondary)

Pupils choose to buy a cheaper snack rather than a full meal because they are short of money. Some respondents suggested this behaviour was particularly noticeable at the end of the week.

■ Some meal options are less popular

Pupils were reported to display strong preferences for particular meals with roast meals being popular. For example:

> *"We have very little waste on roast days and when it's fish and chips, but more waste when it's curry or fishcakes."* (Primary school cook, lunchtime supervisor and Head teacher)

Behavioural reasons for food waste: food that is served, but not eaten

The reasons grouped below relate to the attitudes and behaviours of pupils which were reported to result in uneaten food.

■ Rejection of food due to:

    ○ Food is unfamiliar

Staff commented that in many cases pupils are reluctant to eat school food which is different to what they eat at home. Some thought that children were used to eating fast food so were unfamiliar with freshly prepared dishes. (One school cook reported the reverse, that pupils in her school ate home-cooked food in the evening and wanted fast food at school.) In some areas cultural differences were raised as contributing to lack of familiarity with school meals

    ○ Food looks unappealing

Staff and pupils repeatedly reported that pupils will not even try food that they consider looks unappetising. Most staff praised the quality of the school meals, saying that they had improved significantly in recent years. However in some schools quality was an ongoing issue and that was reported to contribute to food waste:

> *"Sometimes the food really doesn't look nice. Children eat with their eyes, so they won't even touch something if they don't like the look of it."* (Primary school midday meal supervisor)

    ○ Pupils don't want to eat healthy foods

Staff and pupils often reported that healthy options e.g., fruit / vegetables are rejected by pupils. Pupils, in particular, considered this to be a natural state of affairs:

> *"Pupils take veg so they look like they eat healthily, but then they just throw it away"* (Primary school pupil)

> *"Children like rubbish - give them turkey twizzlers every day and there won't be any waste."* (Primary school cook)

    ○ Strange combinations of foods

Occasionally 'strange' combinations of food were reported as being served in school:

> *"There are some odd food combinations – I eat most things, but even I wasn't quite sure about sausages with pasta and gravy"* (Primary school headteacher)

- ○ Pupils are fussy eaters

    Some staff, particularly those who had been working in schools for many years, commented that children had become more fussy about their food than they used to be. It should be recognised however that this might be a misperception and that actually pupils may simply be unfamiliar with some types of food served at school.

- ■ Food not completely eaten due to:

    - ○ Children want to go out to play/ socialize with friends

        Pupils reported that they are often in a rush to get out to play or to take part in lunchtime clubs etc:

        "Children like their friends more than their food - they just want to get out to play" *(Primary pupil)*

        This was also reported by a cross section of staff.

Communications between school staff and catering providers

Respondents were asked if they felt they could make comments regarding school meals within the school and to external catering companies. Comments were mixed, with some respondents highlighting very good relationships while others felt more could be done to listen to and act on the feedback provided. Of the 7 schools who responded that they had difficulties in giving feedback, 4 had catering services provided by the local authority and whilst mechanisms existed for catering staff to feed back to menu planners, these were sometimes of limited use and were not able to be acted on since menus are set for a large number of schools and feedback from all of these schools will not necessarily be the same. All of the 3 other schools had in-house catering arrangements. In one of these, midday meal supervisors reported that they found it difficult to feedback to the chef:

> *"It's tricky because he takes it personally if we suggest children don't like something he's cooked."*

Communications between pupils and midday meal supervisors/ kitchen staff

Pupils and staff reported that communications between pupils and midday meal supervisors and kitchen staff could be improved.

> *"Sometimes the staff just put the stuff on your plate and you don't get the chance to say what you want"* (Primary pupil)

> *"The kitchen staff are good cooks but 'frosty' with the children."* (Primary Head teacher)

4.4.3   Policies and procedures that could have a food waste reduction effect

Information was gathered on what school policies and procedures were in place which could reasonably be considered as possible factors affecting food waste generation. The spread of these is presented in the table below.

Table 10: School policies which could have an influence on the amount of food waste.

School code Prim P Sec S	Eating up policy/ practice	Booking school dinners	Leaving the premises at lunch time	Waste from packed lunches	How free fruit is given out	Eating up free fruit	Role of staff on lunch time duty
1 S	No	No	6th form	Bins or grounds	n/a	n/a	Queues and order
3 S	No	No	6th form	Bins or grounds	n/a	n/a	Queues
4 S	Yr 7	Yes	6th form	None	n/a	n/a	Behaviour in queues and hall
13 S	No response	No	Y 11	None	n/a	n/a	Crowd control
14 S	No response	No	Yr 9 & above	None	n/a	n/a	Behaviour
35 S	Only pupils with eating disorders	No	Yr 10 & 11	Bins or take home	n/a	n/a	Queues
40 S	Yes	No	Yr 11	Encourage to take home	n/a	n/a	Behaviour
8 P	Yes	Yes	No	Take home	Whole	Yes	
11 P	Yes	Yes	No	Take home	n/a	n/a	n/a
12 P	Yes	Yes	No	Take home	n/a	n/a	n/a
18 P	Yes	Yes	No	Take home	Cut up	Yes	n/a
19 P	Yes	Yes	Yes – to go home	Take home			n/a
27 P	Yes	Yes	No	Take home or bin		Yes	n/a
30 P	Yes	Yes	No	Take home		No	n/a
33 P	Yes	Yes	No	Take home	Whole	No	n/a
36 P				In bin	Sometimes cut up	Yes	n/a

When this information is looked at alongside the quantitative findings, the following observations are apparent, although these should be treated as suggestive rather than definitive given the data available.

- The only secondary school in the sample with a school dinner booking policy has the lowest amount of food waste in terms of g/meal/day (see appendix 3)
- The secondary school which allows the most year groups to leave the school premises at lunch time has the lowest amount of food waste in terms of g/pupil per day (see appendix 3). This may be because only two fifths of the school are definitely eating and disposing of their food waste on site.
- In primary schools the data does not show any discernable link between school policies on sending packed lunch waste home and g/ pupil /day of food waste, or on composition (e.g. proportion of sandwich waste). Nor is there a discernable link between policies on how free fruit is given out, or on eating up free fruit, and the proportion of fruit wasted.

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4.4.4 Reported policies and procedures adopted to reduce food waste in schools

This following section details the reported policies and procedures that schools had previously adopted, which they consider to be an attempt to reduce food waste. However, it needs to be stressed that schools had not monitored the effect of these on the amount of food waste generated and there is no proof of the connection between the observations below and actual reductions in food waste.

■ Changing menus to suit pupils' preferences

Many cooks employed directly by the school reported making periodic adjustments to the menu in response to pupil feedback (e.g. via the School Council) or to the amount of food waste generated on particular days.

The secondary school (40) with the second lowest gm/pupil/day of avoidable school waste reported that they:

> "can alter menus – try something a couple of times and if there's a lot left over, they don't like it so I don't cook it again."

However, it cannot be demonstrated that these factors are necessarily linked.

In 5 of the 8 schools with their own kitchens there was evidence that there was a lot of consultation within the schools regarding menus sometimes involving pupils on menu planning and changes. One primary school holds a monthly 'Food Group' involving the Head, the Cook, a teacher, a midday meal supervisor and parents, that meets to discuss food issues. The quantitative data shows that primary schools where catering is provided in-house produce more waste per g/pupil/day than those using external caterers (see Appendix 2, Table 9). However we would expect more food waste from preparation would be created on site in these cases (as opposed to at an off-site preparation facility), so this does not necessarily indicate that overall more food waste is being produced by the system, it just isn't being generated in the school itself.

Even in those schools where catering is done externally by a commercial contractor or a local authority, most schools reported opportunities to give feedback on menus. In one school where meals were provided by the local authority, new menus are trialled and a meeting is then held to discuss any changes needed.

One school reported introducing a scheme where on a Monday pupils can vote for what will be on the menu for the following Friday. Another secondary school catering manager keeps an eye on what pupils are throwing away during the first couple of cycles of a new menu and if they notice that there's something they don't like they adjust the menu.

■ Encouraging pupils to "eat up"

In primary schools most midday meal supervisors considered it an important part of their role to encourage pupils to eat their food. Few schools had an explicit and consistently applied policy on this; staff reported encouraging children because "it's common sense" or "You do it because you're a mum". Many staff prided themselves on knowing the pupils well, choosing appropriate strategies to support and encourage individual children. A range of tools and techniques were reported such as clean plate stickers, challenges for pupils who can finish all that is on their plate, and not allowing pupils to go out to play until everyone has finished.

Seven primary schools reported offering 'seconds', usually to the last children to be served. Only 2 secondary schools reported that they could offer second helpings and one of these required students to pay for an additional portion (see section above on 'Operational reasons for food waste that is prepared but not eaten'),

Some schools reported placing restrictions on who is eligible for seconds to encourage pupils to eat all their food up:

> *"Seconds are allowed if they've eaten all their firsts. If they don't eat all their seconds they're not allowed seconds for the rest of the week." (Primary school Midday Meal Supervisor)*

Primary schools reported that pupils are encouraged to eat up fruit from the free fruit scheme.

■ Use of leftover food

Some schools, particularly primaries with after-school provision, reported offering unserved cake and fruit to staff and pupils in the afternoon, others reported passing unused fruit from the free fruit scheme to the catering staff for use in cakes and puddings, or giving to children who do not receive fruit as part of the scheme:

> *"Any surplus fruit is distributed in any of 3 ways: extra piece for those that want it at break time / taken to kitchen to be used in cakes, puddings, fruit salad / distributed to younger siblings at end of day"* (Primary Head teacher)

Some catering staff, particularly in secondary schools with independent kitchens, described examples where they were able to incorporate leftovers into meals the following day. School 3 was a school that adopted this practice and this secondary school also produced the third lowest amount of avoidable food waste (g/pupil/day).

> "*Staff are good at thinking of ways to reuse food and make up alternative additions to the set menu to use up items' for example; leftovers from main meals become soups with roast meat being used as sandwich fillings, ripe bananas make muffins. (Secondary school cook).*

■ Offering taster sessions to pupils and parents

In one school the chef goes along the queue offering tasters to pupils to see if they like a particular dish before they buy it.

■ Providing assistance to children

Assisting children with meal selection and/or making food more edible (e.g. cutting up fruit, removing pips).

■ Improving the canteen experience

Several midday meal supervisors reported sitting with pupils during the meal time and keeping slow eaters company. In one school the cook talks to pupils as they are served and encourages them to try new things or just have a little portion of something new.

Schools reported attempts to improve the dinning experience including:
○ introducing 2 sittings (1 taking place whilst some classes were still in timetabled sessions, to increase the amount of time available);
○ changing to a till system of payment to reduce queuing
○ providing table cloths, baskets of bread on the table and jugs of water and milk to improve ambience.

■ Involvement of school management on food issues

In one secondary school the Bursar eats in the canteen every day at the end of lunchtime and monitors leftovers. He keeps and eye on the weather, knowing that pupils will buy fewer meals when it is good weather and instructs the cook to change the amount cooked accordingly on the day.

4.4.5 Suggested policies and procedures to reduce food waste in schools

Each school was asked for their views on what additional measures could be taken to reduce waste. Schools were reminded that by "food waste reduction" we meant producing less food waste overall, not just reducing the amount of food waste ending up in the residual waste stream. Despite this, some respondents suggested developing facilities to compost food waste as a means of food waste reduction, implying confusion between waste prevention and waste management. Reducing the amount of food wasted, rather than treating food waste once it has been produced is always preferable given the embedded energy from growing, transporting, storing and preparing food. There are also financial costs associated with food waste - the money spent on buying the food is wasted and costs are incurred in treating and disposing of it. In the context of school meals, there may also be an issue of pupils are not gaining maximum nutritional benefit from the food.

Overall there was a good response across the range of respondents, and suggestions by type of respondent are given in Table 11 below:

Table 11: Suggestions to reduce food waste in schools by respondent

	School Management	Catering staff	Midday Meal Supervisors	Caretaker	Teacher	Pupils
Number of suggestions	10	15	11	6	4	19

This section captures those suggestions which have not already been reported above and groups them under the following headings:

■ Education on food waste issues
■ Organisational changes
■ Portion control
■ Responding to pupils' preferences

■ Education on food issues

The following suggestions were made:
- Introducing food waste issues into Personal, Social and Health Education lessons;
- Show pupils photos of the amount of food waste generated in differing areas of the school: the playground, canteen, kitchen;
- Organised litter picks to raise awareness of how much food is thrown away in the playground area;
- Run a cookery club and lessons for parents;
- Teach children to cook from an early age to change their attitude to trying new food;
- Awareness raising campaigns: posters, poems, raps, pictures, assemblies, song; and
- Staff training for cooks;
- Sending a letter to parents asking them to talk to their child about what goes into packed lunches.

■ Organisational changes

The following suggestions were made:
- o Develop a food policy with parents covering issues relating to food waste;
- o Provide more information to pupils on the menu, particularly so that pupils can see the menu in advance; and
- o Involve the cook more in the school, for example at assemblies and it the canteen so that pupils know them better – "*If you can't see the person who cooked the food it's like it's food that just appeared, so it's OK to throw it away*" (primary school pupil).

■ Portion control

The following suggestions were made:
- o Provide different sized plates to encourage pupils to think about portion size; and
- o Introduce a choice of portion size by year group.

■ Responding to pupils' preferences

The following suggestions were made:
- o Introduce a feedback mechanism for pupils to feedback their preferences, and adjust the menu accordingly; and
- o Introduce an on-line pre-ordering system so pupils, together with parents can pre-order meals according to preferences.

5.0   Qualitative research beyond the school

Section 4, above, gathered information at a school level from both staff and pupils, but it was recognised that there was also a need to gather feedback and test the research findings of the project with relevant bodies operating at a local and national level. This section covers the key findings of this research which involved two areas of work:

■ a stakeholder workshop involving representatives from a range of organisations with an interest in food and/ or waste in schools with the aim of:
- o obtaining attendees' views on and reactions to the types and quantities of food waste found in the quantitative research and the reasons food is wasted identified through the qualitative research; and
- o drawing on their knowledge and experience in order to identify a range of possible solutions to the causes of food waste to inform the development of food waste reduction interventions to be trialled in schools.

■ qualitative research, undertaken by AMN Associates, involving catering providers, food enforcement officers/ local authority monitoring officers and individual caterers in schools from across 9 local authority areas in England with the aim of:
- o understanding what can be done to reduce food waste in school kitchens from the preparation and serving stages whilst complying with the food safety, nutrient and food based standards for schools.

5.1 Stakeholder Workshop

5.1.1 Summary of the Stakeholder Workshop

A wide range of stakeholders involved in setting policy, delivering services, or providing support relating to food and/ or waste in schools were invited to the event. These included Government Departments, the Local Authority Caterers Association, commercial catering companies, local authority catering service and waste representatives, the School Food Trust, Food for Life Partnership, NGOs, and school management representatives. A full list of delegates is given in Appendix 5.

Delegates were presented with the findings of the quantitative and qualitative research, given the opportunity to discuss the findings of this study and to input into what the solutions to reduce the food waste from schools might be.

In particular, stakeholders were asked for their views on:

- What causes food to be wasted in schools?
- What actions/ measures could help to reduce the amount of food wasted?
- How would these measures be implemented?
- Who would need to be involved, what would their role be and what would encourage them to take the desired action?

5.1.2 Key findings

5.1.2.1 Causes of food waste in schools

The following causes of food waste were identified:

- Lack of awareness about food waste as an issue.
- Lack of flexibility caused by centralised menu planning leading to unserved food at the school level and the absence of systems to enable pupils to make choices about meal options in advance of the lunch break, which chimed with many of the "operational" level causes identified in schools themselves.
- Limited opportunities to reduce food waste as a consequence of compliance with legislation and guidance, which although related to reasons identified in schools, is seen from a different perspective by stakeholders, who may in some cases have the power to influence factors which are beyond the level of the school.
- The canteen environment which is often noisy during mealtimes, often serves as a multi-purpose space in the school leading to pressure to rush the lunchtime slot to ensure that the space can be available for other purposes in the afternoon. This factor clearly links to the "situational" factors identified by respondents in schools.

5.1.2.2 Suggestions for reducing food waste in schools

Suggestions for reducing food waste were grouped under four themes at the workshop. These were discussed in depth and are listed below:

- **Training and awareness raising**

The groups discussing this identified the following groups of people as those who would benefit from awareness raising with respect to why reducing food waste in schools is important and training into how this can be done:

- school staff:
    - kitchen staff;
    - midday meal supervisors;
    - school managers; and
    - teaching staff;
- pupils;
- parents;
- local authority officers: procurement, education department, waste services;
- catering companies and suppliers;
- External advisers; and
- Policy makers.

Of these groups of people, school staff (kitchen staff, midday meal supervisors and senior management) and pupils were identified as the priority groups.

Ideas of how to increase awareness amongst staff about food waste included:
- Ensuring that food waste issues are covered in midday meal supervisors' induction training.
- Running courses similar to Food Safety courses ensuring that links between food waste and other initiatives e.g. Food for Life and Eco-schools are made explicit.
- On the job training, e.g. building relationships between kitchen staff and midday meal supervisors.
- Monitoring how much food is wasted in the school and feeding this back to staff including monitoring the number of meals demanded and using production sheets to monitor how many meals are produced/leftover/sold.
- Monitoring portion control (catering staff).
- Encouraging staff to eat school meals with the pupils.

Suggested issues to be covered in training included:
- Food waste – that it is an issue.
- Customer care and how to work with children to provide enjoyable lunchtimes.
- Cooking skills e.g. avoiding over-cooked food.
- Food storage – is re-using food a perceived or a real H&S issue.
- Cooking with leftovers.

Suggestions for how to increase pupils' awareness of food waste issues included:
- Engaging children in where food comes from by growing vegetables, visiting greengrocers and kitchens – enable them to connect with food.
- Teaching cooking skills and sharing food cooked at school in cookery classes.
- Involving pupils in monitoring food waste in the school.
- Providing pupils with opportunities to give feedback on the menu.
- Surveys to find out what pupils like and don't like.
- Taster days and 'try something new' campaigns to encourage pupils to try unfamiliar food.
- Giving out stickers to pupils who finish their food.
- Making an event of free fruit, sharing it together and making an occasion of eating it.

■ **The canteen environment**

The following suggestions were offered to improve the canteen environment and therefore encourage pupils to stay in the canteen and enjoy their meals:

- Limiting canteen noise through the installation of acoustically absorbent mobiles or tiles;
- Creating an atmosphere more like a family shared meal, for example by having mixed age ranges on tables, encouraging older children to act as servers for their table and encouraging adults to eat with pupils;
- Having 'slow food days' when there are no clubs or rehearsals to rush off to, with a focus on eating slowing and enjoying the meal;
- Providing guidance/ legislation for minimum time that should be allowed per meal sitting (change current "conveyor belt" canteen culture in some schools);
- Celebrating food through themed food days, involving parents and producing recipe books to take home;
- Avoiding disposable cutlery and plates as this can lead to an assumption that food is also disposable;
- Letting pupils choose the background music for the canteen; and
- Developing a 'café' style to canteens, logos designed by pupils, smaller chairs, plants and cosy corners.

■ **Menu planning and choice**

The groups discussing this considered how involving children more in menu planning and managing choices more effectively could help reduce food waste in schools. The groups also included suggestions to prevent leftover fruit from being wasted. Possible solutions suggested were:

- Analysing what is left at the end of the day and adjusting menus accordingly.
- Use of information technology to develop menu planning programmes.
- Voting every term for a favourite food to be on the menu.
- Consulting pupils regarding menu changes.
- Taster sessions for children and parents.
- Creating menus from a smaller range of ingredients to reduce waste.
- Reducing choice (the more choice offered the more food has to be provided to make sure there is enough for all to have what they want).
- Increasing choice by allowing more flexibility of what foods on the menu can be served in combination without compromising nutritional compliance (e.g. not restricting having choices such as garlic bread to only one meal option).
- Offering the opportunity for pupils to choose meal options in advance, e.g. children choose at registration and are given colour co-ordinated wristbands to identify meal choice.
- Making smoothies and desserts from uneaten fruit.
- Creating a tuck shop run by pupils to 'sell' leftover fruit to widen its appeal to pupils.

■ **Legislation / guidance / contracts**

The comments and recommendations of the groups discussing possible solutions to food waste relating to these issues are summarised below:

- Making nutritional standards relate to what pupils are actually eating and therefore actual nutrition, rather than just to the sales mix of food provided over the menu cycle (as currently happens).

- Devolving decision making on menus to a school level and giving more autonomy to kitchen staff – a "one size fits all" approach across a large number of schools with many different characteristics, does not meet the needs of all schools (i.e. the same menu choices will not be popular across all schools for various reasons).
- Providing better facilities/ equipment to store leftovers to prevent them from being wasted, e.g. blast chillers.
- Keeping food standards (these are more "common sense"); but repealing nutritional standards and placing more emphasis on a healthy varied menu plan rather than "ticking" nutritional standards boxes.
- Applying the "polluter pays" principle to catering providers via contracts for the amount of food waste created.
- Providing guidance for schools about managing a positive canteen environment.
    - Allowing flexibility in the interpretation of legislation into menu planning.
    - Producing Government guidance to schools on food waste issues.

5.2 An investigation into the opportunities and barriers to reducing food waste and reusing unserved food in school kitchens (AMN Associates)

5.2.1 Aim

The aim of the study was to understand what can be done to reduce food waste in school kitchens from the preparation and serving stages whilst complying with the food safety, nutrient and nutritional standards for schools. Specifically this included:

- Understanding the different factors that determine what food is left over at the end of lunchtime service in school catering and the opportunities and barriers to reducing this form of food waste.
- Understanding how food safety legislation, nutritional standards and catering practices influence what food items are over produced and/or could be re used
- Understanding the extent to which cooking with leftovers, as a way of reducing food waste, is viable in the school kitchen environment.

5.2.2 Methodology

9 local authorities were selected and agreed to help with this work (for details see appendix 6). The aim was to identify the issues involved across a number of organisations by in depth telephone interviews with key members involved in school catering.

Telephone interviews were conducted with:
- Catering Providers (11)
    - Heads of service for local authority commissioners of service, local authority catering managers, and contract caterers managers
- Food enforcement Officers and monitoring officers (7)
    - Environmental Health and Trading Standards
    - Local authority monitoring officers
- Individual caterers in schools (14)
    - both primary and secondary caterers

Each telephone interview covered the following major points for discussion:
- Foods likely to be left over (where left over food is defined as that food that remains on the counter at the end of service that was planned to be served as part of the lunch time meal)
    - types of foods left over;

- o planned over production to account for 'spillage';
- o views on acceptable quantities and types of waste; and
- o processes for reducing left over food and any reuse of food.

- ◼ Regulations determining preparation of school food
  - o Food safety legislation.
  - o Nutritional standards.

Each interview was recorded and later transcribed and coded into categories. Similar categories were then grouped and linked to develop consensus on emerging themes.

5.2.3   Key findings

◼ Factors affecting what food is left over at the end of lunchtime service

o Nutritional Standards

A number of catering providers interviewed felt that, initially, there may have been an increase in food waste following the introduction of the nutritional standards. A range of reasons were given for this, including lack of popularity of new nutritionally compliant menu options and lack of experience amongst catering staff in using some of the new ingredients required to make nutritionally compliant meals.

Note that the Primary School Food Survey 2009[4], carried out by the School Food Trust, did not find any increase in plate waste since the introduction of the nutritional standards. However, the survey did not consider waste left over at the service counter.

o Changes in menu cycles

Both the catering providers and the school cooks suggested that changes in menu cycles were a cause of increased waste. In the first three weeks of a new menu cycle the cooks were unfamiliar with the individual likes and dislikes of their children to the meal choices and children were unfamiliar with the menu items. In a choice menu they are estimating the popularity and uptake of each item. Once the information on uptake is noted, the menu mix can be modified to meet the children's choices. The flexibility to modify menus varied between organisations, depending on their interpretation of the nutritional standards and access to nutritionists to agree potential modifications.

o Flexibility within menu planning

Where school meals are provided by large LA or commercial catering organisations, catering providers plan a standard menu. This menu and the provision mix are analysed to meet the nutritional standards. School cooks working for this type of organisation described the need for the menu to reflect the requirements of the children in their school to avoid waste. Most respondents in this sample felt able to change the menu items if unpopular and apply for a revision on the nutritional analysis accordingly.

o Ordering systems

Since the introduction of the nutritional standards, more food is prepared from basic ingredients requiring longer preparation and cooking processes. It is less easy for caterers to provide additional

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[4] http://www.schoolfoodtrust.org.uk/UploadDocs/Library/Documents/sft_primary_school_food_survey_2009.pdf

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portions quickly (e.g. frozen products cooked to demand) and it becomes more important to have accurate meal numbers well before service time.

Availability of accurate numbers for meal preparation was seen as critical to reduce over- production and leftover food. In schools where children could elect daily whether they were going to have a school lunch numbers could vary by 20% throughout the week. If the kitchen did not receive these numbers by 9.30 am the meals cooked were based on the previous day's numbers which could lead to significant wastage.

    ○ **Use of seconds (primary schools only)**

The majority of caterers felt that providing second helpings was a common sense approach to school meals, provided all other processes to minimise over production were in place, and it was seen as a way to reduce the amount of food left over at the end of service being wasted. Second helpings were offered by the majority of catering providers in this study in primary schools, though it was noted that there was not demand for seconds for all food types,

> "*Pizza, sausage or pie ... but nobody wants an extra plate of vegetables or potatoes*"

Two respondents reported not allowing second helpings to be offered to any of the children, considering this practice to be in breach of the Government's nutritional standards and work towards childhood obesity.

> "*No we don't offer it as seconds as I was informed by the catering operations manager that the Government said we're not allowed to give seconds. If there is something I can't use the next day in a dish, like vegetables, then it would go in the bin.*"

A degree of uncertainty about whether seconds should be offered was expressed by an additional two caterers who did regularly offer seconds to children.

■ **Limited opportunities for reusing unserved foods**

    ○ **Food safety procedures**

The catering organisations interviewed in this study all had food safety guidance developed from best practice for school kitchens. Food safety was seen as paramount and as a result the guidance took the lowest level of risk.

Certain foods carry high risk of causing food poisoning if safe preparation, cooking, chilling and reuse processes are not followed (e.g. protein items and rice). Reuse of any food and particularly those high risk foods therefore requires very clear food safety guidelines. All the catering providers interviewed had a no reheating policy in place; this policy prevented caterers from chilling down any food that had been cooked in order to serve it hot at another service time. The policy is in place to prevent food that has been held warm on a servery from being reused. Safe practice requires cooked food to be chilled to below 8°C within 90 minutes and stored in a fridge or frozen. Any food that is kept warm on a servery can not be chilled quickly enough within a school kitchen environment to meet this 90 minute 'rule'. Food identified as being over provided prior to service that is chilled quickly immediately after cooking – not held warm on the servery – could be safely reused. However, this requires facilities for fast chilling and having staff available to put food away in fridges or freezers. All catering providers interviewed in this study had food safety procedures that prevented staff carrying out such processes.

However, significant variation was found in existing practice relating to how different food types are prepared and stored and whether unserved portions must be discarded, or can be reused between catering providers.

○ **Food safety in practice**

Caterers with experience of working in catering establishments other than school kitchens, or those with higher levels of food safety training recognised that there were some safe practices for reusing food safely the next day that are prohibited within their company guidelines. The FSA food safety guidance identifies circumstances where foods can be quickly chilled immediately after cooking, refrigerated and reused safely the next day. This would be standard procedures in many commercial kitchens. Consequently, inconsistency within implementation of company guidance was reported to exist. In practice there are examples where staff with higher levels of training or experience from other catering establishments know the safe processes and use these to prevent wastage and financial loss whilst recognising that they are outside the local guidance. For example:

> *"As a catering manager you have to meet your margins, your gross profits and whatever, and people I know put things in the freezer and re-heat them - because they know it is a completely safe process so long as you have cooled it down quick enough and re-heated to the correct temperature - to keep their gross profits up otherwise they got pressurised for not meeting their profits and they got pressurised for reheating. It happens."*

Many individual school caterers interviewed were unclear about some aspects of their company food safety guidelines. Others reported tensions between wanting to prevent waste and compliance with food safety policies and questioned the rationale for some rules within their company's food safety guidance. For example:

> *"I had a bit of meat left over today that I've thrown away. But I could have made a lasagne with that and that would have sold but instead I have thrown it away. The cooking practices would ensure that there wouldn't be a risk but at least there would have been an option."*

○ **Importance of food quality**

In situations where low risk food items may be considered acceptable for re-use, issues were raised by the catering providers about staff taking short cuts, the resultant food quality and customer satisfaction. For a number of food items seen as low risk in terms of food safety, re-use was considered to substantially affect the quality of the product, e.g. cooked vegetables where re-heating would lead to a significant loss in vitamin content and their use, if substituting fresh vegetables could affect nutritional compliance:

> *"I have suggested this [re use of cooked vegetables] on a few occasions, but when you see it in practice after it's been in the hot cupboard for an hour or so [-there's] not much I would want to do with the vegetables."*

■ **Focus on minimising amounts of food left unserved**

○ **Financial incentives to reduce unserved food**

Whilst there was a reluctance to allow any reheating and minimal re use of food left over in schools, this has resulted in the adoption in schools in the sample of systems that aim to minimise the amount of food left at the end of service. Excess food prepared and not served represents a cost to the caterer. The catering providers interviewed all recognised the financial incentive to reduce the amount of left over food and were trying to address this. They were very clear that this could not be achieved if there was a suggestion that safety or quality of the service would be compromised.

Most respondents reported processes in place to monitor and record left over food waste on the counter, allowing staff to make changes to menu choices in response. Where waste was seen as a

problem, staff would weigh waste and/or record waste in a day book, allowing them to modify the menu on the next cycle. This was not always a formalised process.

○ **Systems to prevent over-production**

The catering providers and individual cooks interviewed had a range of systems in place to prevent over-production of food. This meant that the need for food handling processes such as chilling and reheating could be eliminated to reduce any food safety risk, maintain quality and reduce the expensive loss of food which would have to be thrown out. Ordering systems, menu planning, standard recipes and standardised portion sizes are all seen as preventing over-production. Despite these guidelines two of the school cooks interviewed described over-producing items such as quiche or cottage pie - which were chilled and frozen or used the next day – and reheating items such as vegetables, pasta , potato and rice.

○ **Practical barriers to reducing unserved food**

In schools catering for small numbers of lunches and schools transporting food to other schools, or for less popular meal choices (e.g. non-meat option), the size of cooking tin was raised as an important factor in limiting over-production and therefore leftover food. The number of portions required may be insufficient to fill a tin and may result in leftover food at the end of service.

Pack sizes of certain ingredients were also reported as being an issue in some schools where ingredients were packaged in quantities too large for numbers catered for in individual schools.

■ **Systems to minimise left over food**

Processes to reduce food waste suggested by those interviewed included:

○ Pre ordering of meals choice (primary schools)
   Catering staff receive accurate numbers for each main course item with sufficient notice to be able to order and prepare the numbers of meals more accurately. These systems require some input from other school staff (Head teacher, school secretary) and may only be possible for implementation in some schools.

○ Flexibility for the cooks to introduce new menu ideas into a local authority/contract caterers generic menu (may put pressure on nutritional analysis services)

○ Familiarising children with new menu items before they are included into the menu
   Tasters of the new dishes introduced before and during a menu cycle change

○ Top up of chilled items throughout service to prevent large amounts left (and discarded) at the end of service

○ Modification of recipes to match size of ingredient pack (tins/meat portions)

○ Availability of a range of cooking tin sizes to enable small amounts of less popular recipes to be prepared in the correct number of portions

■ **Attitudes to food waste from food that has been served, but not eaten**

Amongst caterers interviewed, their perceptions of food waste were largely limited to food wasted at the preparation stage in the kitchen. Food that is served, but not eaten, does not represent a cost to the caterer, as this food has already been budgeted and paid for; so there was no real driver reported for them to consider plate waste. When asked about waste from this source, the following causes were identified:

- o Compliance with nutritional standards that require all children to have at least one portion of fruit and one portion of vegetables
- o School food policies that required full portions of vegetables to be served to children.

One of the conclusions the School Food Trust drew from their Primary School Food Survey 2009 was that more needs to be done to encourage pupils to finish eating the vegetables, salad and fruit which have been served. This conclusion seems to be supported by the waste composition analysis (see Section 3) in which fruit and vegetables were found to account for a significant proportion of food waste in both school types as well as the apparent absence of a mechanism to promote the reduction of plate waste identified by catering providers.

5.3 Comparison of findings from qualitative research with school staff and pupils, stakeholders and catering providers

■ Findings between the school level research and the stakeholder workshop with respect to operational, situational and behavioural reasons at the level of the school were broadly consistent and rarely contradictory. However, the different pieces of research did find that respondents often had a different focus, related to their experience of a problem. An additional issue of lack of knowledge of food waste was identified by the stakeholder group as a potential cause of food waste. Catering providers' explanations for food waste tended to relate primarily to "operational" reasons.

■ Typically the stakeholder and catering provider groups were far more likely to identify reasons for food waste relating to national policies, whilst the reasons identified by those within schools tended to relate to local and school-level policies and practice.

■ Whilst both the school level research and the stakeholder workshop showed awareness of both unserved and uneaten food, research with catering providers showed that their perceptions of food waste were largely limited to unserved food. Food that is served, but not eaten, does not represent a cost to the caterer as this food has already been budgeted and paid for; so there was no real driver reported for them to consider plate waste and a feeling that little can be done about it due to the need to comply with nutrient and food based standards (e.g. all children must be provided with one portion of fruit and one portion of vegetables as part of their school meal).

■ It was apparent across all groups interviewed that there were significant differences in how national nutrient and food based standards and food safety standards were interpreted into local policies and subsequently how local policies were implemented into practice within school kitchens. Confusion at a school level about what practices were permitted (e.g. use of seconds, flexible portion sizes) together with questioning at a catering provider level of the rationale for some policies may suggest that over-zealous or unclear policies in some areas may be resulting in unnecessary food waste.

6.0 The Interventions

6.1 Aim

To trial interventions to reduce food waste in schools and to understand their impacts on quantities of food waste, attitudes of staff and pupils to food waste and identify what if any other positive impacts resulted from the changes implemented.

6.2 Methodology – developing the interventions

Feedback from the stakeholder workshop was analysed alongside the results of the quantitative and qualitative research within schools and used to identify interventions that might be most effective in helping schools to reduce their food waste.

A shortlist of interventions was agreed and these are shown in Table 12 below:

Table 12: shortlist of interventions

Intervention	Rationale	Proposal	Potential issues
Make meal choices cooked to order	This intervention aimed to reduce food waste by introducing a system to supply school meal service providers with information on exactly how many portions of each meal option to prepare that day, thereby: ■ eliminating the need for over-catering practices adopted in some schools to allow the majority of pupils to have their preferred choice of meal (reducing unserved food); and ■ preventing children who are last to come into the dining hall from missing out on the meal option of their choice and being served with a meal option they did not choose and may not like, in schools where the practice is to prepare just one portion of food per child (reducing uneaten food).	Pupils receive information on menu options in advance. Record pupils' meal choices during registration each day and provide pupils with coloured wrist bands to identify their meal choice. Communicate this information was to kitchen staff by 9.30am each morning.	■ This intervention requires a pre-pay system for meals within the school, as well as an efficient way to record and communicate student meal choices in a timely manner. ■ Increased administration for schools may be a barrier
Improvements to the dining experience	This intervention aimed to reduce uneaten food waste arising in the canteen by making it more enjoyable for students to spend time in the canteen and/ or less pressing for them to leave by addressing issues relating	Partner with the School Food Trust (SFT) to identify relevant options for changes to implement from the SFT's "Fresh Look at the	Some changes may take a long time to implement May need to make several changes to make a difference

Intervention	Rationale	Proposal	Potential issues
	to: ■ the canteen environment, e.g. noise levels, crowding, poor ambience; and ■ time pressures, e.g. pupils may spend so long queuing that they do not have enough time to eat all of their meal, or may be hurried along at the end of a sitting to allow other pupils into the dining hall, or to enable the space to be cleared for afternoon lessons.	school meal experience" guide. Schools form an action group to identify priorities, plan activities, implement and communicate the changes. Activities may include: measures to shorten queues, make better use of space, reduce noise and crowding, or extend eating time available.	
Improving familiarity and appreciation of school meals	This intervention aimed to reduce food waste by offering them small 'tasters' of new foods in order to encourage pupils to try, rather than reject, unfamiliar foods and make informed food choices (rather than prejudging whether they will like something). It also aimed to encourage greater appreciation of school meals amongst pupils (e.g. by seeing how the food is prepared) and also amongst parents who may be unfamiliar with the quality of school meals and whose influence could have a positive impact on their children's eating habits.	Activities should address key issues in individual schools and availability of resources, including: ■ pupil feedback on school meals ■ taster sessions for pupils and parents ■ pupil visits to the school kitchen ■ engagement with parents	The time taken to get these suggestions established and working effectively

Based on the findings of this research, an intervention focusing on portion size flexibility was also short listed. The proposal was to measure the effect of allowing pupils to make a choice about the portion size they are served (larger or smaller than the "average") in order to reflect the differing appetite and energy requirements of different pupils within schools. However this was not trialled in schools as part of this project after consultation with the School Food Trust due to concerns raised that encouraging portion variations in practice could lead to pupils' nutritional intake being compromised.

6.3   Methodology: trialling the interventions

6.3.1   School recruitment

A list of schools to target for the intervention trail was generated on the basis of the quantitative and qualitative data generated in the first stages of the project. This included schools with particularly high levels of canteen and / or kitchen waste, schools that had already expressed an interest in trialling an intervention, and the sixteen schools that had taken part in the qualitative research. A specific intervention likely to impact on food waste in that school was recommended for each school on the

basis of the data, and schools were contacted by telephone and email to discuss the intervention and their potential involvement. Repeated telephone and email contact was used to encourage targeted schools to trial this intervention.

Some schools agreed to trial their recommended intervention; however recruitment to the trial was slow and a more flexible approach was adopted, allowing schools to choose the intervention they would trial. All schools which took part in the original waste analysis were contacted with an outline of the three interventions. More details were sent to interested schools and telephone calls made to all schools to discuss their options and encourage participation.

Although this approach was more successful, schools were still slow to confirm their participation in this part of the project. Whilst many schools expressed surprise and concern over the amount of food waste their school was producing, many found it difficult to commit to trialling a particular intervention due to time constraints and competing priorities. Even where schools were keen to participate in the trials repeated phone calls and emails were needed to confirm their participation. It is recognised that in a non-research situation schools would be able to implement an intervention within their own timescales.

In order to achieve the required number of schools for the trial, Resource Futures recruited 3 schools with whom they had existing relationships, outside the four areas involved in the original waste analysis.

Table 13 below details the final list of schools participating in the intervention trials.

As schools were being asked to weigh their food waste an additional 'control group' was included to measure the impact of separating and weighing food waste without any other changes being made.

Table 13: list of schools participating in the intervention trials

Intervention	Trial schools	Total number of trial schools
Meals cooked to order	two B&NES junior schools two Hackney primary schools two Bristol primary schools	6
Improving the dining experience	one Hackney primary school one East Riding secondary school one B&NES secondary school	3
Improving familiarity and appreciation of school meals	one Hackney primary school one B&NES junior school one Bristol primary school	3
Just weighing	one B&NES primary school one Hackney primary school two B&NES secondary schools	4

6.3.2   The trial period

Originally the proposed intervention period was planned for the first half term of 2010; with trials commencing on 4 January wherever possible. The development of the interventions and the difficulty in recruiting schools meant these timescales were not achievable. Timescales were readjusted and trials were scheduled to begin after the spring half term break and lasted for half a term, i.e. 6 weeks. However, some schools found it difficult to begin starting the trials immediately after the half-term holiday, and therefore trials did not run for the full 6 weeks in these schools.

WRAP Material change for a better environment

Three methods were used to measure the impacts of the trials:

■ Waste arisings data
■ Attitudinal survey
■ Feedback from schools

Waste arisings
The original proposal was to measure the impact on food waste by performing a waste analysis in a sample of schools trialling an intervention at the end of the trial.

However, it was decided that, instead of getting waste data from a sample of participating schools at the end of the intervention period, a more useful measure would be to look at the amount of food waste being produced by all schools throughout the intervention period. Schools were therefore asked to weigh the food waste generated in the canteen and kitchen areas during the trial period themselves and, in recognition for the additional time and effort this involved, were offered a contribution to school funds for this. As schools were asked to separate food waste from other materials in both areas, they were offered funding to purchase additional bins to facilitate this if required.

The contribution was paid on receipt of the data required. In practice, not all schools were able to provide a complete set of data. The set of data returned is given in the results section below. In addition, self-weighed data arguably adds a degree of uncertainty over reliability that is not present in the quantitative research commissioned directly by WRAP and described in section 3.

Attitudinal survey
A pre and post intervention attitudinal survey was conducted to identify any changes in attitudes amongst staff or pupils before and after the trial period.

Feedback from schools
A link to an online feedback questionnaire was emailed to the main contact in each school – this was a member of the school's senior management team (head teacher / business manager / deputy head teacher), who had been responsible for overseeing the implementation of the intervention. Where necessary contacts were reminded to complete this questionnaire, ensuring that feedback was received from all twelve schools trialling interventions.

It was recognised that other staff within the school might have different opinions to those of senior management on the success and impact of the intervention, and also less easy access to a computer to complete an online form. Paper feedback forms were therefore sent to the cook / catering manager in each school, and to the midday meal supervisors. These were returned by seven cooks and four teams of midday meal supervisors.

The questionnaire for the management contact asked for detailed feedback on all aspects of the intervention, and contained questions specific to each intervention as well as general questions relevant to all three interventions. It was anticipated that cooks and midday meal supervisors would have less time to fill in a detailed feedback form, and also would not have extensive knowledge of all aspects of the intervention. The paper feedback forms were therefore shorter than those completed by the management contact. They comprised the general questions from the longer survey which were relevant to all interventions: what went well, what problems had been experienced, and their opinions on the impacts of the intervention.

In addition to the formal feedback received via the online and paper questionnaires, informal feedback was included in the evaluation process. This included email and telephone contact during the intervention period as part of the ongoing support provided to schools, and comments made during visits to schools during the communications support work. Follow-up telephone calls were also made to some schools to find out more about issues raised in their feedback questionnaires.

6.3.4   Schools preparation

A member of the senior management team was identified as the main contact in each school, and they were emailed the following materials:

- background information – including reasons why we need to waste less food, background to the research project, project objectives and the project so far;
- instructions for weighing their food waste – schools were provided with signs for the bins and strong coloured bin liners to aid the separation of food waste and make weighing easier. All schools were sent a digital spring balance to weigh the waste, a recording sheet and detailed instructions on how their waste was to be weighed;
- a pre and post intervention attitudinal survey to identify any changes in attitudes amongst staff or students at the end of the trial period;
- details of the feedback they would be asked for at the end of the trial; and
- guidance on raising awareness of the intervention in their schools – who needed to know about it, what messages to communicate and how what channels to use.

6.4   Methodology: support for schools during the trials

6.4.1   General Support to schools

A member of the project team was on call to help schools with any difficulty they had in implementing the interventions or measuring the waste. In addition contact was made with schools two weeks into the trial period to see how the schools were progressing.

6.4.2   Additional communications support to selected schools

In order to get a better understanding of what impact communications support might have on the success of the food waste reduction interventions, it was planned to offer communications support to half the schools participating in the trial, with a representative balance of primary / secondary schools and covering the three main interventions. It was not appropriate to offer communications support to the schools that were just weighing their food waste, since they were acting as control schools and did not require whole-school participation or awareness. It should be noted that for some schools the availability of this support influenced their likelihood to sign up.

The support comprised a half-day visit to the school to meet with key staff and support the planning and / or implementation of the intervention, as well as publicising the intervention to pupils. It was provided by an experienced education consultant with extensive experience of delivering waste education programmes in primary and secondary schools. This consultant had been involved in the project from its outset; had a thorough understanding of the research findings and the aims of the interventions; had built relationships with school staff through telephone conversations and emails in the course of the project; and understood the particular circumstances of each school and their impact on the intervention to be trialled.

Due to the short timescales and schools' other commitments, not all schools offered communications support were able to take advantage of the additional input.

Table 14 below shows the distribution of schools that received communications support in terms of geographical area and intervention:

Table 14: schools provided with communications support

Intervention	Trial schools	Total trial schools	Communications support schools	Total communications support schools
Meals cooked to order	2 B&NES primary 2 Hackney primary 2 Bristol primary	6	1 B&NES primary 1 Hackney primary 1 Bristol primary	3
Improving the dining experience	1 Hackney primary 1 East Riding secondary 1 B&NES secondary	3	1 B&NES secondary	1
Improving familiarity and appreciation of school meals	1 Hackney primary 1 B&NES primary 1 Bristol primary	3	1 Hackney primary	1

Communications support to primary schools

The communications support for primary schools comprised two elements:

- A whole school assembly to launch the intervention to staff and pupils (in larger schools two assemblies were necessary). In all schools this assembly was delivered by the visiting education consultant supported by members of the school's Eco-Team / School Council. A meeting was held with the pupils to plan the assembly, during which issues around food waste were discussed and the details of their school's intervention explained. These pupils were motivated by this involvement and keen to maintain a high profile for the intervention throughout the trial period.

- A meeting involving key school staff to support the implementation of the intervention. Each school chose different staff members for this input, depending on the intervention trialled and the needs of the school / individuals involved. In all schools a member of the senior leadership team was involved (usually the business manager) and in most schools it was possible to involve the school cook. Discussions with staff focussed on the logistics of implementing the intervention and ways to ensure all staff were working together to make it work.

Communications support to the secondary school

The communications support for secondary schools also involved the assembly and meeting involving key school staff elements; but the assembly element was delivered in a different way. Supporting peer to peer pupil communications was felt to be a more effective approach than arranging for a visiting education officer to deliver assemblies to the whole school community in secondary schools. The communications support targeted at secondary school pupils was therefore planned as follows:

- An assembly PowerPoint was put together, to be customised by the school. This presentation included information on food waste issues, food waste analysis data for all schools and specific to the school receiving the support, and slides on the intervention, including the importance of separating food waste during the trial. It was planned to meet with a representative group of students (e.g. School Council) to support them in customising the PowerPoint for delivery to the rest of the school in assemblies and / or tutor time.

Unfortunately this was not possible in the time available; the only way to involve the secondary school in this part of the project was to discuss the presentation with a member of staff. They planned to customise and use it to deliver assemblies for each year group, as well as using it as a starting point for a meeting with the School Council.

Communications support evaluation
Evaluation of the impact of the communications support to schools was incorporated into the feedback questionnaire provided to all trial schools at the end of the intervention period.

6.5   Summary of interventions taken by participating schools

Schools were asked to participate in one intervention type. The intervention document for the 'meals cooked to order' intervention described a clear step-by-step process for planning and implementing the system. Although schools were encouraged to make small adjustments to the steps described to make the system work in their school, the document assumed a very similar approach in all schools.

The documents for 'improving the familiarity and appreciation of school meals' and 'improving the dining experience' were presented as a list of suggested activities, from which schools were encouraged to select according to their particular circumstances and priorities. It was therefore envisaged that these interventions would evolve in different ways in each school to address specific issues. Schools trialling 'improving the dining experience' were referred to sections of the School Food Trust's detailed document on the dining experience, 'A fresh look at the school meal experience' Second Edition[5].

Table 15 shows which activities were actually implemented by the schools, according to the information taken from their feedback forms. Some schools implemented activities outside the intervention type they were officially trialling and these have been categorised in the table below.

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[5] www.schoolfoodtrust.org.uk/UploadDocs/Library/Documents/sft_fresh_look_meal_experience2nd_edition.pdf

Table 15: Summary of interventions

School number	Improving the dining experience											Improving familiarity and appreciation of school meals						Meals cooked to order	Other[6]	Results presented
	shortening queues	making the queue less stressful	ensuring pupils have enough time to eat	encouraging staff to eat with pupils	older children sitting with younger to encourage to eat	children choose who to sit next to	making good use of limited space	reducing canteen noise	making a multi use hall feel like a dining room	making the canteen space more inviting	competition to design new canteen	tasters for pupils and staff	rewarding pupils for trying new foods	visiting the school kitchen	pupil feedback on school meals	sharing recipes with parents	taster sessions for parents	pre-ordering meals using wrist-bands	Midday meal supervisor training	
28				*	*							*	*		*	*				
11			*			*			*		*		*		*			*		
42												*	*		*	*	*			✓
13															*[7]					
4	*	*		*																
23	*[8]														*					✓
34																		*		✓
12																		*	*	
43																		*		✓
10															*			*		
44																		*		
30												*			*			*		✓

6.6 Key Findings

■ All interventions showed the potential to increase awareness amongst staff and pupils of food waste issues.

■ All the interventions would have benefitted from more time for in-school planning and to embed into the school system, this was especially true for the intervention involving improvements to the dining experience where all schools found it difficult to fully implement the activities in the time scales available.

[6] Purple indicates interventions carried out by schools that were not in the original proposals. Where they fit into one of the intervention themes they have been grouped there.

[7] This was done, but not fully

[8] Emphasis was on shortening queues, although school got feedback on meals from pupils.

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Material change for a better environment

- The 'Meals Cooked to Order' intervention appeared to be most popular amongst schools and the easiest to implement in the time available for the trial.
- Some schools did not find it useful to make a distinction between the 'Improving the Dining Room Experience' and the 'Improving Familiarity and Appreciation of School Meals' as evidenced by the fact that half of those schools trialling one of these interventions also chose to implement activities that were applicable to the other.
- Schools which participated in trialling interventions demonstrated a commitment to food waste issues as evidenced by the fact that 8 out of the 12 undertook additional activities in the school to promote food waste reduction.
- All schools expressed an interest in continuing with the changes made as part of the interventions and one catering company stated that it was hoping to extend the Meals Cooked to Order system to all the primary schools for which it provides school meals in one local authority area. (It would be valuable to get further feedback from these schools at termly intervals in order to assess how the interventions are progressing and whether any further impacts have been discerned).

6.7   Summary of data received from schools

All schools were asked to provide the following information:
- Daily weight of food waste from kitchen and canteen in the week preceding the start of the intervention;
- Daily weight of food waste from kitchen and canteen in the 6 weeks during the intervention;
- Number of pupils eating schools meals on each day;
- Attitudinal survey before the intervention;
- Attitudinal survey after the intervention;
- Feedback survey after the intervention.

It was intended to use this information to assess the impact of the interventions on reducing weights of food waste and on perceptions of and attitudes towards food waste.

Table 16 shows the information that was returned, as well as whether the school participated in the waste compositional analysis in September 2009.

Table 16: Summary of data returned from each school

School code	Type	Compositional	Weights kitchen	Weights canteen	Attitudinal pre	Attitudinal post	Feedback
Improving familiarity and appreciation of school meals							
Hackney 1	Primary	Y	Y	Y			Y
Banes 1	Primary	Y	Y	Y			Y
Bristol 1	Primary	N	Y	Y	2	15	Y
E Riding 19	Secondary	Y	Y	Y	1	1	Y
Improving the dining experience							
Banes 2	Secondary	Y	Y	Y			Y
Hackney 2	Primary	Y	Y	Y	19		Y
Just weighing							
Banes 3	Secondary	Y	Y	Y	9	10	N/A
Banes 4	Primary	Y	Y	Y			N/A
Banes 5	Secondary	Y	Y	Y	12	7	N/A
Meals cooked to order							
Hackney 4	Primary	Y	Y	Y		5	Y
Banes 6	Primary	Y	Y	Y			Y
Bristol 2	Primary	N	Combined				Y
Banes 7	Primary	Y	Y	Y		15	Y
Bristol 3	Primary	N	N	Y	8	10	Y
Hackney 5	Primary	Y	N	Y		1	Partial

From the table above, it can be seen that not all of the data was provided by all of the schools. Some schools struggled with the requirements to separate and weigh food waste and complete the feedback forms and pre and post intervention attitudinal surveys and feedback forms.

6.8   Results: waste arisings

With regard to the measurement of food waste arisings during the intervention we cannot be totally confident of the accuracy of the self-weighed data even where it was provided. Some schools, for example had problems with the weighing, and provided only canteen waste weights, or combined the kitchen with canteen waste. In one case, data for the week (including Friday) was submitted before midday on a Friday which strongly suggests that that day's weighing, at least, was an estimation.

In terms of reducing the amount of food waste, it was recognised that the intervention may have caused a step change at the point of implementation of the changes, or it might be that the changes took some time to bed in, and that weights measured over the course of the intervention might show some change to reflect these impacts.

With regard to being able to measure a step change in waste arisings, it was recognised that this would be difficult as (with the exception of one school for one week) the project lacked self-weighed data in the period immediately before the interventions started. Most schools participating in the intervention had had their waste composition analysed in autumn 2009. At this time an average grams per pupil per day was calculated for kitchen and canteen waste. This could therefore be compared to the same measure during the intervention period. However, many factors could have changed in the intervening time, such as changes of staff, changes to menus etc. This comparison was made where possible; however there was no clear pattern in changes to waste arisings. This does not mean that for these schools there was not a step change at the start of the intervention period, just that we could not discern one from the available data. The results are included in Appendix 7.

[9] This school was nominally in the improving dining experience group, but the piece of intervention they chose to do was from improving familiarity and appreciation.

In order to look at changes during the intervention period, linear trend lines were fitted to each school's waste arisings data, and where the R^2 value was greater than 0.5, the trend was considered valid. The weights of food waste generated from the kitchen and canteen during the monitoring period did not show any trends for most of the schools (including all three schools not participating in any of the interventions). Those schools that did have trends in waste arisings are described in Appendix 8 as case studies for each intervention. The presence of a trend implies a learning or feedback process during implementation of the intervention, the nature of which depends on the intervention activities implemented. This learning or feedback process would not continue indefinitely, as a point of full implementation and therefore greatest effect would be reached. For this reason, trend lines are not shown on the graphs of waste arisings.

6.9   Results: attitudinal survey

The attitudinal survey was generally completed by different schools at the pre- and post-intervention stages, and so the results are not comparable. On a few occasions the same groups of people from the same school had participated in both the pre- and post-intervention surveys, and so their results were compared. Two of these schools were weighing only schools, and a third was from the meals cooked to order intervention. There were no major changes in attitudes based on answers to the questions asked at both stages, which is perhaps unsurprising in the "weighing only" control schools.

The post-intervention questionnaire contained an additional question: As a result of being involved with the 'Reducing Food Waste in Schools' project, has your level of concern about food waste changed? Table 17 below shows the results of this question cross-tabulated by participation in an intervention or not.

Table 17: Change in level of concern about food waste by whether school participated in an intervention or not

Response	Weighing only schools		All intervention schools	
increased a lot	2	13%	11	23%
increased slightly	5	31%	21	45%
remained unchanged	8	50%	12	26%
decreased slightly	1	6%	3	6%
decreased a lot	0	0%	0	0%
total	**16**	**100%**	**47**	**100%**

Half of respondents in the weighing only schools had unchanged levels of concern about food waste, with the rest having increased levels of concern. In the schools trialling interventions, around three quarters of respondents had an increased level of concern about food waste.

The results were also analysed by whether the school had had communications support or not (intervention schools only) and by whether the school had demonstrated a change in waste arisings (i.e. case study schools). The numbers of respondents qualifying for these cross-tabulations were few, and there were no clear differences between the groups.

6.10   Results from feedback on interventions

Tables 18 and 19 below shows the feedback received by job type and by intervention.

Table 18: Feedback by job type

	Response Percent	Response Count
Senior management	41%	12
Cook / chef	28%	8
MMS	14%	4
Other (e.g., teacher, office staff)	17%	5

Table 19: Feedback by intervention

	Response Percent	Response Count
Meals cooked to order	69%	20
Improving the dining experience	21%	6
Improving familiarity and appreciation of school meals	10%	3

Although there were more schools trialling the 'meals cooked to order' intervention, the increased response rate from staff in these schools may also reflect the extent to which the intervention involved the whole school.

6.10.1 Meals cooked to order feedback

All schools involved in this intervention used the same methodology i.e. pre-ordering meals using wristbands to identify what pupils had ordered.

Detailed feedback was received on this intervention from the management contact in all 6 schools. Paper feedback forms were received from all 6 cooks and from four teams of Midday Meal Supervisors in two schools. Verbal feedback was received from three administrative staff, whose opinions were particularly useful as they had been involved in administering the meal-booking system. Comments from two teachers have also been included in the evaluation.

Overall, feedback was very positive, and all schools are continuing to use the meal ordering system beyond the trial period. As a typical comment:

> *"The kitchen reported a significant reduction in kitchen waste and the cook liked to know the exact numbers that she was cooking for on a daily basis - it took away the guess work. The parents of the younger children were involved in helping the children to make choices and they liked that. It also made the service quicker as children weren't standing at the counter thinking about what they wanted.* [Our catering company] *are so impressed with the reduction in food waste and the successful implementation that the manager is aiming to introduce it in more schools."* (Head teacher)

Impacts

■ Reducing food waste

Those completing both the online and paper feedback forms were asked their opinion on how successful the intervention had been at reducing food waste in their school. 83% of the management respondents and 71% of all respondents perceived the intervention as 'highly successful' or 'successful' in this respect. Only one respondent considered the intervention to be 'highly unsuccessful' at reducing food waste, and in her comments she attributed this to the quality of the food rather than the system for pre-ordering meals.

Table 20: Management opinion on the impact of meals cooked to order intervention on food waste reduction

Management opinion	Response Count
Highly successful	2
Successful	3
Neither successful nor unsuccessful	0
Somewhat unsuccessful	0
Highly unsuccessful	1

Table 21: All staff opinion on the impact of meals cooked to order intervention on food waste reduction

All staff opinion	Response Count
Highly successful	5
Successful	5
Neither successful nor unsuccessful	3
Somewhat unsuccessful	0
Highly unsuccessful	1

■ **Other impacts**

Respondents were asked their opinion on other impacts of the intervention within the school. Responses from the main contact, who could be expected to have a good overview of all aspects of the intervention, were very positive:

Table 22 Management opinion on the positive impacts of the meals cooked to order intervention

Management opinion					
	positive impact	negative impact	no impact	don't know	Response Count
Pupil awareness of food waste	5	0	0	1	6
Staff awareness of food waste	6	0	0	0	6
Morale among catering staff	3	1	1	1	6
School meals uptake	1	0	3	2	6
Pupils' diets	5	0	1	0	6
The eating environment	3	0	1	1	5
Amounts of food waste	4	0	1	1	6

In addition the following impacts were noted:

- o All schools reported that they would continue with the system
- o One external caterer fed back that they were intending to extend the system to all the schools they cater for
- o A reduction in errors in ordering system, due to wearing the wristbands leading to costs savings in the school due to reductions in meals cooked for which there were in fact no orders
- o Pupils giving more thought to the choice of their meal. One Head teacher fed back that:

> *"Engaging them in the process of planning meals ahead is very positive and gives them ownership of their food planning. Children liked the system and wearing the bands, making school meals system more appealing."* (Head teacher)

- o Less complaints about the menu from pupils, because they feel part of the process
- o A reduction in queuing and the time taken to get children through the system as they have don't waste time at the counter deciding what they want to eat:

> *"Children had already made their choice so didn't hold up the queue deciding what to have to lunch service moved quicker."* (Cook)

> *"I have received some feedback from the Green Warriors and they feel the system is working, and, along with the new menu, seems to be going down well. Their only real complaint is the fact that they don't have a band for pudding too! Some of them felt they ought to be able to ensure they got the pudding they wanted as well as the main meal. I'm not quite sure how to solve this one, as having two bands is not really practical."* (Head teacher)

Reported issues and lessons learned

The documentation provided to schools covered most of the areas that caused logistical problems and stressed the importance of planning and consultation with key staff. However, the timescale for the trial meant that participating schools felt rushed to implement the system, and in most cases did not have time to work through the documentation as thoroughly as they would have liked. Head teachers and business managers have suggested that other schools should allow three to four weeks for the planning process before launching the scheme to the pupils.

■ Getting orders to the kitchen in time

- o Most schools found it a challenge in the first days of the scheme to get the numbers of each meal choice to the kitchen (usually via the school office) early enough:
  > *"Sometimes numbers were late arriving so quantities of choice were difficult to know what to start cooking in time for lunch i.e. jacket potato numbers."* (Cook)
- o Cooks highlighted the fact that some ingredients needed to be defrosted overnight, in which case numbers were needed the previous day – this was a particular issue on days when roast meat was served. One school developed a system to ask pupils on the previous afternoon for an indication of whether they would be having roast, so that approximate numbers could be communicated to the cook to allow her to defrost the meat. The cook reported that this worked well (e.g. on one day she was given an estimate of 80 roast dinners and the actual number ordering a roast meal on the following morning was 78)
- o Cooks getting used to the new system:
  > *"On one day the Cook got the red and green options muddled up - when it was something not obviously vegetarian like Pizza - so that caused an interesting situation - but resolved without bloodshed!"* (Head teacher)

■ Pupils' needing to commit to the choices they had made

Pupils had to adjust to the fact that their meal choice was made in the morning, and they could not change their mind if they preferred the look of another meal. One cook described being a bit flexible for the first few days of the new system, before insisting that children had the meal they had ordered.

- **Problems with the wristbands**
  - Wrist bands were too big for the very young children in some schools so teachers gave them out just before lunch rather than risking the children losing their bands during the morning. Other schools also adopted the approach of distributing the bands just before lunch to avoid them getting lost.

  - Distribution of the bands in the morning was soon sorted out, but schools struggled with establishing a system for getting the bands back to each classroom, ready to be distributed the next day. With time, each school found its own solution to this e.g. appointing 'band monitors':

    "*It was just the logistics of getting the bands back to the classroom for the next day particularly with the older children who were keen to get out to play!*" *(Head teacher)*

  - One school reported that the children liked the wristbands so much that quite a few went missing at first. Once the novelty had worn off this problem disappeared. One school also reported concern that the wristbands needed washing after each use; they experimented with different ways of doing this.

- **Menus**
  - Some schools found that their menus were not laid out clearly enough for teachers, parents and pupils and to identify easily what was on offer each day. This was commented upon by both senior management and cooks, particularly in schools where catering and menus were provided by an outside organization / LA catering services. One cook reported that teachers occasionally gave children the wrong information on meal choice during the ordering process so pupils were upset when at lunchtime they did not receive the meal they thought they had ordered. One school designed new child-friendly menus, with a simple layout and pictures to help less confident readers. Another decided to build up a bank of photographs of the actual meals to display on classroom whiteboards in the morning as pupils were making their meal choice.

  - One business manager raised a concern linking menus and the nutritional standards for school meals. She was pleased that the meal-ordering system provided the school / cook / catering company with the accurate data showing which meal options were popular and which less so, and hoped that this would allow the menu to be adjusted to provide food that children liked and would eat. However she was under the impression that nutritional standards required schools to include certain items on the menu, e.g. oily fish and to prepare them, even if no pupils ordered them. While she is correct that nutritional standards require items such as oily fish to be included in menus, in a school with a pre-ordering system there is no requirement for any meal options to be prepared that have not been ordered. When reviewing the menu in the light of take-up, menu planners would be expected to consider alternative ways to serve key food items such as oily fish – for example in a pie or pasta bake, to ensure that they remained on the menu for pupils to order.

  - Some respondents also felt that the language used on menus could be improved in order to help children make informed choices.

"Chicken thighs were recently introduced and many children refused to eat these as they had bones in!! The menu lists chicken as the option, so pupils select this and then discover that it is the chicken they don't like and don't eat it. This waste is therefore caused by lack of menu clarity, not the system."

■ Size of food containers available

One school cook raised a concern about tin size. For mixed meals such as cottage pie, her smallest tin contains twelve portions. She might therefore be forced to prepare more portions of cottage pie than have been ordered, simply due to the sizes of tin available. She has investigated sourcing smaller tins but been unable to find them. She did not consider this to be a serious problem as she served any extra portions as seconds to pupils. It is interesting that this issue has not been reported by other cooks in the trial although it was mentioned by caterers in the qualitative research see Section 5.

Conclusions

■ This intervention was positively received by a wide range of groups in the trial schools: school managers, cooks, pupils and parents. Participants perceived its benefits to be wide-ranging, and are keen to continue using the new system themselves and to recommend it to other schools.

■ The feedback received indicates that thorough planning of the meal-ordering system, involving all staff, is essential in order to avoid as many teething problems as possible. One head teacher provided the following advice for other schools considering introducing the system:

"Make sure that you have thought through the logistics of the band management. Prepare the menus before you start. Make sure all staff are on board because it can depend on class teachers implementing it in the morning. Make sure that office staff have a way of passing on the information early enough to the Cook so that he/she can cater for the correct numbers. Don't be afraid to try it out - it worked really smoothly from day one." (Head teacher)

6.10.2 Improving familiarity and appreciation of school meals feedback

Detailed feedback was received on this intervention from the management contact in all three schools. Paper feedback forms were not returned by either cooks or Midday Meal Supervisors in these schools.

Feedback about the activities suggested in the intervention document was positive, with a few reservations about the timescale in which the activities could be implemented and the speed with which a reduction in food waste could be expected. A typical comment is:

"Being honest I know my data does not show a reduction [in food waste]. *However the initiatives and ideas have been brilliant and I think in time they will have impact. We will keep going and it has got my kitchen staff engaged which is no minor achievement!"* (Head teacher)

Activities included in the intervention

The documentation for this intervention suggested six possible activities for schools to trial, and suggested that they try at least three of these in order to achieve a significant impact. In their feedback, management contacts were asked to indicate which activities the schools implemented during the trial period, and also which they had tried in the past or planned to implement in the future. This was in order to gauge whether the reason for not implementing an activity was that the school had already done so, and also whether a suggested activity was considered to be worth trying in the future. The responses from the three managers are detailed in Table 23 below:

Table 23: Activities trialled in the improving familiarity and appreciation of school meals intervention

Activity trialled	Tried / implemented during trial	Tried / implemented in the past	Plan for the future	Response Count
Taster sessions for pupils and staff	2	0	2	3
Rewarding pupils for trying new food	3	0	1	3
Visiting the school kitchen	0	0	1	1
Pupil feedback on school meals	3	1	1	3
Sharing recipes with parents	2	1	1	3
Taster sessions for parents	1	1	2	3

The responses above, combined with additional feedback, suggest that the schools considered most of the activities to be worth trying, with the possible exception of visiting the school kitchen.

One school trialled five of the suggested activities during the intervention period, another four, and the third two. Additional feedback information shows that the school that trialled only two activities had introduced their own additional ideas, suggested by pupils during the feedback process. It should therefore not been seen as indicating a lower level of engagement with the trial.

Additional activities

As suggested in the intervention documentation, all three schools had adapted the suggested activities to suit their situation and also introduced their own activities, many of which were suggested by pupils. It is interesting to note that a number of these fall under improvements to the dining experience.

■ One school identified their youngest pupils as needing extra support at lunchtime in order to encourage them to eat their school meal:

   "School Council sat with younger children encouraging them to try new foods and talking about the types of food." (Head teacher)

■ In an area with low uptake of school meals, one school targeted some of their activities on children who do not normally have school meals.

   "We introduced once a month free lunch for 6 children who normally do not have school lunches to encourage them. Now left over food - although limited - instead of being seconds is offered as tasters to packed lunch children - children's suggestion!" (Head teacher)

■ The school that only chose two activities from the suggested list initiated their own system for pupils to pre-order meals, at the request of the pupils. They also undertook a number of activities in response to pupil feedback, which focused on the dining experience more broadly:

   "We've changed to 2 sittings, this took away the sense of urgency to finish lunch and get outside. Now all children in the sitting stay for the same amount of time, this means children do not rush their food. It also means fewer children on the playground improving the play opportunities. The canteen in cleared up AFTER lunch, not during. This was a huge problem before and made the lunch experience unpleasant. Following pupil requests, children now sit with their friends, there are no 'dinners tables' and 'sandwich tables'. (Deputy head teacher)

Impacts

■ **Reducing food waste**

In comparison with the 'meals cooked to order' intervention, respondents were less positive about the impact of the intervention on food waste during the trial period. However, the two schools that had run taster sessions for pupils used meals from new menus to be launched after the trial period had ended. Both commented that they were expecting to see reductions in food waste (and an increase in school meal uptake) once the new menu started.

Table 24: Management opinion on success of improving familiarity and appreciation of school meals intervention on food waste reduction

Management opinion on overall success of the intervention at reducing food waste in school	Response Count
Highly successful	0
Somewhat successful	1
Neither successful nor unsuccessful	2
Somewhat unsuccessful	0
Highly unsuccessful	0

■ **Other impacts**

Table 25 below shows that all three respondents thought that the intervention had a number of positive and no negative impacts.

Table 25: Management opinion on impacts of improving familiarity and appreciation of school meals intervention

Management opinion on the impacts of the intervention					
Answer Options	positive impact	negative impact	no impact	don't know	Response Count
Pupil awareness of food waste	3	0	0	0	3
Staff awareness of food waste	3	0	0	0	3
Morale among catering staff	3	0	0	0	3
School meals uptake	0	0	3	0	3
Pupils' diets	1	0	1	1	3
The eating environment	2	0	1	0	3
Amounts of food waste	1	0	2	0	3

The following additional impacts were also noted:

- All 3 respondents reported that the process of consulting pupils (and sometimes parents) to find out what they liked and disliked about school meals was very productive.
- Taster sessions were also reported to be a success:

  "*Taster sessions worked really well and we were surprised how many of the children who always have packed lunches tried new foods.*" (Head teacher)

  This head teacher has since reported that children who had previously had packed lunches are choosing school meals on the days when the meals they have tasted are on the menu.

- One school that had developed a recipe book with parents and pupils reported that:

> *"Parents and children have shown really good interest in our cookery book initiative and we will be having one of the suggestions as a meal for school lunches." (Head teacher)*

The recipe referred to, which had been submitted to a recipe competition by a Reception child, has now been served as a school meal and received enthusiastically, particularly by other members of the Reception classes.

Reported problems

The only problem reported was the challenge of implementing the intervention in a short timescale. Two of the three schools had particular circumstances that made rapid implementation a challenge: one had a new head teacher and the other was undergoing extensive building work, including a temporary kitchen, while planning for a new catering contract to start at the end of the intervention period. The third head teacher, who did not have additional factors to contend with, also commented that she would have liked a longer trial period.

Conclusions

■ A longer period is likely to be needed for schools to develop this intervention to see changes in pupil attitudes towards school food.

■ The lower response rate for feedback forms might suggest that this intervention was less successful than 'meals cooked to order' at involving a wide range of adults within the schools. However, all three management contacts report an increase in the morale of kitchen staff, with one specifically commenting: *"...it has got my kitchen staff engaged which is no minor achievement!"* (Head teacher)

■ All three schools consulted pupils to get their feedback on school meals. The feedback for this intervention, and for 'improving the dining experience', suggests that pupils do not consider school food and the experience of eating it separately: when consulted about improvements their suggestions covered both areas - for example pupils in one school commented on what they liked and disliked about school food, and also that they wanted to be able to eat sitting next to their friends. This crossover between interventions is reflected in some of the additional activities introduced in schools taking part in the trial.

6.10.3 Improving the dining experience

Detailed feedback was received on this intervention from the management contact in all three schools. Paper feedback forms were returned by all three cooks, but not by the Midday Meal Supervisors in these schools.

This intervention was less successful at achieving an impact, in the eyes of respondents, than 'meals cooked to order' and 'improving the familiarity and appreciation of school meals'. This was mainly due to the time schools needed for planning and/or funding the changes they wanted to make.

> *"Timing was a difficult one for us - only able to implement a small handful of solutions - however great timing for assisting planning... would have received more joined up response if we had planned into the school calendar... we will be using the document for our dining experience project over the next 9 months... I will be able to review then!" (Secondary business manager)*

Activities included in the intervention

The documentation for this intervention suggested eight possible areas which schools could work on for improving the dining experience. Schools were encouraged to form an Action Group of adults and pupils to lead the intervention and to choose one activity to develop in depth or three or four 'quick fixes' as appropriate for their school.

In their feedback, management contacts were asked to indicate which activities the schools implemented during the trial period, and also which they had tried in the past or planned to implement in the future. This was in order to gauge whether the reason for not implementing an activity was that the school had already done so or whether a suggested activity was considered to be worth trying in the future. As the tables below show, only one school was able to implement any changes during the trial period; however the other two schools consulted with their pupils via the School Council and made extensive plans for the future.

Table 26: Activities trialled in the improving the dining experience intervention - secondary school 28

Secondary school	Tried / implemented during trial period	Tried / implemented in the past	Plan for the future
Shortening queues	X	X	
Making the queue less stressful	X		X
Ensuring pupils have enough time to eat			X
Encouraging staff to eat with pupils	X		
Making good use of limited space			X
Reducing canteen noise			X
Making a multi-use hall feel more like a dining room			X
Making the canteen space more inviting			X

Table 27: Activities trialled in the improving the dining experience intervention - secondary school 42

Secondary school	Tried / implemented during trial period	Tried / implemented in the past	Plan for the future
Shortening queues		X	
Making the queue less stressful		X	
Ensuring pupils have enough time to eat		X	
Encouraging staff to eat with pupils		X	
Making good use of limited space		X	
Reducing canteen noise			
Making a multi-use hall feel more like a dining room		X	X
Making the canteen space more inviting		X	X

Table 28: Activities trialled in the improving the dining experience intervention - primary school 11

Primary school	Tried / implemented during trial period	Tried / implemented in the past	Plan for the future
Shortening queues			X
Making the queue less stressful			X
Ensuring pupils have enough time to eat		X	X
Encouraging staff to eat with pupils		X	
Making good use of limited space			X
Reducing canteen noise			
Making a multi-use hall feel more like a dining room		X	
Making the canteen space more inviting			X

Additional activities

In the weeks prior to the official intervention period, the primary school trialling this intervention conducted extensive consultation with pupils and parents about all aspects of school meals and the dining experience. This informed their plans for the future, including a new menu, better knives and the replacement of airline trays with plates. It also resulted in small changes being made during the intervention period. The cook made adjustments to the proportions of the meal types she prepared in order to offer more jacket potatoes and baguettes as requested by the children. The cook also worked with the Midday Meal Supervisors and decided to reduce portion sizes slightly in order to reduce waste and allow children who were particularly hungry to have seconds.

Impacts

■ **Reducing food waste**

The manager from the school that had implemented changes during the trial period rated the intervention as 'somewhat successful' at reducing food waste. This was attributed largely to the process of separating and weighing the canteen and kitchen food waste each day.

> *"The waste weighing helped the catering team reflect on preventable waste and it has had a positive impact on our waste collection volume re: food."* (Business manager)

This opinion was shared by the catering manager of the other secondary school, who rated the intervention as 'highly successful' at reducing food waste, and said, *"Just shows how much waste there was"*, referring again to the process of separation and weighing necessary for the intervention monitoring.

■ **Other impacts**

Table 29 below shows that all three management respondents thought that the intervention had a positive impact on both pupil and staff awareness of food waste.

Table 29: Management opinion on impacts of improving the dining experience intervention

Management respondent opinion on the impacts of improving the dining experience					
	positive impact	negative impact	no impact	don't know	Response Count
Pupil awareness of food waste	3	0	0	0	3
Staff awareness of food waste	3	0	0	0	3
Morale among catering staff	0	1	1	1	3
School meals uptake	0	0	3	0	3
Pupils' diets	0	0	3	0	3
The eating environment	0	0	3	0	3
Amounts of food waste	1	0	1	1	3

The level of awareness of pupils and staff can be attributed in part to the process of separating and weighing their food waste. One secondary manager commented:

> "The separate bins & signage have had an interesting impact as students 'paused' when leaving the dining areas" (Secondary business manager)

In addition the primary school reported that it was fully engaged in the programme even though they had not yet implemented any of the suggested activities. The management respondent described the intervention as 'very high profile'. She listed extensive activities to publicise their plans to improve the dining experience and to reduce food waste: a meeting for teaching staff, a meeting for catering staff, a School Council meeting and assemblies for pupils. In addition the school included information about their work on the school website and in parent newsletters.

The secondary school that had implemented changes during the intervention period described the intervention as 'fairly high profile' and described having a meeting for Midday Meal Supervisors and catering staff, as well as mentioning the topic of food waste / the intervention in assemblies.

Reported problems

■ **Timescales and funding**

The limited time available to plan and implement change was the main problem raised by all three schools. Obtaining funding to make the changes was also mentioned by all three.

> "Improving the dining experience isn't something that can be achieved by a quick fix. Following suggestions from pupils, we have made a number of small changes which they appreciate. Other suggestions for improvement are proving prohibitive because of the cost. In order to make a real difference we need more time and more funding." (Secondary business manager)

■ **Increasing staff interaction with pupils at lunchtime**

Both the primary and secondary schools commented that efforts to encourage staff to eat with pupils were of limited success:

> "Staff were encouraged to eat with pupils by being provided with a free meal. The staff uptake rose but staff did not interact with pupils. Pupils do not wish to sit with staff during their meal breaks." (Secondary business manager)

Conclusions

■ This intervention needed significantly more time for schools to plan, fund and implement. This is particularly relevant for secondary schools where improvements to the dining experience can involve expensive changes such as new furniture and equipment, or alterations to buildings.

6.11 Results regarding the communications support to schools

6.11.1 Feedback from managers

When analysing the data for schools which received additional communications support, and particularly when comparing their responses to schools which did not receive this additional support, it is important to remember that in some cases these schools were offered communications support in order to recruit them to the trial. They needed this offer of additional support before agreeing to participate and are therefore not a representative sample of the group as a whole.

Feedback from the management contact in the 5 primary schools is given below; this was not available from the secondary school where additional communications support was provided.

Table 30: Feedback on the effect of communications support during interventions

In comparison with launching the intervention alone, please rate the effect of the visitor's support in the following areas.						
Answer Options	very positive effect	slightly positive effect	no effect	slightly negative effect	very negative effect	Response Count
Raising awareness of food waste issues among pupils and staff	5	0	0	0	0	5
Imparting information about the intervention to pupils and staff	5	0	0	0	0	5
Motivating staff and pupils to reduce food waste	3	2	0	0	0	5
Changing the behaviour of pupils and staff with respect to food waste	2	3	0	0	0	5
Enabling the school to plan and set up the intervention	5	0	0	0	0	5
Enabling the school to start the intervention quickly	4	2	0	0	0	5
Reducing the school's food waste	3	2	0	0	0	5

Feedback from managers, quoted below, demonstrates the value of involving the pupils in the delivery of key messages and putting the intervention into a wider context:

"It is more powerful when the children and staff feel that it is a wider issue and we are part of a big plan that involves other schools."

"The children get bored with hearing my voice all the time, so they respond really well to visitors doing an assembly and it has a much bigger impact. The assembly was great. Having the kids act it out was the key."

6.11.2 Comparison between schools receiving and not receiving communications support

Overall success of the communications support
Table 31 below shows opinions on the success of the intervention in those schools receiving communications support.

Table 31: Success of intervention (schools receiving communications support) All responses

Thinking about all aspects of the intervention, how would you rate its overall success at reducing food waste in your school?	Response Percent	Response Count
Highly successful	31%	4
Successful	31%	4
Neither successful nor unsuccessful	23%	3
Somewhat unsuccessful	8%	1
Highly unsuccessful	8%	1
answered question		13

Table 32 below gives opinions on the success of the intervention in those schools not receiving communications support.

Table 32: Success of intervention (schools not receiving communications support) All responses

Thinking about all aspects of the intervention, how would you rate its overall success at reducing food waste in your school?		
Answer Options	Response Percent	Response Count
Highly successful	20%	2
Successful	30%	3
Neither successful nor unsuccessful	40%	4
Somewhat unsuccessful	10%	1
Highly unsuccessful	0%	0
answered question		10

This feedback shows a small difference in reported success between schools receiving communications support and those not, with 62% respondents reporting the intervention as highly successful or successful, compared with 50% in schools not receiving the support. When school management responses were analysed as a separate group the rating for schools receiving communications support was 83% rating the intervention as highly successful or somewhat successful, compared with 33% for the schools who didn't receive support. However, it is important to bear in mind the small size of the sample.

Success of the communications support in bringing about positive impacts

Tables 33 and 34 compare the responses from all staff in schools receiving communications support with those that did not. Given the small sample sizes (where one person can make 17% difference) we should not be surprised that these results do not give a clear picture. We have done further analysis separating out the school management responses from the catering staff, as they will have had the benefit of experiencing the school assemblies, whereas catering and Midday Meal Supervisors will not. Some analysis of the results is given following the tables themselves.

Table 33: Impact of interventions (schools receiving communications support) – All responses

Please indicate below whether you think the intervention has had any impact on the following areas.					
Answer Options	positive impact	negative impact	no impact	don't know	Response Count
Pupil awareness of food waste	64%	0%	18%	18%	11
Staff awareness of food waste	82%	0%	9%	9%	11
Morale among catering staff	73%	9%	9%	9%	11
School meals uptake	18%	0%	54%	28%	11
Pupils' diets	55%	9%	36%	0%	11
The eating environment	40%	10%	30%	20%	10
Amounts of food waste	75%	0	25%	0	12
				answered question	**12**

Table 34: Impact of interventions (schools not receiving communications support) – All responses

Please indicate below whether you think the intervention has had any impact on the following areas.					
Answer Options	positive impact	negative impact	no impact	don't know	Response Count
Pupil awareness of food waste	89%	0%	11%	0%	9
Staff awareness of food waste	90%	0%	10%	0%	10
Morale among catering staff	60%	10%	20%	10%	10
School meals uptake	20%	0%	70%	10%	10
Pupils' diets	40%	0%	50%	10%	10
The eating environment	50%	0%	50%	0%	10
Amounts of food waste	50%	0%	30%	20%	10
				answered question	**10**

The responses showed 75% of schools with communications support thought there was a positive impact on the amounts of food waste produced (compared with 50% in schools not receiving this support). Looking at school manager responses only, this rose to 80%, with only 17% holding this view for schools not receiving support. The impact of communications support on school staff also seems to have been positive with slightly higher responses for positive impact on staff awareness of food waste and morale among catering staff in those schools where additional communications support was delivered.

In other areas, however, there were less positive responses. For example, among all respondents, a higher positive impact on pupils' awareness of food waste was perceived to have been achieved in schools where no additional communications support was provided than those in schools where this support was provided. 64% of all respondents rated that awareness of food waste had increased in schools receiving support compared with 89% in schools which received no support.

7.0   Comparison of activities that have been proved to reduce food waste in households and an assessment of their application to schools

This section explores the proposition that food waste reduction in schools could be comparable with food waste reduction in households. It compares the main reasons for food waste in schools, identified through this study, with the main causes of food waste from households, identified through WRAP's research into household food and drink waste. It also compares the approaches that have proved effective at reducing food waste in households with those likely to be effective in schools.

■ Reasons food is wasted

There are two main reasons food is wasted in households - cooking or preparing too much food; and not using food in time.

The reasons food is wasted in schools are more wide ranging and in the main very different to those given above. They are categorised into three key areas "operational" (relating to policies on food and school meals as well as practices and systems at a school level), "situational" (relating to broader issues not directly connected to food, such as rushed lunch hours or the canteen environment), or "behavioural" (relating to individual choices and preferences). The majority of food waste from school is thought to originate from school meals. (In primary schools in particular school policy would suggest that food waste from packed lunches is sent home and would end up in the household waste stream).

■ Approaches to reducing food waste in households

To address the main causes of food waste in households, providing information and advice on the following via the Love Food Hate Waste behavioural change programme has proved effective:

- "It pays to plan" – check what's in the cupboard, fridge and freezer before going shopping; know what you're going to buy before you go shopping; plan meals in advance
- "Perfect portions" – measure portion sizes to help avoid cooking or serving too much food
- "Know your dates" – check the dates on food regularly and use foods with the shortest date first; freeze for later foods you won't get round to eating in time
- "Lovely leftovers" – be creative with using up leftovers
- "Savvy storage" – most leftovers will keep for up to two days in the fridge well wrapped; most fruit and vegetables will stay fresh for longer stored in the fridge; once opened, wrap fresh foods well or store in air-tight containers

In order to achieve a reduction in food waste, messages and advice on the above need to be targeted specifically at those people who are responsible for buying, cooking and preparing food in the household.

■ Approaches to reducing food waste in schools

As you might expect, the approaches that have proved effective at reducing food waste in households are unlikely to have the same impact in schools, as the causes of food waste are different (e.g. food that had passed it best before or use by dates was not found to be a significant proportion of food waste in schools). School kitchens operate commercially and therefore have processes in place to minimise wastage from not using food in time (e.g. menus planned in advance and stock control systems) and from preparing too much food – unserved food represents a cost to the caterer.

Whilst storing leftover food appropriately so that it can be used again can be an effective way to reduce food waste in households, the re-use of most food types in the school kitchen is not an option due to food hygiene polices in place to avoid risk to children. Due to the way that food is served in school canteens, the reuse of food types that may be considered "safe", such as vegetables, is often undesirable in terms of quality e.g. unserved vegetables which have been under a hot plate throughout

wrap   Material change for
       a better environment

the lunchtime service. Identifying processes which can minimise leftover food are more important here, e.g. preparing salad and fruit items in batches on demand and keep them refrigerated.

The opportunities to address the operational causes of food waste are often limited by the greater need to comply with nutritional and food hygiene standards and there are often financial and logistical barriers to overcoming the situational causes of food waste. Therefore addressing the behavioural reasons for food waste might be expected to have the most impact in terms of reducing food waste from schools and the additional benefit of improving the nutritional intake of pupils. There are a number of key groups whose behaviour is likely to affect the amount of food wasted at a school level, including catering providers, school staff (especially those supervising meal times) and pupils. Further work in this area is planned in partnership with the School Food Trust.

■ Working with schools to reduce food waste in households

If the aim is to reduce food waste from households, activities in schools aimed at primary school pupils may not be the most effective use of resources, as children are not those responsible for buying, cooking and preparing food in the household.

Working through schools as a channel to reach parents who want information to help them reduce food waste at home could be effective. More work is being done to understand how this can be done and the likely impact.

8.0   Conclusions

■ The quantitative research suggests that a total of 80,328 tonnes of food waste is generated by schools in England per (40 week) school year (55,408 tonnes in primary schools and 24,974 tonnes in secondary schools.) Of this, the largest fractions were found to be vegetables, fruit and mixed (non sandwich). (The category mixed (non sandwich) refers to meals such as pizza, cottage pie and spaghetti bolognaise which incorporate a number of food stuffs). The majority of food waste is generated in the kitchen and canteen areas (72% in primary schools and 59% in secondary schools) and is assumed to originate from school meals. Significantly more food waste was found to be produced per pupil head in primary schools than in secondary schools (with an average of 72 grams per pupil per day and secondary schools 42 grams per pupil per day). For both primary and secondary schools, smaller schools produce more food waste per pupil per day on average.

■ More than three quarters of the food waste was classified as avoidable, i.e. it could have been eaten at some point prior to disposal, but was not. However, in the school environment the opportunities to significantly reduce this avoidable waste are limited due to the need to comply with nutrient and food based standards and food safety requirements. Food waste is one factor among a hierarchy of key priorities for schools when thinking about food and whilst schools should be encouraged to reduce food waste as much as possible, this should not be at the expense of other essential goals. Other policies, such as introducing pupils to a wide range of foods, even if they are likely to reject them and therefore create waste, is seen by many as an important function of school meals.

■ Staff and pupils have an interest in and understanding of food waste issues, although the qualitative research shows they will not always be seen as a top priority. The majority of schools interviewed had previously taken some action to reduce food waste, although in some cases this was motivated by a desire to improve pupils' diets by encouraging them to eat up their meals. All schools contributed suggestions as to what further actions could be taken with education of pupils and/ or staff being the most frequently suggested. Schools that took part in the intervention trials showed a

commitment to reducing food waste and all stated that they hoped to continue with the intervention after the trial period. There is anecdotal evidence to suggest that schools have indeed continued with the interventions. However it needs to be recognised that these schools were to some extent self selecting, choosing to take part in the project, whereas other schools involved in the research did not want to be involved in the intervention trials. The project therefore demonstrated that for some schools there is an interest in food waste issues, sometimes as part of a wider interest in healthy eating, and that there is a good chance these schools will respond to ideas for change given the right level of support and encouragement. Engaging all schools may be more challenging.

■ The intervention trials demonstrated that it is difficult to make a measurable impact on food waste arisings over a short time scale. Interventions can take time to set up and become established within the school environment, especially if they involve a process of learning new behaviours. However all schools involved in the interventions reported a positive impact on staff and pupil awareness of food waste issues. The commitment given by schools to continue with the interventions provides an opportunity to undertake further follow up research with these schools to ascertain the benefits of the projects initiated over a longer time scale.

■ The findings suggest that reducing food waste in isolation may not be a significant enough issue for most schools to take action on. However, many of the actions that were identified through this study as being likely to reduce food waste often correspond with actions that might be taken to achieve other aims anyway. For example reducing time spent queuing allows pupils more time to actually consume the food they are served, and is therefore likely to reduce waste, but it is also likely to improve behaviour in the canteen, improve children's nutritional intake, and, as a result of the latter, to increase concentration in afternoon lessons.

■ The project demonstrated that there are a large number of stakeholders (internal to the school and external) that have an influence on food waste generated, particularly those involved in menu planning, and those that interpret national legislation and guidance into local policies and procedures regarding nutritional guidelines, portion sizes and use of leftovers.
National guidance and legislation on nutritional standards for school meals and on food hygiene tend to be interpreted into policy at a local level in a very strict way to ensure compliance and avoid risk; but at a school level there tend to be wide differences in how policy in interpreted into practice (i.e. some practitioners follow to the letter; some use their own judgement/ draw on their own experience to create more flexible practices). The differences in practices at a school level may be one reason why the amounts and types of food waste vary between schools.

9.0   Recommendations

■ The reduction of waste in school food needs to be included as an objective in achieving the goals of the School Food Trust. Encouraging children to eat the food the have been served, rather than leaving it on the plate would be expected to achieve better nutrition for all the children. In addition, reducing food waste could contribute to minimising waste disposal costs and potentially transport and preparation costs. The aspiration to reduce food waste could also contribute to the aim of achieving a sustainable, secure and healthy food system.

- It is important that the issue of food waste becomes part of the whole school approach to food. In order for this to take place partnership working is required with the wide range of organisations involved in improving food in schools. Partners include the School Food Trust, Healthy School programme leads (LA), Healthy weight leads (PCT/LA), School Governor Association the Soil Association (Food for Life) ,the Local Authority Catering Association (LACA) and other commercial contract caterers and the Chartered Institute of Environmental health. Partnership working between these stakeholders would enable initiatives to reduce food waste to complement work to increase the nutritional quality of school food and increase food knowledge and skills of children.

- There is a need for greater clarity at a national level on issues such as portion sizes, as this study found significant confusion at practitioner level about what flexibility was permissible and frustration at perceived inconsistencies.

- As zero food waste is not a realistic aim in schools, further work is needed to understand the most efficient options for managing organic waste from schools, for example separate food waste collections for further treatment, or on-site treatment to divert waste from landfill.

- Schools should be directed to practical guidance to help them to reduce food waste. Materials to help schools to identify and address issues that may be causing food to be wasted can be found here: www.recyclenow.com/schoolsfoodwaste

- Further work should be undertaken to research the economic benefits to schools of reducing food waste.

Appendix 1: Memorandum of understanding with participating schools

Memorandum of Understanding between Resource Futures and [INSERT NAME OF SCHOOL]

Resource Futures is carrying out a research project on behalf of WRAP (Waste & Resources Action Programme) to better understand the types and quantities of food waste produced in primary and secondary schools in England.

[INSERT NAME OF SCHOOL] has been approached to participate in this research, and has provided its consent.

This document serves to confirm that [INSERT NAME OF SCHOOL] agrees to participate in the study in accordance with the research activities and requirements described in the Project Details and Requirements Document (Ref SCH220/RF1011).

It also confirms that Resource Futures is committed to conducting the research in the manner described in the Project Details and Requirements Document (Ref SCH220/RF1011), and in accordance with its company's policies and procedures, including those relating to Health and Safety, Confidentiality, Data Protection, Child Protection, Environmental Management and Quality Management.

Signed for and on behalf Resource Futures:
Name: Cathy Riley
Position: Food Waste in Schools Project Manager
Address: Create Centre, Smeaton Road, Bristol, BS1 6XN
Signature:

Signed for and on behalf of [INSERT NAME OF SCHOOL]:
Name:
Position:
Address:

Signature:

Appendix 2: Calculations to estimate a national figure for food waste in schools

Methodology

In order to arrive at a national estimate for a national figure for food waste in schools the data were weighted. This was done by using categorical variables to represent the prevalence of school meals, and creating factors for school size for each permutation of school type and prevalence of school meals. This method would have the disadvantages of:

■ Converting a continuous variable into a categorical one, and thus losing the explanatory power of this variable.

■ Weighting on some very small case numbers, which could have a disproportionate effect on the outcomes.

■ The need to repeat a lot of the analysis.

In order to understand the impact of these variables, and to give an understanding of how these data relate to the national picture, an alternative approach of a regression model has been used. This enables an indication of the effect of each variable (e.g. school size), while controlling for other known effects (such as eligibility for school meals or form of catering). A model was built to include all variables for which there was data, and for which theory would suggest they could have an impact on the dependent variable (in this case *grams food waste per pupil per day*).

The apparent effect of one variable in a cross-tabulation may actually be due to other causes. A regression model takes account of the effect of each variable included, so that it can be assumed that the apparent effect of any one variable is not due to any of the others included. In this way, the model can predict the effect on the dependent variable for different values of the independent variables. An example below is the creation of a factor to predict the change in *grams food waste per pupil per day* according to school size.

However, it is only in the most controlled circumstances that all, or nearly all, of the independent variables can be known, so that there is always the chance that the results are due to an unknown variable. Therefore, when viewing the results the first step is to check the proportion of the effect on the dependent variable that the model explains.

In addition to the independent variables suggested in the question at the top of this section, it was considered that eligibility for free school meals may be a factor in schools waste production. This variable was also therefore included in the regression.
A regression model was first created:
Dependent variable – what we are measuring:

■ Grams food waste per pupil per day

Independent variables – what we understand to affect the dependent variable:

■ Number of pupils

■ Number of school meals cooked per day

■ Number of pupils eligible for free school meals

■ Food not provided internally

Results
As the other parts of this research found there to be a statistically significant difference between the waste produced by the two school types, the analysis was split by primary and secondary. The outputs of the model are given in Table 1.

Table 1

		Change in gm/pupil/day (B-value) associated with:			
	Variance explained (adjusted R^2*100)	Each additional pupil (B value)	Each additional meal provided (B value)	Each additional free meal entitlement (B value)	Food not provided internally
Primary	14.2%	-.203	.242	.023*	-14.65
Secondary	18.6%	-.037	.029	-.049	4.651*

*This figure is not statistically significant

For the two school types 14% and 19% respectively of the variance in the dependent variable was explained by the model. This is a relatively low figure, leaving a lot variation unexplained. The B-values are commented on in the sections which follow.

> **Notes:**
> Beta coefficients (referred to as b-values) provide the degree of change in the dependent variable associated with a unit change in the independent variables. This means that a b-value of -.203 for additional pupils suggests that increasing the number of pupils is associated with a decrease in food waste production of .203gm/pupil/day per additional pupil.

Effect of school size

Table 2 shows the baseline data used in the regression analysis, with the effect of changing pupil numbers. The effect of pupil numbers is statistically significant in each case.

Table 2

School type	Average N of pupils	Average food waste/pupil/day	Increase in average food waste/pupil/day per additional pupil
Primary	294	82	-.203
Secondary	935	41	-.037

There is a decrease in food waste/pupil/day per additional pupil in school size, for both primary and secondary schools, meaning that the larger the school, the less waste is produced per pupil per day: indicating an 'economy of scale' associated with reduced food waste per pupil in larger institutions. Table 3 gives the 2009 national figures for school and pupil numbers, and compares this with the sample for this research.

Table 3

	N of schools England	N of pupils England	Average pupils per school nationally	Average pupils per school in this research	% difference
Primary schools	17,041	4,068,360	239	294	23.14677
Secondary schools	3,211	3,131,030	975	935	-4.11191

*Source: schools, pupils, and their characteristics, January 2009 (provisional) DCSF

It can be seen that the average school size achieved in this research is very near to the national average for secondary, but nearly a quarter greater for primary schools.

Table 4 shows a projection on national average school size based on the outputs of the regression above.

Table 4

School type	Average pupils/school in this research	Average food waste g/pupil/day	Increase in average food waste g/pupil/day per additional pupil	Average pupils/school nationally	Projected average food waste g/pupil/day nationally	Difference between projected and researched g/pupil/day
Primary	294	82	-0.203	239	70.78212	-11.2179
Secondary	935	41	-0.037	975	42.48351	1.483514

It can be seen that, for secondary schools, the projection, adjusted for this variable, suggests that waste production nationally is very near to that of this sample. However, for primary schools the figure is reduced to 70 gm/pupil per day.

Effect of number of meals provided

Table 5 relates the regression findings to potential increases in provision of cooked meals. The effect of school meals is statistically significant in each case.

Table 5

School type	Average N of meals	Average food waste g/pupil/day	Change in average food waste g/pupil/day per additional meal provided
Primary	152	82	.242
Secondary	299	41	.029

There is an increase per additional meal provided, meaning that the average amount of waste per pupil per day increases with the scale of meal provision. However, the increase is much smaller for secondary schools. It was not possible to make a comparison with national statistics due to lack of availability of the data.

Effect of free school meal eligibility

Table 6 relates the regression findings to potential differences in eligibility for free school meals. The effect of is statistically significant for secondary only.

Table 6

School type	Average eligibility for free school meals in this research	Average food waste g/pupil/day	Change in average food waste g/pupil/day per additional eligible pupil
Primary	77	82	.023*
Secondary	147	41	-.049

*This figure is not statistically significant

Both school types in the above table show very small differences in gm/pupil/day for each additional eligible pupil, although the figure for primary schools is not significant. The figure for secondary schools shows a decrease per eligible pupil, with the opposite effect (non-significant) in primary.

Table 7 gives the 2009 national figures for free school meals, and compares this with the sample for this research.

Table 7

School type	N of schools nationally	N pupils eligible for free school meals	Average free school meals/school day nationally	Average free school meals/school/day in this research	% difference
Primary schools	17,041	656,570	39	77.48	101.0961
Secondary schools	3,211	438,860	137	147.28	7.760124

Although secondary schools in the study were fairly typical in eligibility, there was a large difference in primary schools.

Table 8 shows a projection on national average school eligibility based on the outputs of the regression above.

Table 8

School type	Average eligibility for free school meals in this research	Average food waste g/pupil/day	Increase in average food waste g/pupil/day per additional meal	Average free school meals/ school/day nationally	Projected average food waste g/pupil/day nationally	Difference between projected and researched g/pupil/day
Primary	77	82	0.023	39	82.89588	0.895877
Secondary	147	41	-0.049	137	40.49402	-0.50598

It can be seen that the projection suggests that waste production nationally is very near to that of this sample for both school sizes. However, for primary schools, it must be remembered that the b-value, from which the projection was derived, was not statistically significant.

Effect of the school meals provider

A variable was created combining LA and contractor provision of catering, to make a variable representing external catering provision. Table 9 relates the regression findings to potential increases in provision of cooked meals.

Table 9

School type	Average proportion of samples from external providers	Average food waste g/pupil/day	Difference in average food waste g/pupil/day between samples from external providers and the control.
Primary	72%	82	-14.65
Secondary	57%	41	4.651*

Results for primary schools were significant, suggesting that external provision of catering is associated with a decrease in waste production. The effect suggested for secondary schools is in the opposite direction, but is not statistically significant. It was not possible to make a comparison with national statistics due to lack of availability of the data.

Summary

The model suggests that increased school size is associated in a reduction in food waste production. However, increases in the scale of catering are associated with increases in food waste. Eligibility for school meals had a very small effect for secondary schools, and was not statistically significant for primary schools. Using external caterers was associated with a strong and significant reduction in primary school food waste, but was not statistically significant for secondary schools.
Where national data were available (school size and eligibility for school meals), a projection was made to give a suggested value for national schools waste. This is shown below. However, it should be noted that this does not take account of the scale of meal provision or type of provider.

Table 10

School type	Average food waste g/pupil/day	Adjustment for school size	Adjustment for free meal eligibility	Projection of g/pupil/day nationally
Primary schools	82.00	-11.22	0.90	71.68
Secondary schools	41.00	1.48	-0.51	41.98

Table 11: Calculations of total tonnage of school food waste per year

Type of school	Food waste g/pupil/day	No pupils nationally	school days per year	Total waste (tonnes) per year
Primary schools	71.68	4,068,360	190	55,407.81
Secondary schools	41.98	3,131,030	190	24,973.72
Total waste per year				80,381.53

Appendix 3: Headline summary quantitative data by school

Table 1: Total food waste data by primary school

School number	KG sorted	g/pupil/day	g/meal/day
5	139.2	49.8	93.1
6	180.3	84.9	n/a
7	202.4	95.5	199.6
8	288.8	142.4	219.9
9	68.6	26.0	n/a
10	217.9	102.6	227.0
11	194.4	64.7	149.5
12	151.1	45.6	109.5
15	440.4	73.4	193.1
17	378.9	50.8	225.6
18	139.7	81.7	175.7
19	316.3	71.7	150.6
20	88.1	23.4	n/a
21	216.3	46.3	171.7
22	326.3	117.6	290.1
23	397.8	64.3	127.5
24	335.4	104.2	136.1
25	422.7	123.1	156.6
27	784.9	92.6	149.5
28	262.3	76.5	93.7
30	329.3	64.0	84.4
31	238.9	57.7	83.4
32	293.4	86.2	122.3
33	940.7	114.4	156.8
34	393.4	79.2	121.4
36	633.7	119.7	192.0
37	243.3	104.1	155.2
38	646.6	137.1	230.9
41	300.6	67.3	130.1

Total food waste data by secondary school

School number	KG sorted	g/pupil/day	g/meal/day
1	514.4	53.6	131.9
2	304.1	54.9	101.7
3	686.6	40.0	132.0
4	552.3	39.6	70.8
13	589.2	50.4	323.7
14	385.3	18.9	642.2
35	315.7	35.1	87.7
39	583.1	43.2	77.8
40	444.4	35.9	158.7

Appendix 4: Food waste by primary and secondary schools

In order to allow comparisons to be made between schools, analysis was carried out looking at the amount of food waste produced per primary school.

The amount of food waste collected from each school over the three week period varied greatly. This is as we would expect due to the waste generating variables such as number of pupils, school meal provision etc. being different for each school. The range of total food waste sorted for primary schools was 872kg (69 – 941 kg) with a mean of **330 kg**. The standard deviation for the sample of 29 primary schools was 202, this gives a coefficient of variation (stdev / mean) of 61%, which is high and reflects the large range of values in the dataset.

The data was analysed by the number of pupils and also the number of school meals prepared to see if there was less variation between schools when looking at the data based on these parameters. Total weight of food waste sorted on each of the monitoring days at the school was divided by the number of pupils or number of school meals prepared. The weights by school regarding gm/pupil/day and gm/meal/day are given in Appendix 3.

The figure below shows the mean amount of food waste per pupil per day (circle in the bar) for each school and the 95% confidence interval (the bar). The confidence interval (CI) represents the range that we can be 95% certain that the mean daily value falls within for the school. If a school's daily results are close together in value the confidence interval is narrow (small bar) for a school with a wide range of daily values the confidence interval will be greater. The same methodology was used for all the mean and CI charts in this section of the report.

Total weight of food waste by primary school

Figure 1: Daily mean quantity of food waste generated per primary school pupil and 95% confidence intervals across all monitoring days g/pupil/day
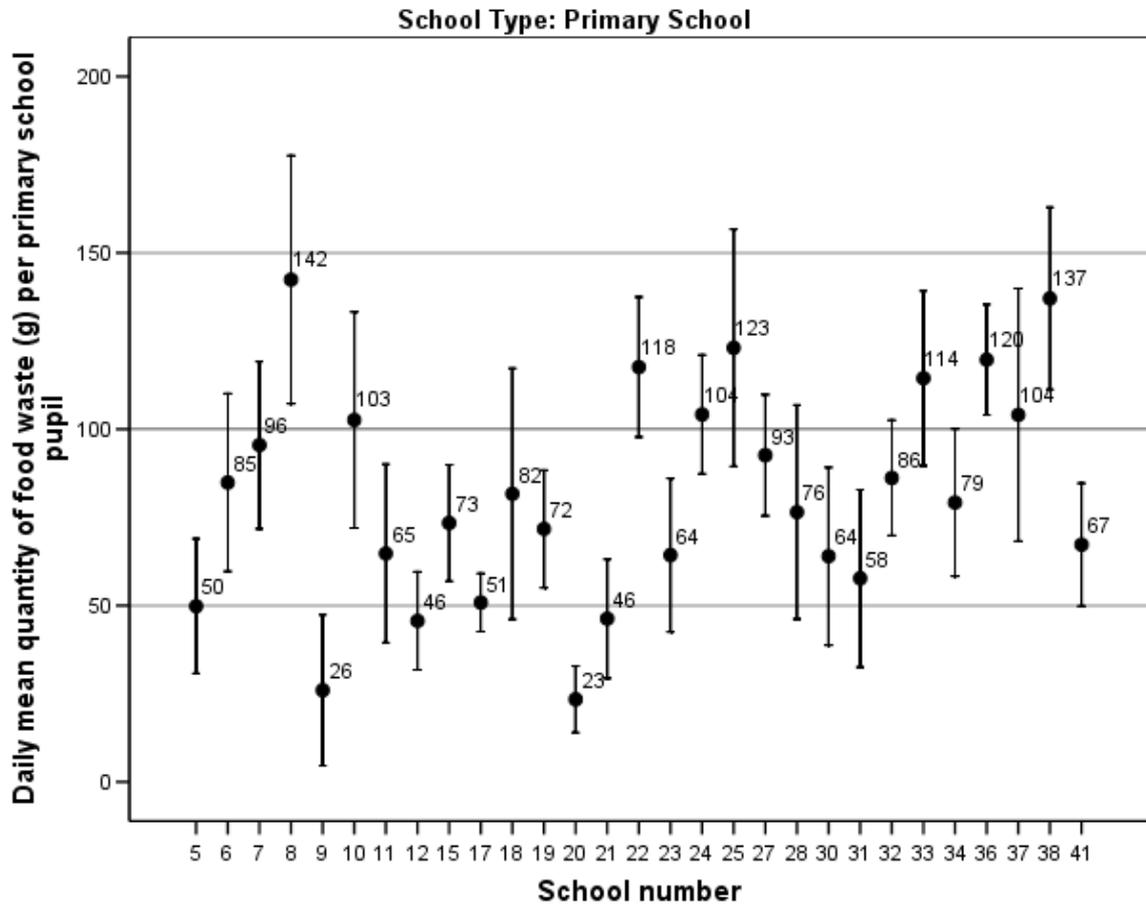
Figure 1 above shows that the range of mean values was 119g (23 – 142 g/pupil/day). The mean daily value for all 29 primary schools was **81 g/pupil/day.** The standard deviation was 31g / pupil / day giving a coefficient of variation of 38%, less than analysing at the data on a total weight sorted level. The figure below represents the data based on the daily mean amount of food waste produced per hot meal prepared to see if this lowers the coefficient of variation between schools.

Figure 2: Daily mean grams per number of hot meals prepared across all monitoring days and 95% confidence interval for primary schools
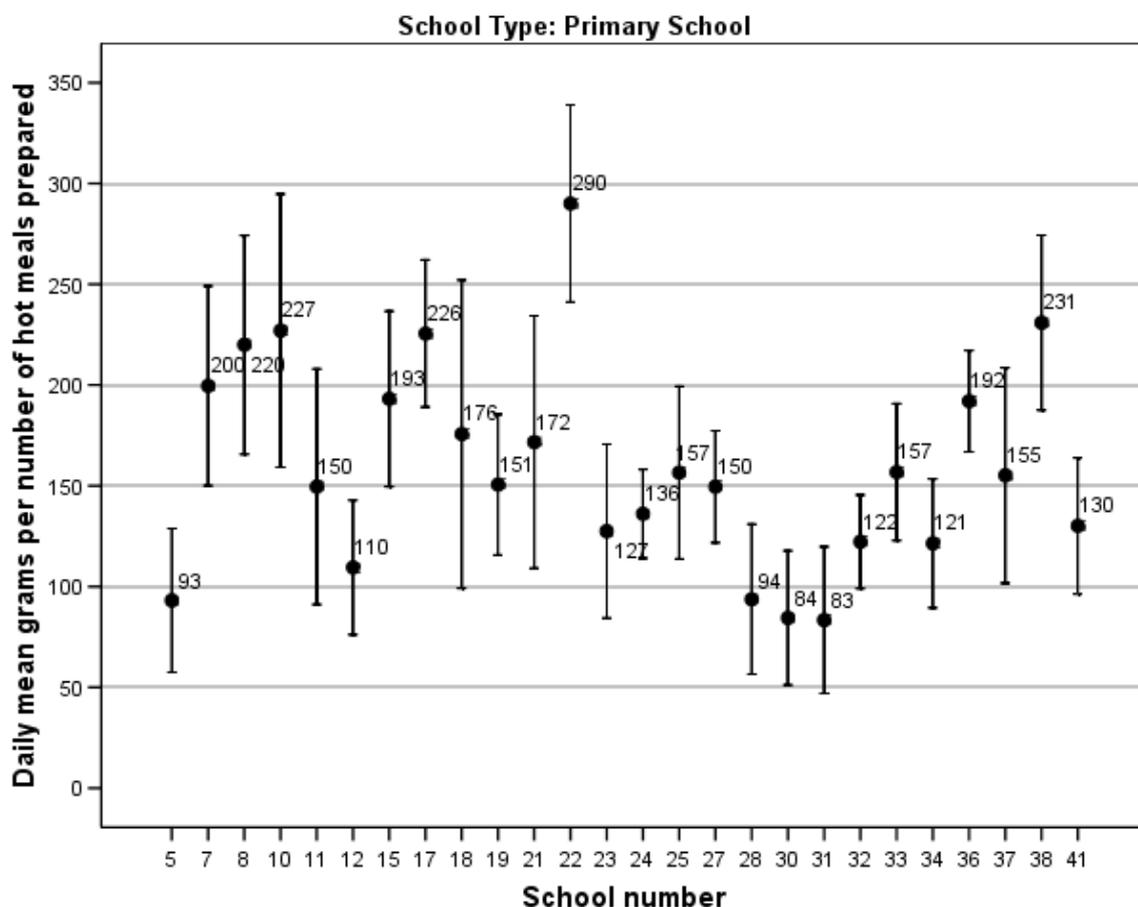
The figure above shows the mean amount of food waste produced per day per hot meal prepared (circle on the bar) and the 95% confidence interval for the school (the bar). A wide confidence bar represents a greater range of daily values for the school. The three primary schools missing from the figure with no data (6, 9 and 20) did not prepare any hot meals on site, 2 served only packed lunches to pupils eligible for free school meals that the third had its hot food prepared off site. The range of values was 207g (83 – 290 g/meal/day) with a mean value of **159 g/ meal/day.** In all cases the values are higher than the per pupil figures simply as a result of the schools preparing less hot meals than the number of pupils. The standard deviation was 53 giving a coefficient of variation of 33% this is very similar to the variance in the data based on a per pupil per day basis.

Total weight of food waste by secondary school
As with the primary schools analysis was carried out to assess the variability of the data between schools.

As we would expect the amount of food waste sorted over the duration of the project varied by each school. The range of total food waste sorted for secondary schools was 383kg (304 - 687 kg) with a mean of **486 kg**. The standard deviation was 132 giving a coefficient of variation of 27%, this is smaller than the primary schools result, but the smaller sample size should be borne in mind in interpreting this result (9 secondary schools compared to 29 primaries). Compared with primary schools, the weights sorted are greater, this is likely to reflect the fact that secondary schools are in general several times bigger that primary schools in respect to number of pupils. The mean number of pupils in the primary schools included in the study was 294 compared to 935 for secondary schools. In order to allow a comparison to be made between the secondary schools the data was analysed on a per pupil per day basis and based on the number of hot meals prepared.

Figure 3: Mean grams per pupil per day across all monitoring days and 95% confidence intervals for each secondary school
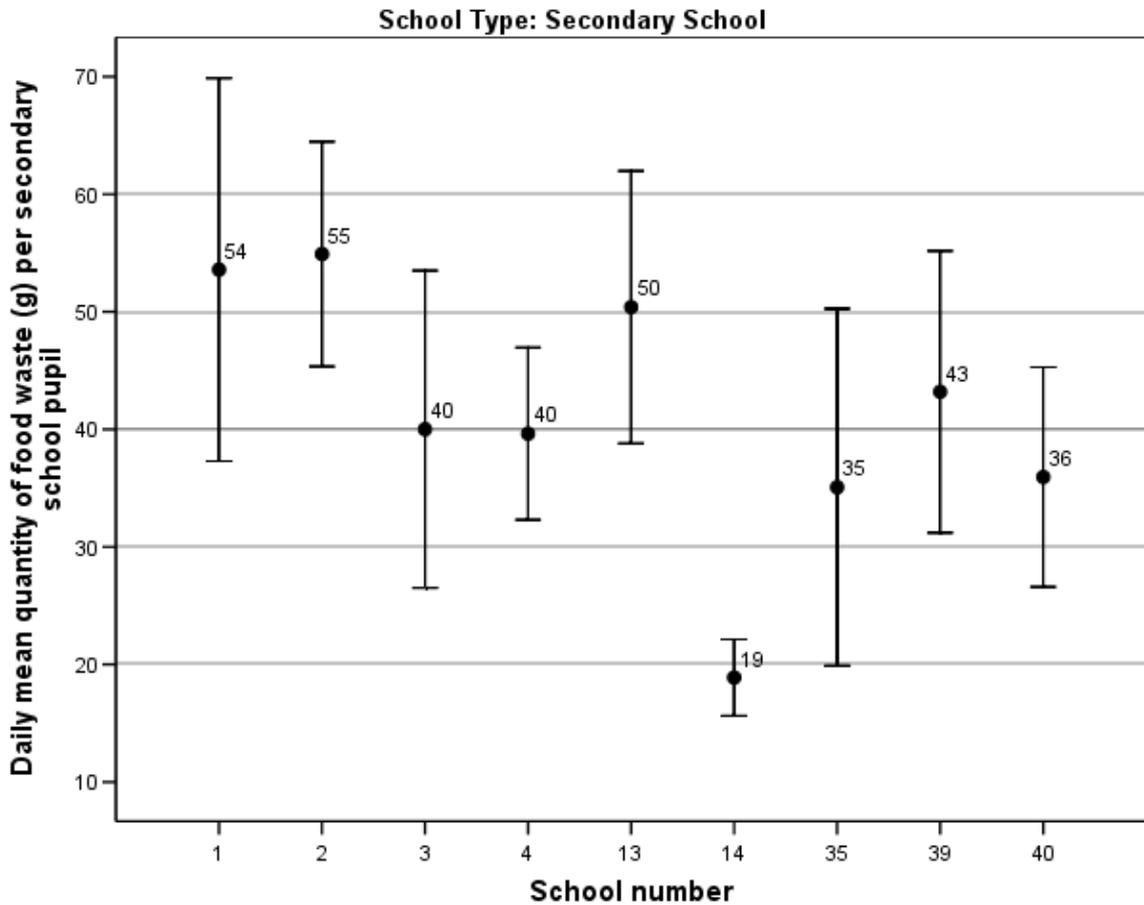

Figure 3 above shows that the mean amount of food waste per pupil per day varies between schools. The range of values was 36g (19 - 55 g/pupil/day), with the mean for all secondary schools being **41 g/pupil/day.** This is considerably less than the figure calculated for primary schools (81 g/pupil/day). The standard deviation was 11, giving a coefficient of variation figure of 26%. School 14 is noticeable due to the low mean figure of 19 g/pupil/day being almost half of the next smallest figure.

Figure 4: Mean amount of food waste (g) per day per hot meal prepared across all monitoring days and 95% confidence interval in each secondary school
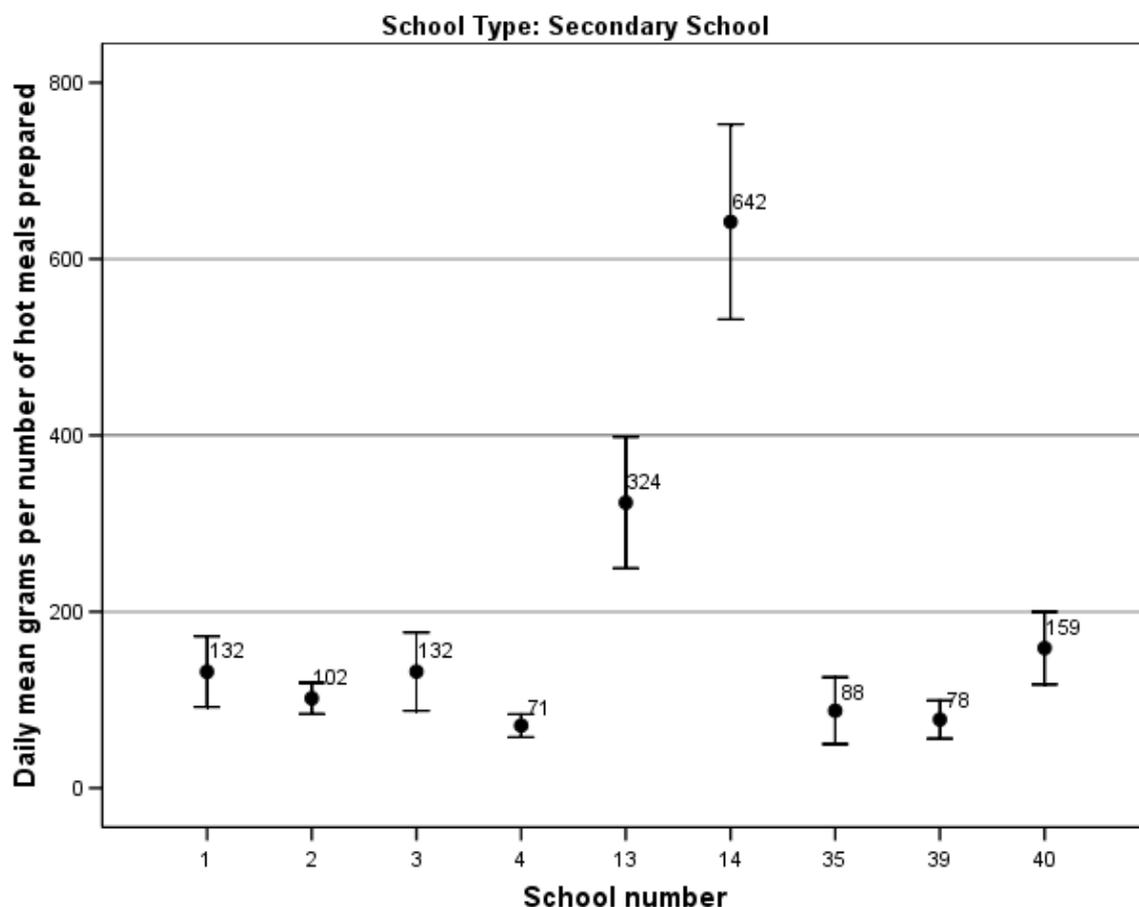
Figure 4 above shows the mean amount of food waste produced per day per hot meal prepared. The range of values was 571g (71 - 642 g/meal/day) with a mean value of **191 g/ meal/day**. The standard deviation was 186 giving a coefficient of variation figure of 97% which reflects the wide range of values in a relatively small sample.

Figure 4 shows two outliers, schools 13 and 14. School 14, however, only prepares hot meals for 3% of the pupils (40 meals per day). Dividing the total food waste generated by the school (i.e. for all pupils, including packed lunch waste etc.) by this figure gives a potentially misleading result – the g/pupil/day figure is actually very low. In addition, in the following sections, when arisings by point of origin are looked at, this school has significantly lower arisings generated from the kitchen and canteen compared to other secondary schools. If we remove school 14, the mean g/meal/day is 136 with a stdev of 82 and a coefficient of variation of 60%. If we then also remove the other outlier, school 13, the mean g/meal/day is 109g with a stdev of 33 and a coefficient of variation of 30%. School 13 only prepared meals for 15% of the pupils a much lower figure than the other schools where the mean figure was 43%.

When comparing the data from primary schools and secondary schools the g/pupil/day means were found to be statistically significantly different (t = 8.925 sig. (2-tailed) 0.000). The differences in g/meal/day between primary and secondary schools was also found to be statistically significantly different (t= -2.940 sig. (2 tailed) 0.003).

Food waste composition for each school

The following two figures (5 and 6) show the composition of the total weight of food waste sorted for each school split by primary and secondary.

Figure 5: Primary school food waste composition (% weight)
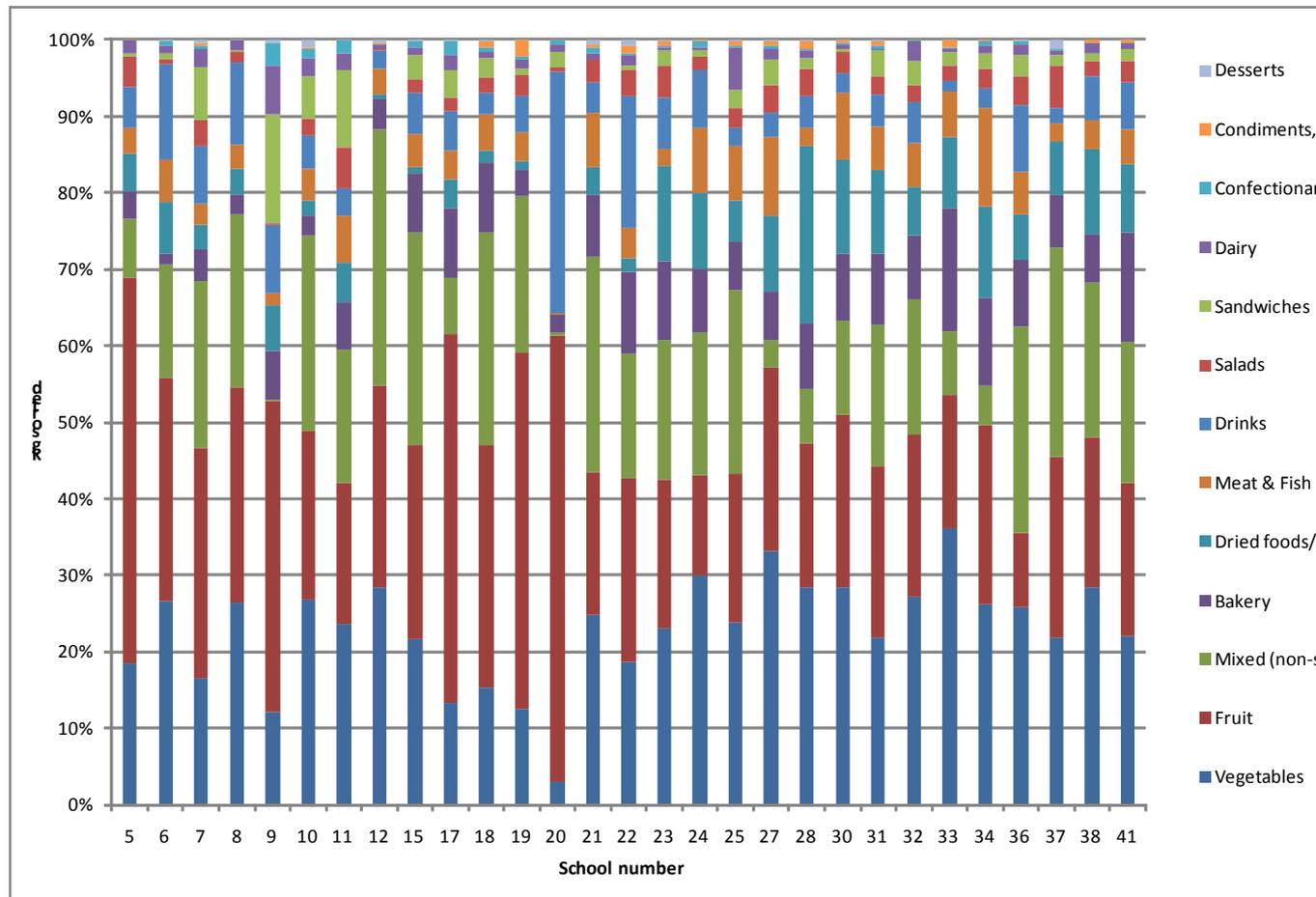
Source: Chart created by Resource Futures

The figure above shows that the composition of the waste sorted at the individual school level varied, however the figure shows that the major food waste categories, in most cases were, fruit, vegetables and mixed food (non sandwich). The composition of primary school 20 is conspicuous due to the fact that fruit and drinks made up the majority of the waste. This was one of the schools that had no hot school meal provision, so all children at this school brought packed lunches or had them provided by the school if they were eligible to free school meals. The study was done in October when the apple tree in the playing field was dropping fruit so this might be inflating the fruit figure at this school as well.

Figure 6: Secondary school food waste composition (% weight)
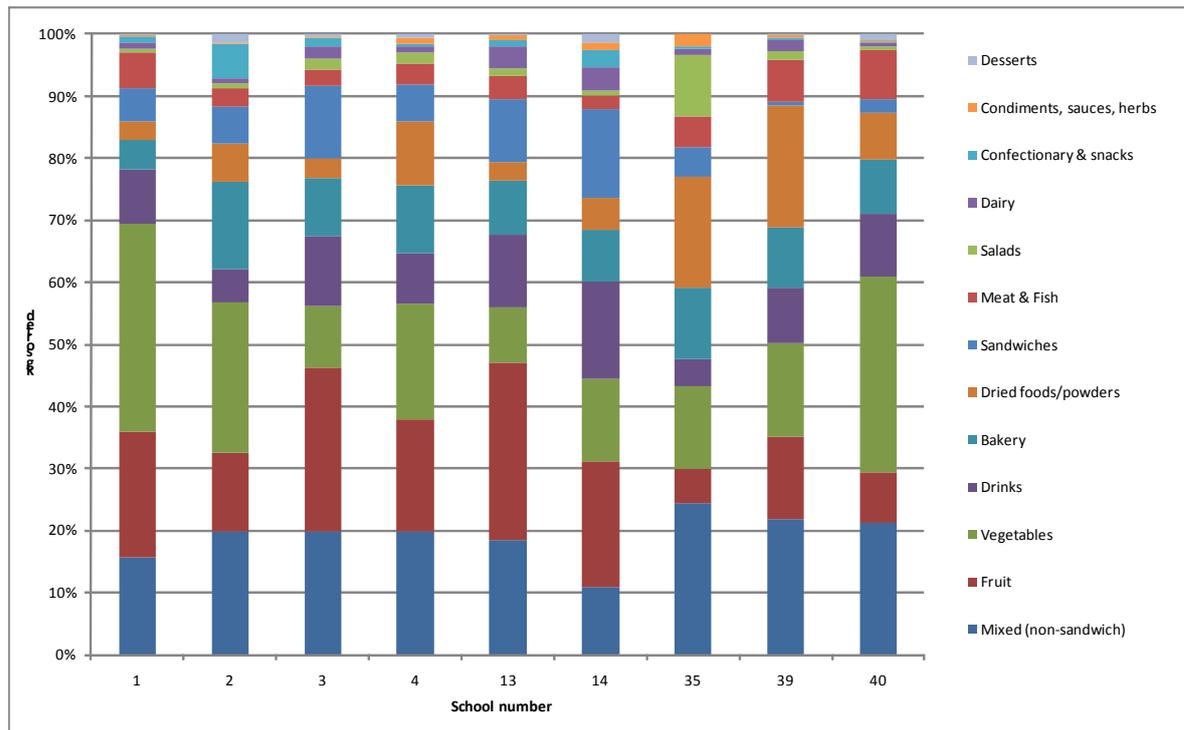
Source: Chart created by Resource Futures

For secondary schools food waste the major categories at the individual school level were fruit, vegetable and mixed (non sandwich).

Food waste avoidability for each school

The two figures (7 and 8) below present the categorisation of potential to 'avoid' waste data for each school type. As we would expect based on the mean data presented in Figure 9 in the main report, the individual school figures below confirm the fact that the majority of food waste in each school was classified as avoidable. It is noted that the proportion of avoidable food waste does vary by school, indicating that some schools are discarding less avoidable food waste than others.

Figure 7: Avoidable primary school food waste (mean g/pupil/day)
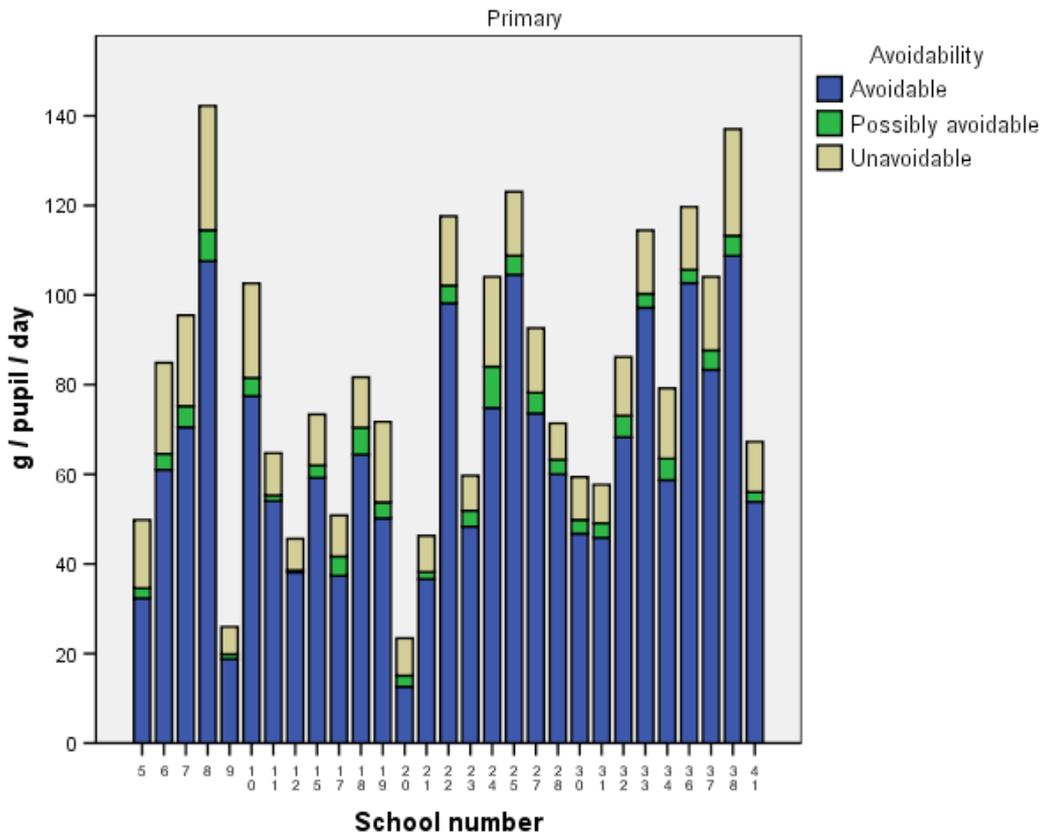
Source: Chart created by Resource Futures

Figure 8: Avoidable secondary school food waste (mean g/pupil/day)
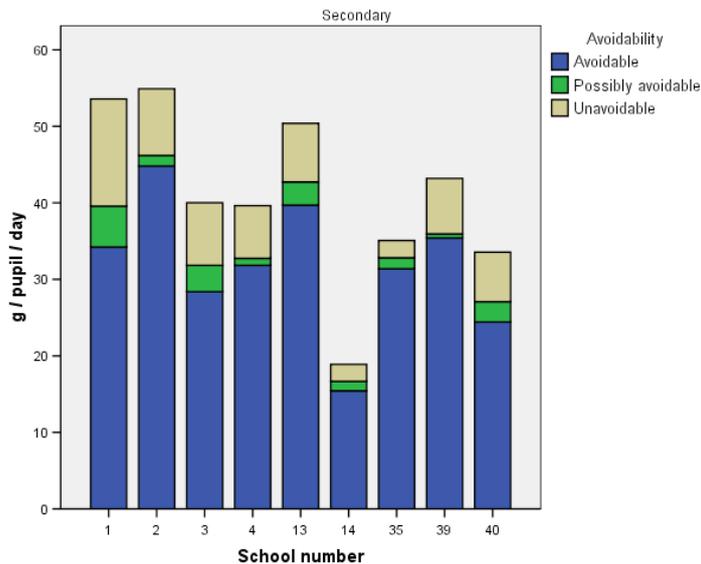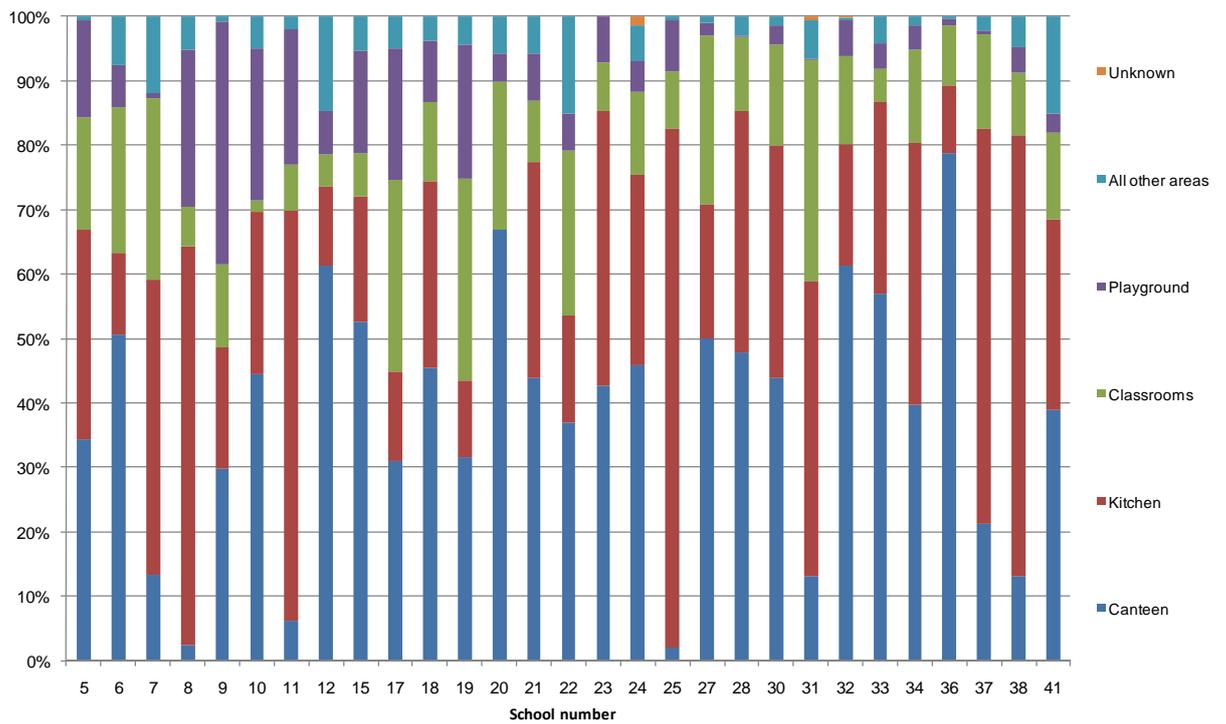

Source: Chart created by Resource Futures

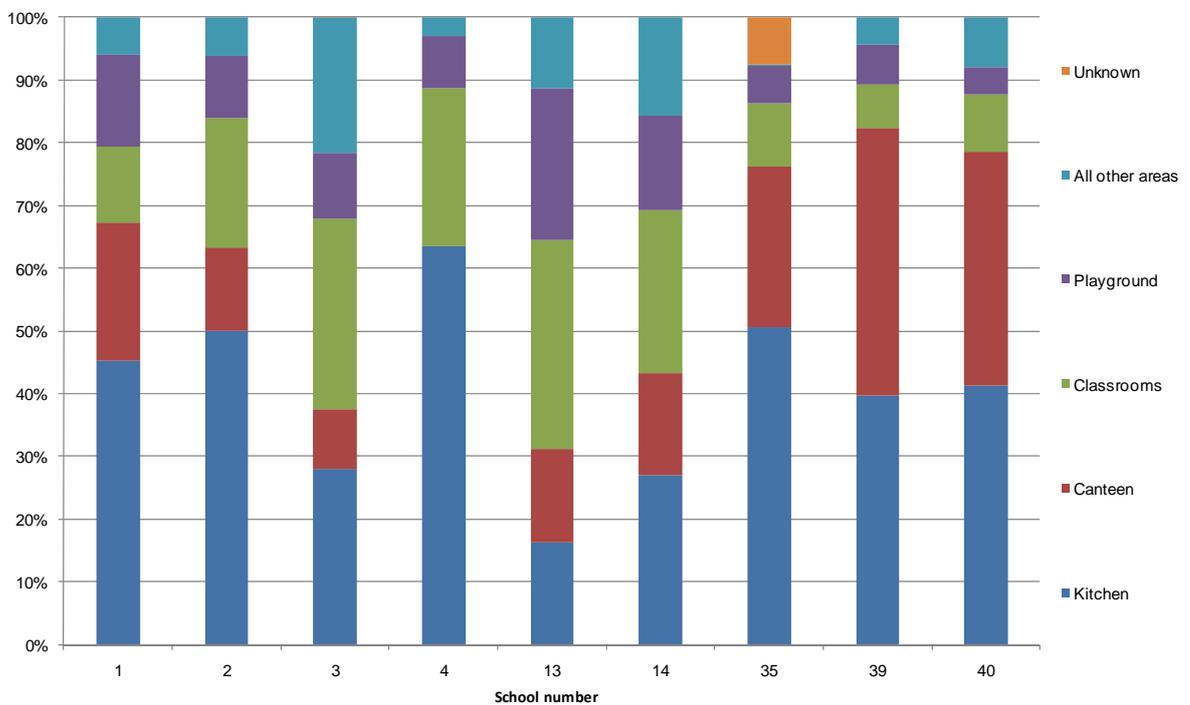## Food waste by point of origin for each school

The following two figures (9 and 10) present the proportion of food waste that was generated in each area of the school at the individual school level.

Figure 9: Primary school food waste by area in school (% weight)

Source: Chart created by Resource Futures

Figure 10: Secondary school food waste by area in school (% weight)

Source: Chart created by Resource Futures

As we would expect to see at the individual school level, figures 9 and 10 above show that the majority of food waste is generated in the kitchen and canteen areas of the school. Classrooms and playgrounds account for varying amounts of waste by individual school in primary and secondary schools.

Appendix 5: Delegates to the stakeholder day

Organisation	
Food for Life Partnership	Chartwells
Schools Food Trust	Islington Catering Contracts Manager
Local Authority Catering Association (LACA)	Groundwork UK
Croyden Council Catering (&LACA)	Global Action Plan
Surrey Commercial Services (&LACA)	B&NES Council
London Metropolitan University	B&NES Catering Service Team
Wastewatch	The Learning Trust, Hackney
DCSF	NUT
London Borough of Islington Council	Randal Cremer School
Bath and North East Somerset Council	Caterlink
Hackney Council	Sustainable Development Commission
Defra	Keep Britain Tidy (eco-schools)
The National Association of School Business Management	Defra - Sustainable Food Procurement
Suffolk County Council	
Good Food Training for London	

Appendix 6: An investigation of the opportunities and barriers to re using left over food in school – telephone interviews undertaken

School Caterers

Local authority	Type of catering	Type of school
E Riding	Contract caterer	Secondary
E Riding	Contract caterer	Secondary
Islington	Local authority	Primary
Islington	Contract caterer	Secondary
Bath NE Somerset	Local authority	Primary
Bath NE Somerset	Local authority	Primary
Hackney	Local authority	Primary
Hackney	Direct catered	Primary
Enfield	Local authority	Primary
Enfield	Local authority	Secondary
Bristol	Contract caterer	Secondary
Bristol	Contract caterer	Primary
Cumbria	Direct catered	Secondary
Cumbria	Direct catered	Primary

Catering commissioners and Catering Providers

Local authority	Type of service
Durham	Centrally procured private contractor
Enfield	Local authority catering
Enfield	Local authority catering
Islington	Centrally procured private contractor
Islington	Contract caterer
Hackney	Local authority catering
Hertfordshire	Local authority catering
Birmingham	Local authority catering
Tameside	Local authority catering
Bath NE Somerset	Local authority catering
Torbay	Centrally procured private contractor
Torbay	Contract caterer

Other Agencies

Local authority	Role	
Bath NE Somerset	EHO	
Tameside	EHO	
Tameside	Trading standards	
Enfield	Recycling team	

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Appendix 7: interventions: summary of data received

Table 11: Summary of data returned from each school

School code	Canteen				Kitchen			
	Compositional g/pupil/day	Intervention period (first 3 weeks) g/pupil/day	Change	Trend during intervention	Compositional g/pupil/day	Intervention period (first 3 weeks) g/pupil/day	Change	Trend during intervention
Improving familiarity and appreciation of school meals								
School 28	84.21	55.32	-34%		66.16	35.30	-47%	
School 11	no data				no data			
School 42	no data			increase	no data			decrease
School 13	18.63	33.26	+79%		20.09	63.57	+216%	
Improving the dining experience								
School 4	no data				no data			
School 23	49.38	73.86	+50%	decrease	49.05	25.81	-47%	decrease
Just weighing								
School 1	21.14	25.40	+20%		43.31	23.53	-46%	
School 5	35.63	48.80	+37%		33.90	29.48	-13%	
School 2	24.12	66.72	+177%		90.52	92.16	+2%	
Meals cooked to order								
School 34	65.38	36.68	-44%	decrease	67.08	29.60	-56%	decrease
School 12	34.26	103.66	+203%		6.86	27.43	+300%	
School 43	no data				no data			
School 10	168.93	122.73	-27%		96.04	75.14	-22%	
School 44	no data				no data			
School 30	42.12	55.14	+31%	decrease	34.56	no data		

Appendix 8: Intervention specific case studies

Meals Cooked to Order Intervention

This intervention has the potential to reduce waste in the kitchen as the cooks know in advance how much of each dish to prepare and so un-served food would be reduced, and also has the potential to reduce waste in the canteen as the children are more likely to be eating their choice of meal. One may expect to see a step change, and also a gradual change during the intervention as pupils get more used to interpreting the menus to select their preferred option, and the cooks increase in confidence and cut down on 'insurance' portions.

In this intervention group, three schools out of six had changes in their food waste arisings during the intervention. Where the location of the changed arisings was discernable, this was seen to be a decrease in canteen waste.

School 34 - Primary
School 34 used the wrist bands to enable pre-ordering of meals.
Only 4 weeks of weight data were provided by this school, which make trends less easy to discern. However it would appear that canteen waste was following a downward trend, and decreased from 41 to 32 g/pupil/day (20%). From this data it is not possible to see the point at which the arisings level off once implementation of the intervention is complete.

Kitchen waste did not change so much, and the R^2 value of the trend line is on the border of being considered valid (by the criterion of analysis used here).
Un-served food at this school is served as seconds, so kitchen waste is from preparation only. This could therefore explain why the kitchen waste arisings are not as changed by this intervention at this school.

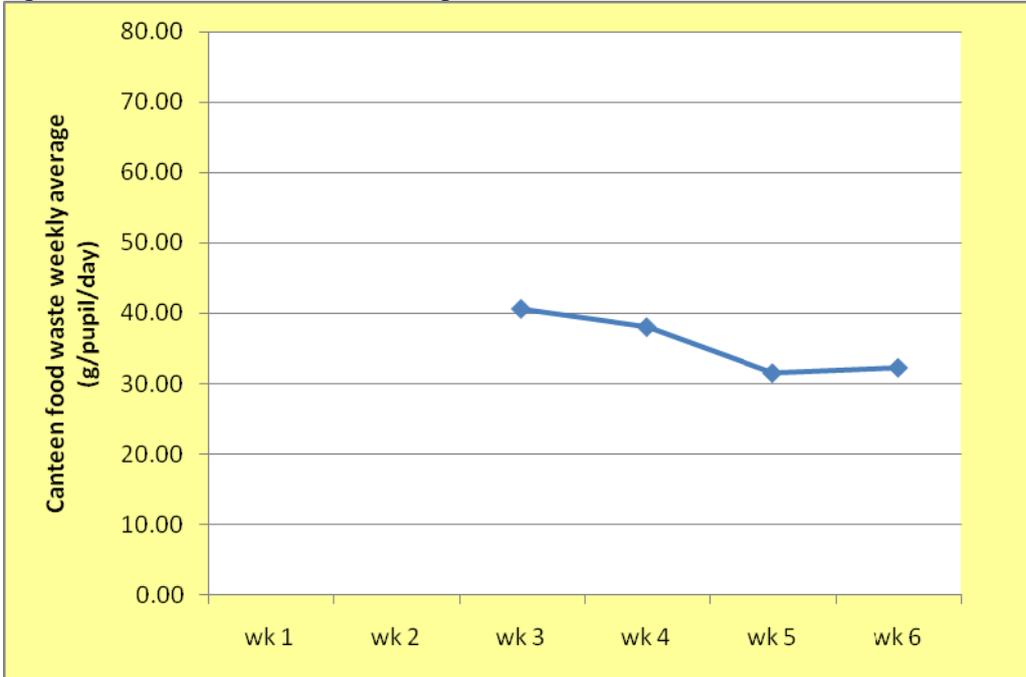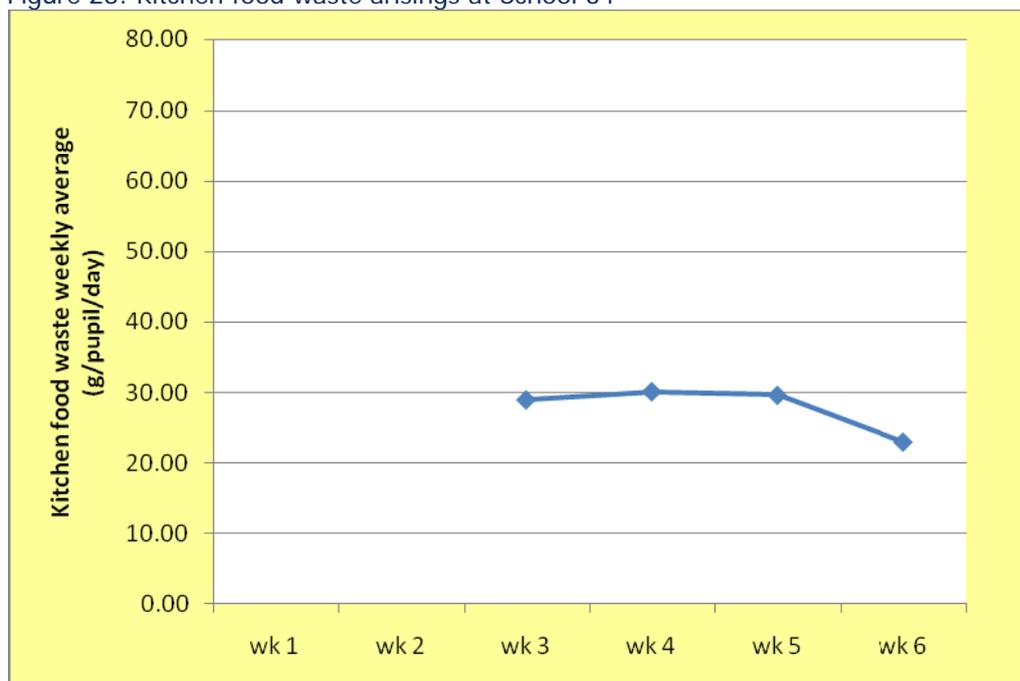Figure 27: Canteen food waste arisings at School 34

Figure 28: Kitchen food waste arisings at School 34

Five teachers from this school participated in the post-intervention attitudinal survey. Three of these thought they had unchanged levels of concern about food waste, and the other two had slightly increased levels of concern.

Prior to the launch of the intervention this school had no systems in place for pupils to order a school meal – in the other schools pupils were already indicating each morning / week whether they were having school dinners or packed lunches. As a result the school had ongoing problems keeping track of which children had eaten school meals and which parents to charge, and was often left covering the costs of meals for which parents did not pay. While this situation meant that the school had extra challenges when sorting out the logistics of the meal-ordering system, it also meant that the Business Manager was highly committed to implementing the system in order to save her team time and the school money.

Learning points

■ Setting up the intervention takes time and commitment from a wide range of staff and involvement of pupils and parents
■ The commitment of the school management was important

School 43 - Primary

School 43 used the wrist bands to enable pre-ordering of meals.
The waste arisings from this school appear to fall during the intervention period, from 72 g/pupil/day to 44 g/pupil/day, a fall of 38%. From this data it is not possible to see the point at which the arisings level off once implementation of the intervention is complete. This school did not provide separate data for kitchen and canteen waste, and weighed waste for 4 weeks of the intervention.
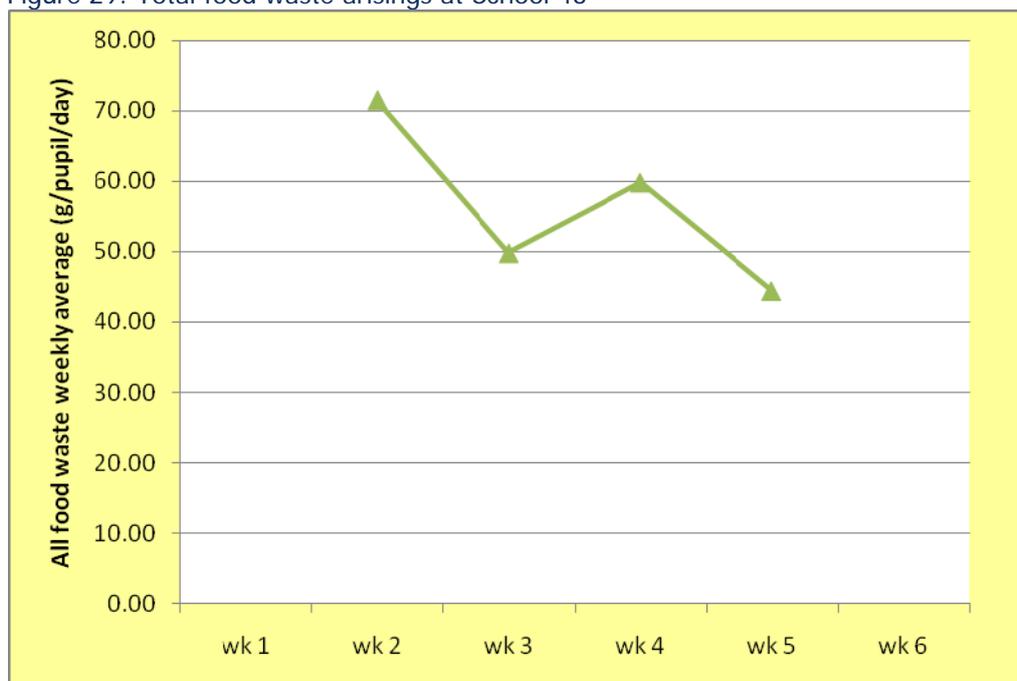
Although this school did not complete the attitudinal survey the feedback from the head has been very positive and 3 MMS staff completed the feedback form. The school received communications support.

The whole staff, led by the Head teacher, worked particularly hard on the pre-booking system for meals. Pupils were encouraged to order their meal choice in the morning and a lot of effort was put into ensuring that the layout and design of the menus were clear and that they were accessible to pupils. The catering staff also gave a day's advance warning on the 'roast dinner' day and pupils were encouraged to give an indication of whether they would be ordering a school dinner so that the cook could defrost an appropriate amount of meat overnight.

Learning points

- The leadership of the Head teacher in making sure that it was easy for pupils to use the system.
- The active involvement of the MMS staff.

School 30 - Primary

School 30 used the wristbands to pre-order meal choices and in addition they also provided tasters for pupils and staff, and got feedback from pupils on school meals.

School 30 only provided weights of canteen waste arisings. Of the 4 weeks' data supplied, the canteen waste fell from 58 g/pupil/day to 46 g/pupil/day, a decrease of 20%. From this data it is not possible to see the point at which the arisings level off once implementation of the intervention is complete.
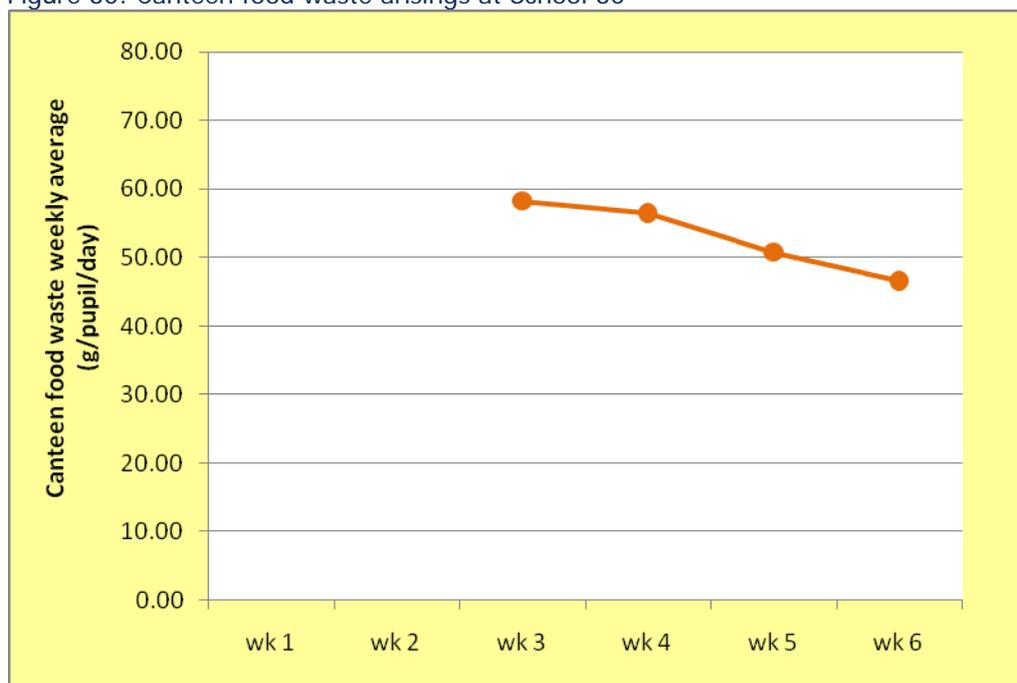
The deputy head-teacher at this school participated in the post-intervention survey. No comparison of the situation pre-intervention was possible, but they did say that their level of concern about food waste had increased a lot. The deputy head at this school did attend the stakeholders' day and has been very involved in the project at every stage. They are an example of the importance of support from the school management.

Learning points

■ The school combined the wristband system with providing tasters and pupils' feedback on menus.
■ The deputy-teacher played an active roll in supporting the intervention and the project as a whole.

Improving Familiarity and Appreciation of Meals Intervention

School 42 - Primary

School 42 participated in almost all of the suggested ways to improve the familiarity and appreciation of school meals. The school gave out tasters for pupils and staff, rewarded pupils for trying new foods, obtained feedback on the meals from pupils, and shared recipes with and gave tasters to parents.
The school worked with their catering company to organise a day of tasters for staff and pupils to launch the new menu which was to be introduced after the intervention period. In planning the taster day the menu was shown to the School Council and pupils highlighted dishes which they thought sounded unappealing (Moroccan stew with apricots, home-made fish fingers and chocolate and beetroot cake.) On the taster day children and staff were invited in groups to taste small amounts of each of these dishes, after they had eaten their normal meal. The head teacher reports that children having both school meals and packed lunches responded with great enthusiasm, as did many staff who did not normally try school meals

At the suggestion of pupils, another 'taster' method was introduced on a regular basis. Food that was un-served at the end of the lunch period, which was previously served as seconds, was offered to pupils who normally have packed lunches (after they had eaten them_, to see if they would be interested in having school meals. The head teacher describes this as a success, with very little food uneaten, so it is unlikely to have contributed to increased canteen arisings.

Canteen waste appeared to increase during the intervention period, from 23 g/pupil/day to 49 g/pupil/day.

Kitchen waste however decreased, from 12 g/pupil/day to 0.4 g/pupil/day. This is very low indeed, and is from the final week of term for which there are data from 3 days only. The previous week's kitchen arisings were 3.3 g/pupil per day. This is a 73% reduction in arisings compared to the first week of the intervention. The data here does not show a levelling off, which means that the effects of the intervention were not fully felt by the time the weighing stopped.

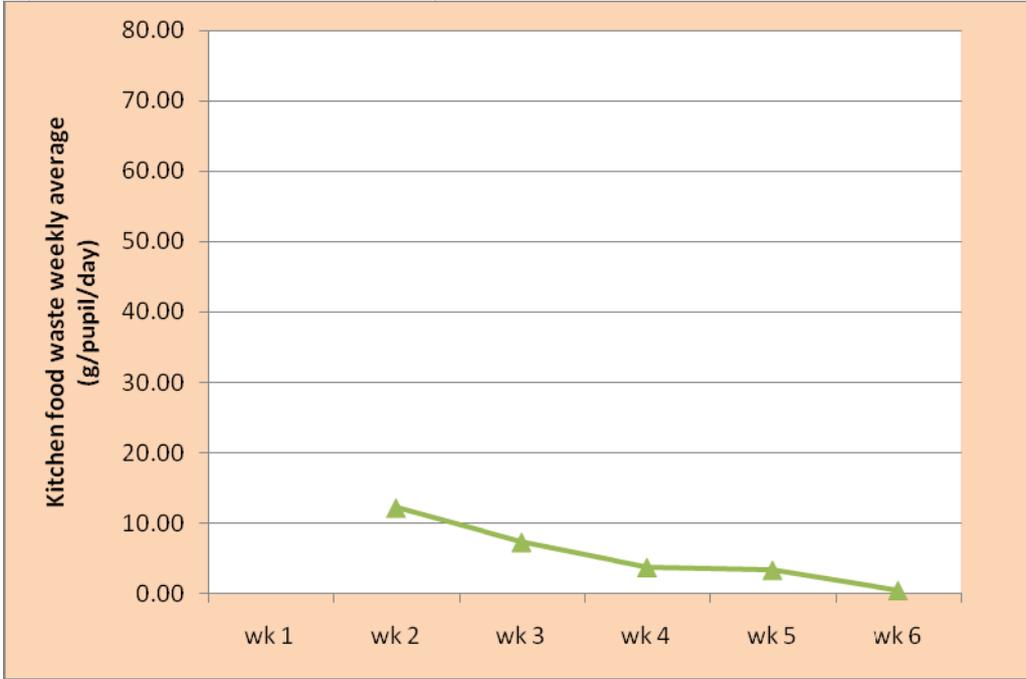Figure 31: Canteen food waste arisings at School 42
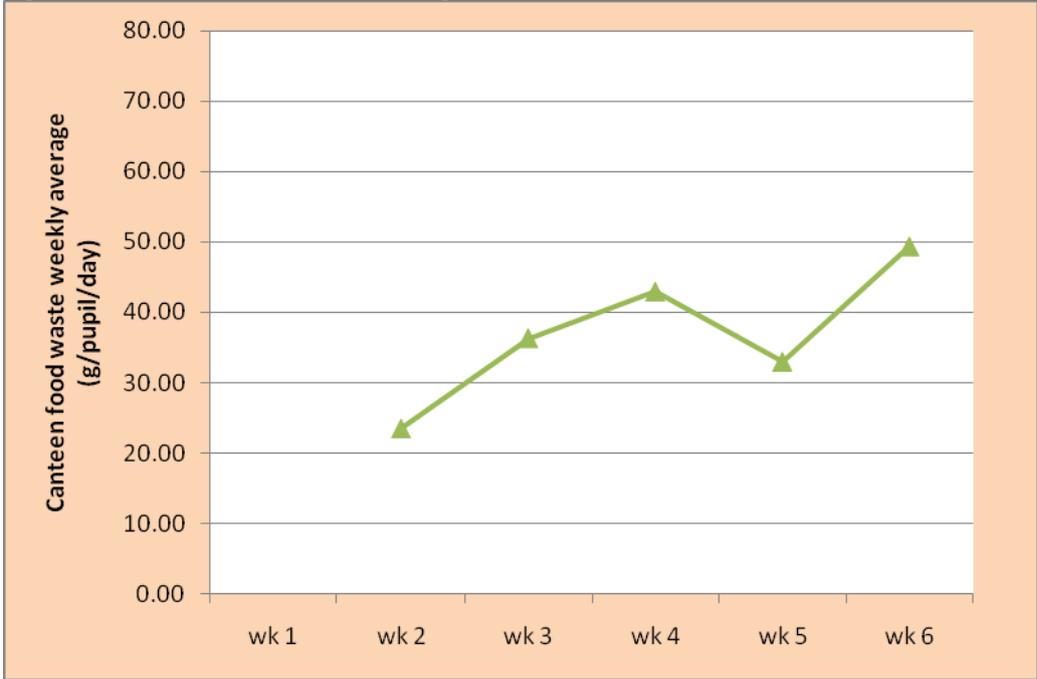
Figure 32: Kitchen food waste arisings at School 42

School 42 participated in the post-intervention attitudinal survey only, so comparison to pre-intervention is not possible. Their perception of how their level of concern about food waste had changed was similar to all those who had participated in an intervention.

The reason why the interventions may have had an effect on waste arisings at this school and not the others in this intervention group are:

■ This school did five of the six suggested activities, whereas the other schools did fewer.

■ The Head's feedback was very enthusiastic and probably explains why they undertook so many of the intervention activities.

■ One of the other schools (School 13) did not really engage with the intervention, and just did one of the suggested activities and not in much depth. One of the other schools (School 28) had general food quality issues and the motivation of kitchen staff was low at this time.

■ School 28 also did tasters, but they were of next term's menu.

■ The final school doing this intervention (School 11) did two intervention activities, but also used wristbands to pre-order meals. Pre-ordering meals appears to have potential to decrease canteen arisings, whereas School 42 had increased canteen arisings. It may be that the combination of interventions had the effect of cancelling each other out in School 11.

Learning points

■ The need to combine a number of activities

■ The importance of leadership from school management to ensure that all staff actively participate

■ The importance in involving pupils in the design of activities

■ The importance of including staff in 'taster' sessions.

Improving the Dining Experience Intervention

School 23 – Primary

School 23 did work on shortening dining room queues, and also sought feedback from pupils and parents on the menus, as well as a broad range on lunchtime issues including the cutlery. This consultation was underway before the start of the official intervention period. Their main emphasis however was on improving the dining experience.

The school consulted with parents and children, and found that meals composed of meat and vegetables were not popular; pupils much preferred jacket potatoes and baguettes. During the trial period the cook therefore adjusted the proportions of the meal options she prepared. For example, with 265 pupils having school meals she used to cook about 7kg of meat (approx 140 portions); she now cooks 2.5kg (approx 50 portions). She is preparing a correspondingly higher number of baguettes and jacket potatoes, which produce less food waste during the preparation stage.

School 23 provided weights of canteen and kitchen waste during the intervention period, but also continued with the intervention changes that they'd implemented into the next term, and so continued to weigh food waste.

Canteen waste did not have an apparent direct trend during the main intervention period, but with the additional weighing period included, it can be seen that arisings decreased from 80 to 36 g/pupil/day, a fall of 55%. It seems that the decrease in waste arisings from the canteen was slowing through the weighing period.

Kitchen waste decreased from 34 g/pupil/day to 12 g/pupil/day a decrease of 65% during the main intervention period, and continued to fall in the next term to 10 g/pupil/day. It seems that the decrease in waste arisings from the kitchen was slowing around halfway through the weighing period, and may have levelled off.

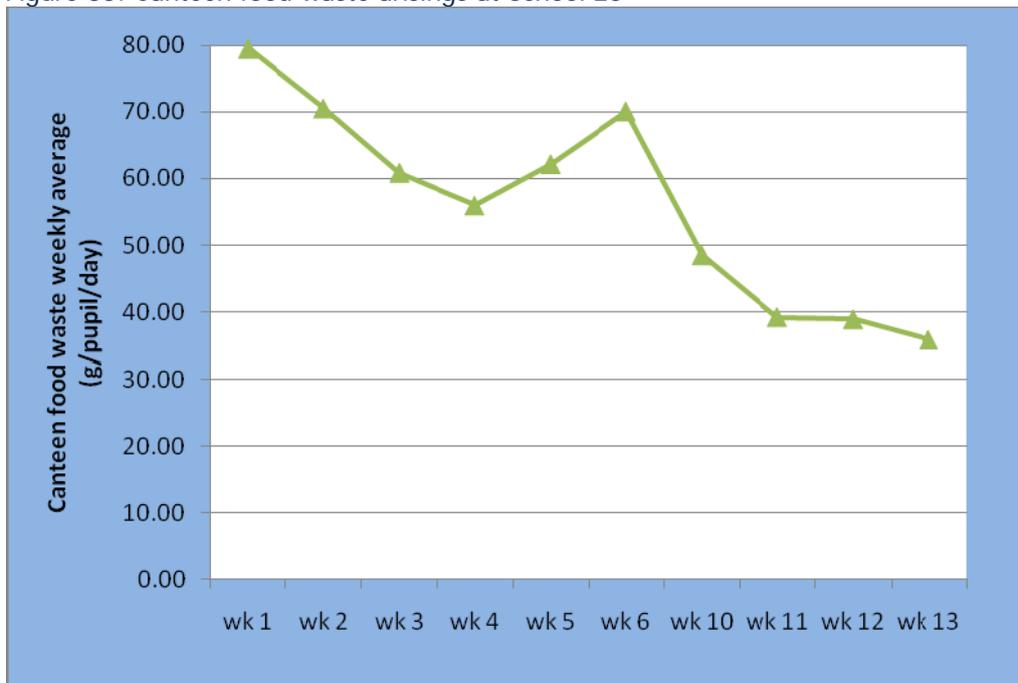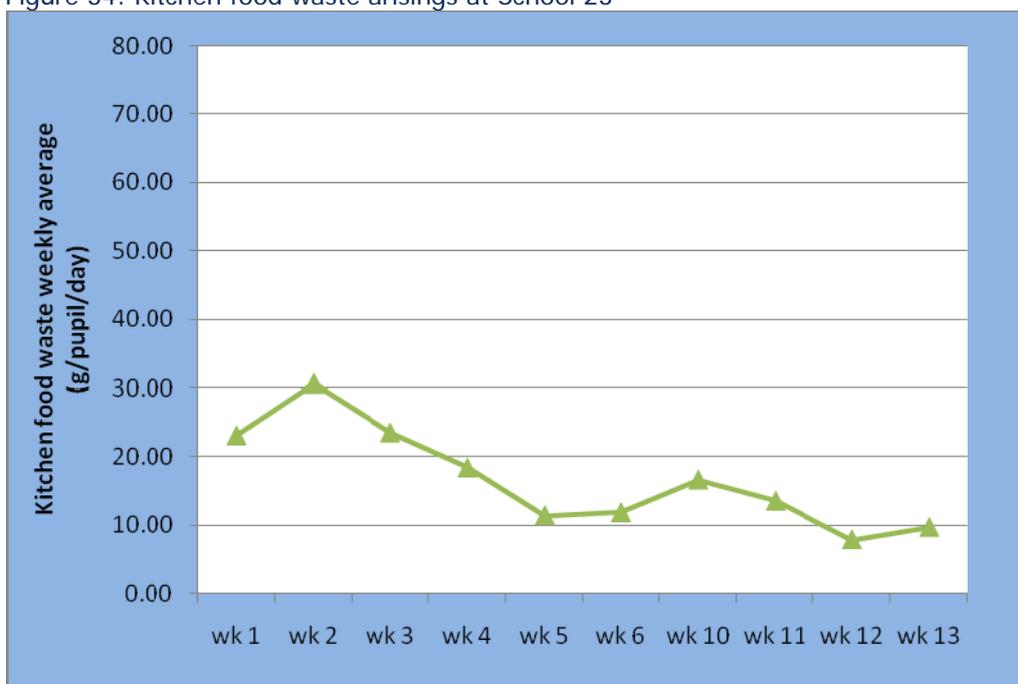Figure 33: Canteen food waste arisings at School 23

Figure 34: Kitchen food waste arisings at School 23

A range of staff from School 23 participated in the pre-intervention attitudinal survey, but not in the post-intervention survey, so no comparison has been possible.

School 23 is a primary, whereas the other school doing this type of intervention was a secondary. A smaller school with younger children could be an easier setting in which to implement changes. The consultation regarding menus has resulted in the kitchen preparing fewer hot dinners (meat, potatoes and vegetables), and more meals such as baguettes and jacket potatoes. Preparation of baguettes and jacket potatoes involves generating less food waste, and this could be the reason for the decline in kitchen waste.

Consultation around cutlery has revealed that the currently knives are not sharp enough to cut through meat and jacket potato skins. Jacket potato skins are consequently being thrown away, contributing to canteen waste. Replacement of the knives have been ordered, and when they are in use the school say they will continue to monitor the effects of waste arisings.

Learning points

■ Although the intervention was about improving the dining experience the major impact appears to have come from changes to the menu following feedback from pupils.

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