Development of the Zero Heroes Program in the London Borough of Croydon

An Interactive Qualifying Project Report
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Abstract

In order to promote sustainable travel to school, Croydon Council is working with Norbury Manor Primary School to introduce Zero Heroes: a program encouraging all students to walk to school on June 15th, 2012. Utilizing academic research and interviews with experienced staff in similar programs throughout London, the WPI team identified and compiled the key components for a successful walk-to-school program and applied them in the formulation of Zero Heroes - including recommendations for continuing the program in future iterations.

Acknowledgements

Our team would like to thank our sponsor, Croydon Council, for providing us with the exciting opportunity to work on this project. We would especially like to thank our sponsor liaison, Peter McDonald, for providing us with the guidance, advice, and resources necessary for success while working on this project. We also would like to thank Linda Johnson and Clive Simmonds of the Croydon Council Pollution Team for the information they provided and their willingness to help with the Zero Heroes program, especially with components relating to educating students about air quality.

Additionally, we would like to thank Jo Hill, Tannith Cattermole, and Ali Lin for making time in their busy schedules to speak to us about programs they have been involved in. Their advice was valuable in augmenting Zero Heroes for maximum effect.

We would like to thank Hena Ahmad for being extremely helpful as a contact point at Norbury Manor Primary School. Not only was her feedback useful in refining and verifying our ideas for the Zero Heroes program at the school, but her willingness to assist us in the implementation and distribution of materials was greatly valued and appreciated.

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Authorship

This report was developed through a collaborative effort by all members of the project team: Erin Agar, Christian Iamartino, Caitlin McMahon and Christian Mortensen. All sections were developed and edited as a team, with equal contributions made by each member to the project.

Executive Summary

London is a vibrant, multicultural metropolis that boasts one of the most advanced public transportation systems in the western world. However, this impressive system is not perfect, and problems arising from transportation, such as air pollution and road safety, are at the forefront of London's public and governmental concerns. These issues are especially evident when dealing with school-related traffic: a problem which not only strains London's roadways during drop-off and pick-up times, but also proves to be a worrisome hazard for student pedestrians.

In November of 2011, a group of project coordinators and council staff from throughout London, known as the London Sustainable Schools Forum, convened to draft an exciting and educational new program to solve the problems of school-related traffic and poor air quality through the promotion of sustainable school travel methods on one day. This program, originally titled "Zero Heroes and Bubble Day", focused on gaining support for one day, June 15th, 2012, when all students at a chosen primary school in each of the participating boroughs would walk, cycle, or scoot. Events were planned for the months leading up to the day, including student air quality monitoring and school assemblies dealing with the impact of poor air quality on the environment. Norbury Manor Primary School was selected to be the pilot school in the London Borough of Croydon by Peter McDonald (Travel and Transport Planning Officer at Croydon Council), the chief coordinator of the program there.

During their time working with Croydon Council on this program, the WPI team researched effective methods for changing environmentally-related behaviors through literature and interviews with heads of similar programs. One of the first things that was found in the program implementation research was that in order to develop popular interest in the Zero Heroes program, the team needed to create a number of promotional materials, such as posters and news articles. We therefore designed a set of posters that targeted different audiences. For example, a poster titled "Say NO to NO_2" was aimed at older students (years 5 and 6), who would be more likely to understand the play on words. We designed a number of other advertisements to be included in the Croydon Council magazine and website, as well as the school's newsletter, to reach more people.

In order to directly involve students in the Zero Heroes program, the team prepared two assemblies to be presented at Norbury Manor Primary. The first one consisted of a skit acted out

by students at the school, which presented the benefits of walking, and in contrast, the negative aspects of being driven to school. This skit was followed by a brief, team-mediated query session which served to better advertise Zero Heroes. The second assembly, which has not yet been run at the release of this report, will focus on the story of the peppered moth, highlighting the effects of air pollution on plants and animals. It, too, plans to make use of student actors to present a brief performance which will engage children by having them listen to their peers.

Competitions were found in research literature to be another effective way of gaining participation in a school program. In addition, many of the interviews that were conducted with coordinators in similar sustainable travel programs informed us that competitions would be enjoyed by students and parents alike. The Peppered Moth assembly will kick off one of two competitions planned to enhance participation in the program. This "Peppered Moth competition" will have each class create a dark-colored paper moth, which will then be posted in the classroom. Each time a student walks to school, they will gain a white sticker, which they can place on the moth, making the moth lighter and representing their contribution to reducing air pollution. This competition possesses a two-fold encouragement factor; it possesses a set of prizes that the class can win, but also shows each student the importance of his or her individual contribution in helping the environment.

The other competition, which has already been initiated at Norbury Manor Primary School, is the "Design a Zero Hero Competition." Students were asked to design and draw what they believe a Zero Hero would look like and to give a brief description of their hero. This design competition allows students to be creative and have fun with the Zero Heroes concept, and because our supporting research showed that something that is made to be personal will incite responsibility, the design competition ties in perfectly to our goals and objectives.

In addition to the competitions, we developed designs for several customized incentives to further encourage participation in Zero Heroes activities. For instance, students who walk to school at least once during the week leading up to Zero Heroes Day will be awarded with a small badge in the shape of a right foot. Students who walk on Zero Heroes Day will get a left foot badge with a different pattern to make a complete pair. Each class will also be receiving one or two kickballs emblazoned with the Zero Heroes logo, which will seek to remind them of their participation in Zero Heroes and elicit interest in the program - even when the program is not in session.

Zero Heroes Week will additionally have a variety of activities to build up excitement for Zero Heroes Day. After initiating the program on Monday with an introductory assembly, the events will continue on Tuesday with Road Safety Day, where students will dress up in bright colors and learn about road safety. Wednesday will be Air Quality Day, when a member of Croydon Council's Pollution Team will give a demonstration of air quality monitoring equipment and speak about how driving to school impacts air quality. On Thursday, Activity Day, Zero Heroes kickballs will be unveiled and the students will have an extended recess to play one or more ball games, emphasizing aspects of physical activity.

Finally, the culmination of Zero Heroes Week will be Zero Heroes Day – a day where students will be able to dress up as Zero Heroes. A breakfast will be provided for parents, students, and teachers, supported by donations from local stores. Additionally, there will be a poster for attendees to write their thoughts about the day as a means of providing feedback to the Council that will be useful for future iterations of the program.

To ensure the program's sustainability after our departure, the team created an action plan for both the school and for Peter McDonald (Travel and Transport Planning Officer), our sponsor liaison at Croydon Council. This action plan details what to do, when to do it, and any supplemental materials required before each of the planned events. The Zero Heroes team also developed several recommendations for improving and expanding Zero Heroes in following years, which could also be applied to any similar school travel program. A general list of recommendations follows:

- An external coordinator should be appointed to manage the program across participating schools.
- All participating schools should identify at least one student leader in each classroom to promote the program at the class level.
- Each participating school should also identify a teacher or staff member to act as the champion and head the program at the school.
- A school play is an excellent way to present the program to the parents of the students.
- A long-term buildup of activities to Zero Heroes Day, through both lessons on related topics and school activities or trips, will make the day itself more successful.
- Embedding Zero Heroes in a school's long term plans will greatly enhance its chance of being run again during the next year.

- Two separate assemblies are needed to address the age difference between Key Stage 1 and Key Stage 2.
- Directions to the school must be as detailed as possible to minimize confusion, easing the extra work that the teachers and administrators must complete to ensure that the school follows the underlying vision behind the project.

In conclusion, the provisions developed by the team will actively support Croydon Council in the goal of achieving 100% participation on Zero Heroes Day. It is our hope that this program will contribute to improving air quality, road safety, and traffic congestion in the Borough of Croydon to the benefit of citizens in Croydon and London beyond. In addition, our Zero Heroes program can be used as a model to facilitate the implementation of walk-to-school programs in other schools.

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1. Introduction

Twenty-first century London is a densely populated urban area which hosts a number of traffic-related problems. The large numbers of vehicles on the city streets cause heavy road congestion, especially during rush hour (Transport for London, 2012). This congestion leads to substantial quantities and concentrations of vehicle exhaust entering the atmosphere, resulting in a serious air quality issue which concerns both citizens and city officials alike. According to a web survey conducted by the Greater London Authority in 2008, 57% of responders stated they were affected by poor air quality in a variety of symptomatic ways, including respiratory problems such as asthma (Greater London Authority). Children are especially vulnerable to the effects of poor air quality, as are people living near busy roads (especially roads that are commonly congested to the point of start-stop driving), where higher concentrations of air pollutants exist (Greater London Authority).

Road congestion also causes a number of pedestrian-related safety concerns for all citizens, but most importantly children. The traffic jams that occur while parents drop children off at school lead to violations of traffic rules and endanger other motorists and schoolchildren crossing streets (see Appendix III: Interview with Hena Ahmad, Norbury Manor Primary School Parent Liaison).

To combat this lack of safety and the widespread air quality problems, programs have been launched to encourage sustainable travel to school – via methods such as walking, cycling, or scooting. Walk Once a Week, run by Living Streets, is a program in which children who walk at least once a week per month earn a collectible badge (Wavehill Consulting, 2009). Sustrans Heroes, run by the nonprofit organization Sustrans, involves students in various cycling activities relating to the Olympics and Paralympics by awarding gold, silver, and bronze medals to students who earn a certain number of points through participation. Bike It and a related once-per-year event, The Big Pedal (also run by Sustrans) encourage children to cycle to school by holding an interschool cycling competition that totals the journeys traveled by all students on bicycles or scooters (*Bike It - Sustrans*).

Zero Heroes, the focus of this Interactive Qualifying Project (IQP), is a new program that aims to create a "bubble" of clean air around each participating school on June 15th, 2012 – a day which will have no school-related automotive traffic or emissions (*Project Summary: Zero*

Heroes and Bubble Day). Norbury Manor Primary School, located in north-west Croydon, was selected by Croydon Council to pilot the program in the borough. Although originally, four boroughs intended to participate in Zero Heroes, ultimately only two schools: Norbury Manor Primary and Christ Church Bentinck Primary in Westminster, will be having a Zero Heroes Day in 2012.

The aim of our IQP was to develop a set of essential components that could be used to create successful walk-to-school programs, and then use those principles to implement the Zero Heroes program at Norbury Manor Primary. To do so, the team analyzed previous sustainable school travel programs, both through library research and by interviewing staff involved in organizations that had run such programs. We surveyed students and parents, interviewed the school's parent liaison, and observed morning and afternoon school traffic at Norbury Manor Primary to assess the state of transportation there. From the data gathered, the team established a set of components needed to run a successful program, and created materials and plans to fulfill those components in the context of Zero Heroes. These materials included two competitions to evoke excitement and participation in the build-up to Zero Heroes Day, as well as incentives to encourage walking, cycling, or scooting during the week of Zero Heroes in June. To advertise the program, we created several different motivational posters to persuade the students that traveling sustainably to school is a laudable and enjoyable goal. We also left both the school and our sponsor with a calendar detailing when to take additional actions, such as ordering incentives or having students write to local grocery stores asking for donations of food. Together, these plans and materials are a near-complete package that can be reused year-to-year and expanded to other schools without requiring a large expenditure of effort.

2. Background

2.1 Introduction

As the largest city in Western Europe and the administrative and financial capital of the United Kingdom, London naturally faces a number of difficulties related to travel and transportation. Traffic congestion, a result of the city's high population density and personal vehicle usage, is a significant problem that has never been fully remedied. This congestion is detrimental to road safety and causes high amounts of air pollution in the city and surrounding boroughs. Encouraging more sustainable methods of travel such as walking or cycling is therefore a high priority for city officials. In order to promote these alternative methods, many organizations have chosen to target the younger generations which are more susceptible to behavior change than their elders. For example, there are many programs focusing on the manipulation of student travel behavior on journeys to and from school. However, while some methods such as cycling and walking have been heavily emphasized individually, they have yet to be fully combined in one all-encompassing program.

2.2 The Nature of the Problem

2.2.1 London's Traffic Problem

The large volume of vehicles on London roads strains the capacity of throughways within the Capital. Three major "ring roads" and the interchanges that connect them combined serve an average of 30,000 vehicles each day. Seventy-nine percent of this daily load is made up of small vehicles such as personal cars and taxis (Transport for London, 2012). Congestion resulting from small vehicles is found to be especially prevalent during school drop-off and pick-up times. The need for parents to quickly stop to drop off their children in the morning, and the need to find parking spots in order to pick up children in the afternoon, seeks only to slow traffic down – especially on residential streets not designed for high-volume traffic flow. However, these school-related traffic jams do not have to exist. According to the Road Safety Team at Croydon Council, most schoolchildren in Croydon live less than two miles from their school, however, parents driving their children in the morning contribute a surprisingly large portion (about 20%) of all morning rush hour traffic. (Croydon Council, 2010G); (Wavehill Consulting, 2009). To

alleviate this large percentage of traffic, it is suggested that students find alternative means of getting to school.

2.2.2 The Issue of School Safety

Increasing the number of students walking to school could help to improve congestion and road safety in London, especially around schools. However, the densely packed, labyrinthine streets of urban London undermine sustainable travel programs. According to Transport for London, there were 5,400 total pedestrian injuries, fatal or otherwise, in 2010. This total was second only to automobile passenger injuries (Transport for London, 2011). Children are not exempt from this figure – in fact, one out of every fifteen children will experience a potentially fatal accident before their 16th birthday (Jowett, 2000).

As a result of heightened traffic levels, parents attempting to drop off or pick up their children at school do not always obey the rules of the road, making areas around London schools unsafe for students. Hena Ahmad, parent liaison at Norbury Manor Primary School, reported that parents dropping off their children often stop on zig-zag street markers in front of the school, sometimes even stopping in the middle of the road, obstructing thru-traffic. Both of these are forbidden by law, and not only pose a threat to young pedestrians, but also cause serious traffic flow problems. For example, vehicles taking unusual paths to avoid these obstructions can surprise unwary pedestrians, potentially causing fatal accidents. Observations by the project team at Norbury Manor Primary School revealed that of the 92 cars that passed by the school during one morning drop-off period, one-third violated traffic rules, including: making three-point turns on a congested road, parking on zig-zag lines, and stopping in the middle of the street. If more children walked to school, not only would congestion decrease, but cars that did arrive at the school would be less obstructed by fellow motorists and there would be less need for dangerous traffic violations, therefore increasing safety levels for school pedestrians.

2.2.3 Air Pollution in London

Vehicular air pollution is another serious problem which plagues metropolitan areas within the UK, especially within London. An estimated three million privately owned small vehicles are registered in the Greater London Area, and although measures have been taken to reduce the number of pollutants released by these small vehicles, their sheer number alone

generates significant amounts of air pollutants such as NO_2 (nitrogen dioxide) and PM_{10} (particulate matter smaller than ten microns in diameter) (Office for National Statistics, 2012). Because as much as 20% of the morning traffic is school related, a reduction in the number of small vehicles travelling to schools would remove a large portion of vehicular pollutants from London's air.

A breakdown of the air pollutants in London shows that 67% of PM_{10} and 41% of NO_x present in the London area can be traced back to vehicles (London Assembly Environment Committee, 2009) (See Figure 1). Furthermore, Clive Simmonds, a member of the Croydon Council Pollution Team, stated that if all small vehicles were removed from London roads, air pollution would be reduced by approximately half (see Appendix IV: Interview with Linda Johnson and Clive Simmonds, Croydon Council Pollution Team).

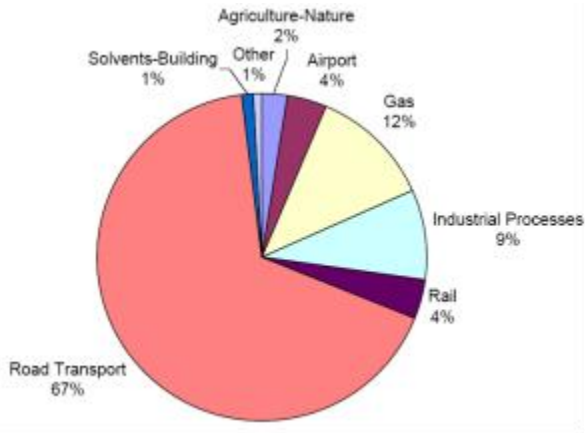

Figure 1: Sources of PM_{10} emissions in London in 2003 (London Assembly Environment Committee, 2009).

Vehicular air pollution does not only manifest itself as an orange haze which mars London's skyline, it also causes negative health effects in the local populace. Fifty-seven percent of Londoners surveyed in 2008 reported being affected in a negative way by poor air quality, with symptoms ranging from increased coughing to more serious conditions such as asthma (London Assembly, 2009). Vulnerable groups, including children, the elderly, and those with cardiopulmonary conditions, as well as those living near busy roads, were among the most affected (Greater London Authority). While it is difficult to judge exactly how many deaths are directly caused by noxious air, estimates from 2008 state that between 3,000 and 5,000 premature deaths in the Greater London Area were attributable to poor air quality conditions

(London Assembly, 2009); (Miller, 2010). Therefore, a decrease in private car use would be very helpful in improving London's air quality and reducing the danger to its inhabitants. However, to achieve such a change, investigation into the psychological aspects of behavior change is needed.

2.3 Behavior Change Techniques

In any program that seeks to change people's behavior, including Zero Heroes, there are a number of design factors to consider in order to maximize the program's effectiveness. Before a selection can be made on what factors need to be addressed, we must first understand why humans behave the way they do. The theory of planned behavior, put forth by Icek Ajzen (Professor of Psychology at the University of Massachusetts), connects behavioral decision making with three major factors: what the subject thinks, what the subject perceives others to think, and how much control the subject believes it has over a situation (Hargreaves, 2011). As such, there are multiple components to consider when attempting to influence people's decisions, and each of these components must be addressed to some degree. Programs such as Zero Heroes should seek to address matters of student knowledge, peer influences, and perceived ability to change. However, programs often cannot merely seek to solely change *attitudes* without inciting corresponding changes in *behavior*. Arbuthnott states that if leaders of large institutions can be convinced of the value of a certain behavior change, it can result in interactions and policies that cause behavior change to trickle down through the subordinates (Arbuthnott, 2009). In order to increase the number of walking students, Zero Heroes must address all of the aforementioned factors in order to target both behavior change and attitude.

Behavior change campaigns should also be sure to target a specific behavior rather than simply disseminate information. It has been found that programs related to sustainable development, (i.e. programs seeking to increase walking) are more effective if they present case studies and develop specific and well-defined class exercises based on documented behaviors (Arbuthnott, 2009). According to Jo Hill, Programme Manager, Education, at Sustrans, class exercises are a good way to engage students and teachers in sustainability issues and ensure these issues remain incorporated in school curricula (see Appendix V: Interview with Jo Hill, Sustrans). One way to ensure these topics remain embedded in the system is to incorporate the idea of personal responsibility in causing a problem. For example, educating students on the impact of a car journey to school can help instill personal responsibility for causing air pollution.

This idea, however, has drawbacks. According to a 2012 British Social Attitudes survey from the British Department for Transport, 47% of the respondents believed that "there is no point in reducing my car use to help the environment unless others do so" (Department for Transport, 2012). Therefore, if a behavior change requires effort, cost, or inconvenience, and people do not believe they can individually make a difference, then they are much less likely to make that change (Arbuthnott, 2009). Ultimately, in order to be successful, an environmental program must make people aware of the implications of a multitude of people contributing to a solution, rather than the contributions of an individual alone. In the case of Zero Heroes, the argument that walking will reduce traffic, increase safety, and reduce air pollution inevitably needs support from the populace. Programs such as Zero Heroes should focus on what an individual can do to contribute, but make an individual aware of the implications that their actions have on a grander scale within their community.

In addition to these general design factors, there are a number of techniques more specific to walk-to-school or transport-related programs in schools that have been shown to be successful and are important considerations in designing a new program of this nature.

2.3.1 Incentives

Incentives are a compelling way of motivating and encouraging participation, especially among children. Wavehill Consulting, in their evaluation of Walk once a Week (WoW), a nation-wide program in the UK designed to persuade students to walk to school, found that 18% of girls and 19% of boys who were surveyed started walking to school due to incentivized badges given as rewards for participation (Wavehill Consulting, 2009). It has been said that the more rewarding environmentally sustainable behavior is, the more likely it is that change will be observed (Arbuthnott, 2009). Although the WoW badges were found to be instrumental in inciting children to walk, these badges are an expensive part of the program (Wavehill Consulting, 2009). Therefore, some parents and council members view them as a waste of money. One way to solve this problem would be to find or develop an enticing, low-cost incentive, like a sticker or button. Such a cost-effective item would be ideal in increasing and retaining Zero Heroes supporters without impairing the Council's or any other organization's financial ability to implement the program. (McDonald, 2012b); (see Appendix II: Transport for London Behaviour Change Pan-London Meeting).

2.3.2 Advertising

Another effective way to reach the minds of parents and students alike is through advertising. While advertising promotes awareness of a program in the short term, it also maintains an air of legitimacy, seeking to increase participation through authority and through recognition of symbols, reasons for the program, and group participation. Nomura et al. tested the effectiveness of motivational advertising signs near escalators, using the signs to suggest taking the stairs instead of the escalators to promote healthy behavior. As a result, the number of male students taking the stairs increased from 10% to 18%, and for female students, the percentage increased from 4% to 20%, out of approximately 3,400 students. Once the signs were removed, the rate of stair use dropped back down to pre-experiment levels. Nomura concluded that "the use of signs was effective in changing behavior" (Nomura, Yoshimoto, Akezaki, & Sato, 2009). Another use of signs is evidenced in the Transport for London Teen Road Safety Campaign, which features pictures of students lying on the ground, captioned with statements such as "My friend saw her bus. She didn't see the car." This appeal to emotions was found to be more effective than previous, more informationally-based campaigns (see Appendix II: Transport for London Behaviour Change Pan-London Meeting).

The use of characters in advertising can also have a significant impact on society's recognition of a brand or program. In a report done by Margaret Calcott and Barbara Phillips about creating a likeable spokes-character, it was stated that "research suggests that advertisements containing spokes-characters have a greater ability to change consumers' brand preferences than other ads (Ogilvey and Raphaelson, 1982)." The article also explains "There are two reasons why advertising likeability translates into advertising effectiveness: (a) when consumers like an advertisement, they will be more likely to pay attention to it and learn its message and (b) when consumers like an ad they may transfer those positive feelings to the brand (Walker and Dubitsky, 1994)." Furthermore, the paper goes on to state that spokes-characters begin to take on human characteristics in the minds of consumers, generating feelings of trust or respect for the brand based on the character's attributes – especially personality and physical attributes (Calcott & Phillips, 1996).

Logos, too, are a critical means of generating brand or program recognition. As stated by logo designer Gareth Hardy: "An enterprise without a logo has no chance of making an impact on its target audience… Logos help to communicate with the target audience and are often the

first point of contact with that group" (Hardy, 2011). Indeed, a well-designed logo can have a significant impact on young children, as shown by a study conducted by Fischer et al. in Atlanta, Georgia, USA. Two-hundred and twenty-nine pre-school and kindergarten children were asked to correlate a set of brand images to the products they were trying to sell. It was found that a vast majority (91%) of six year-olds were able to correctly correlate a brand image to the product. It was concluded that "young children see, understand, and remember advertising" (Fischer MD, Schwartz MD, Richards Jr. MD, John W., Goldstein MD, & Rojas, 1991).

The overall shape of a logo is also an aspect to keep in mind. In a study done in Germany by Pavlova, Sokolev, and Sokolev in 2005, it was found that a shape's orientation in space can have a significant impact on the preconceived emotions and attitudes towards a certain design - like a program logo. The report states "Particular personal traits, needs, dispositions, and emotions (aggression, fear, loss of safety, or rescue) are often attributed to these [triangular] shapes as if they were animate beings (Bassili 1976)." Round shapes, such as circles, are typically associated with peace, longevity, and perfection, while others, such as angular polygons (especially triangles), are typically associated with war, anger, and discord. Shapes were displayed in positions of stability (static) and instability (i.e. in the process of falling over) and subjects were asked to label each of the shapes with a certain emotion. It was found: "Irrespective of the shape of a figure, a positive relation was found between negative emotions (fear, suffering) and perceived instability" (Pavlova, Sokolov, & Sokolov, 2005). Therefore, a circular shape – one which generates positive, stable emotions, is likely the best choice for a children's logo.

2.3.3 Peer Pressure

Peer pressure, or the use of social conformity to encourage behavior change, can be quite beneficial at increasing involvement in an environmental program. Kowalski found that "the best indicator of what a child will do is what his or her friends are doing" (Kowalski, 1999). The important element for a successful program is to harness positive peer pressure as a means for increasing participation. Achieving a "critical mass," that is, a significant percentage of students involved in a program, can result in feelings of isolation in those not involved, eliciting a certain want or need to join in the program since it is "the thing to do" (Garnet, 1996). The best way for instant motivation of children is to show them what they are missing. As an example, having a

picky eater eat with a more adventurous eater will likely force the picky one to try new things in order to satiate curiosity or create a point of experiential commonality between the two eaters (Warnick, 2005). Some transport campaigns in London employ this method of peer pressure in conveying program messages. For example, the Teen Road Safety Campaign uses a peer-to-peer method of advertising with statements such as the previously-mentioned "My friend saw her bus. She didn't see the car." This method of personal responsibility for a friend not only ties back to what was mentioned before about responsibility in advertising, but also exemplifies peer pressure, as it makes the reader feel as if it is "their fault" for allowing their friend to be hit by the vehicle. (see Appendix II: Transport for London Behaviour Change Pan-London Meeting).

2.3.4 Parental Support

However, not all aspects of advertising are directly under a child's control. Parental support is another factor critical to a school program's success. By ensuring that parents are actively involved, a project or program can be strengthened and active participation can be raised. Mackett found that 65% of schools without a Walking School Bus (WSB) program in New Zealand, in which parent volunteers conduct students to school via an organized walking "bus," cited "lack of parental interest or support" as an explanation for why the program had not been implemented successfully (Mackett, Lucas, Paskins, & Turbin). Simple parental involvement is not enough, however – parents also need to be accepting of the proposed lifestyle change (Bennett & Sothern, 2009). In a study done on the psychological and environmental aspects of cycling, cyclists with friends or relatives who cycled often felt more supported in their activity than non-cyclists, and so programs and campaigns aimed to inspire more people to travel sustainably should focus on the benefits of group or familial encouragement (de Geus, De Bourdeaudhuij, Jannes, & Meeusen, 2008). A final consideration is that most students do not have the ultimate say in whether or not they walk to school. It is the parents that must be convinced that walking to school is a worthwhile and safe venture for their children to undertake.

2.3.5 Coordinators

In addition to gaining support of the children's parents, a successful program also needs a dedicated coordinator who can provide organization and central authority to its implementation. Mendoza, in his 2009 evaluation of a Walking School Bus (WSB) program at three schools in

Seattle, Washington, USA, found that schools with a WSB coordinator had a much higher participation rate when measured at one, six, and twelve-month follow-up intervals as compared to programs without a coordinator (Mendoza, Levinger, & Johnston, 2009). In 2004, Mackett found that 25% of the WSBs that failed in Hertfordshire, UK failed due to "lack of a coordinator" (Mackett et al.). Mackett also found that a coordinator is integral to a WSB or any similar school program because parents and student volunteers have no reason to continue participating upon graduation (Mackett et al.). An external coordinator can allow the program to persist unbroken, resisting the transient nature of students' and parents' participation in the school system.

2.3.6 Teacher Support

As a corollary to having a program coordinator, teacher support is another important factor to consider in ensuring a program's success. In a study of thirty-five Hong Kong grade two classes, it was found that teachers who provided cognitive support through well-planned dynamic and interactive teaching had students who scored much higher on exams than their peers who were in classes with non-dynamic teachers (Law, 2011). This shows the power a teacher has in inciting young children to become more involved and interested in learning material in the classroom. With proper support from teachers like those mentioned, this type of dynamic and interactive learning could be applied to the Zero Heroes program to great success.

Another project which emphasized the effectiveness of a good teacher was a study done by Jane Case-Smith et al. on the effectiveness of extracurricular programs in the classroom. Write Start, an extracurricular program piloted in the State of Minnesota, was implemented to improve 1st graders' writing quality and penmanship. This program included a secondary teacher in the classroom who promoted work with the Write Start program and assisted in teaching. Student handwriting during the 12-week period was tested using the Evaluation of Children's Handwriting Test, the Minnesota Handwriting Assessment, and the Woodcock–Johnson Fluency and Writing Samples and was found to have "increased significantly" (Case-Smith, 2011). The importance of a dedicated teacher, therefore, cannot be understated.

2.3.7 Making It a Local Issue

However, the benefits of a teacher-supported program do not end there. In findings from Duvall et al., an environmental program can be especially effective not only in the classroom, but at home as well. The paper, which surveyed seven studies done on K-12 institutions in seven countries, including the United Kingdom, United States, and Australia, found that parents of students involved in an environmental education program at their school were much more likely to be involved in promoting environmental awareness and initiatives. The authors further emphasized teacher and parent support by stating: "Researchers in several studies (Ballantyne et al., 2001a; Legault and Pelletier, 2000) found, not surprisingly, that committed and interested teachers had greater success in creating enthusiasm toward environmental causes in their students. It is possible, therefore, that their students will, in turn, be more likely to discuss environmental issues with their parents" (Duvall et al., 2007). He further explains the relevance of such programs on the local level:

> *Programs that promote exploration and action on local issues contain a high level of inherent relevance, making problems real and encouraging a sense of ownership for both children and adults (Ballantyne et al., 2001b; Sutherland & Ham, 1992). Focusing on local issues seemed to work particularly well when used in combination with in-depth exploration of an issue and when formulation and implementation of actual solutions were encouraged (Ballantyne et al., 2001a).*

One particular program in London that has utilized the technique of emphasizing local issues is the Get Active Challenge. This program seeks to increase students' physical activity by having them record walking, cycling, and scooting to school and other physical activity outside of the school journey, comparing the combined distances to the length of the UK torch relay for the 2012 Olympic Games (McDonald, 2012). In designing a school program, therefore, it may be useful to consider making it relevant to other aspects of children's lives to help engage them.

2.4 Zero Heroes Program at Norbury Manor Primary School

2.4.1 Original Program Conception

The focus of this research project was to aid the London Borough of Croydon in further developing and implementing Zero Heroes (originally called Zero Heroes and Bubble Day), an environmental program designed to decrease driving and increase walking to school. The program's conception was the result of a collaborative effort between several London boroughs at the London Sustainable Schools Forum in November, 2011, focused on student measurement of air quality around schools. June 15th, 2012, or Zero Heroes Day, was planned as a day free of school traffic, where students would walk to their school and compare the air quality on the day of Zero Heroes to days that came before. The program was originally planned for one primary school in each of the boroughs of Croydon, Hackney, Wandsworth, and Westminster (*Project Summary: Zero Heroes and Bubble Day*). However, in practice, the program only proceeded beyond the concept phase in the boroughs of Westminster and Croydon. The design and implementation of Zero Heroes as described in this report is focused on Norbury Manor Primary School in northern Croydon.

The original goals of the Zero Heroes program drew support from concerns about the problem of air pollution as well as national educational objectives. The stated aim in the Project Brief for Schools is "to involve your pupils at looking at the ways to improve air quality around your school whilst promoting active and sustainable travel for the school journey" (Hill, 2012). According to Peter McDonald, Travel and Transport Planning Officer at Croydon Council, the program is intended to provide students and their parents with enough information on the importance of good air quality, for health and for the environment, to encourage walking to school rather than driving (McDonald, 2012a). In addition to spreading awareness of responsible environmental practices to younger generations and their parents, some of the UK's Science National Curriculum teaching objectives are fulfilled by having students participate in the program, such as: making observations and measurements, making comparisons between expected and actual results, and a final communication of discovered results (Hill, 2012).

2.4.2 Review of Norbury Manor Primary School Travel Plan

In order to ensure that the Zero Heroes program met the needs of the school, we identified some key transport-related issues at Norbury Manor Primary School by reviewing their

2009 school travel plan (STP). A school travel plan is a document written by the school for a local council which describes and illustrates the school's locale and the status of school-related transport. It often includes details such as a map of where the students live, how students travel to school, and the school's plans for promoting sustainable travel. The travel plan for Norbury Manor Primary described the school's traffic conditions and concerns, and included some data on how students travel there. Additionally, the travel plan contained examples of surveys asking about school-related transport habits, which assisted in the design of our parent and student surveys.

Some of the key findings from this document that aided in our program design included that the school (which is located on Abingdon Road in Norbury) is also located near the busy A23 London Road from Brighton. The travel plan described irresponsible parent parking during drop-off and pick-up times as well as congestion outside of the school gates caused by too many parents and carers passing through the area at one time. Additionally, parents reported that students who walk to NMPS in the morning face hazards such as cars exceeding posted speed limits and difficulties crossing the street near the school due to a lack of crosswalks. Some of these concerns could likely be resolved by re-evaluating Abingdon Road's traffic and road safety tolerances.

2.4.3 Revised Program Goals

The goals and plans of Zero Heroes were adapted and further developed by the WPI team to set in motion the events that would lead to the program's implementation. Although the original program goal was to see a reduction in air pollution levels for the day of the event, we determined that a lengthier period of time would be necessary to see any appreciable trend in air quality. This, combined with survey results indicating that a large proportion of students already walked to school, allowed us to redefine the goals of the Zero Heroes program as follows:

1. To provide students with the information necessary to develop an understanding of
    - what they and their parents can do to increase road safety around the school.
    - why walking is a healthy, enjoyable, and sustainable habit to develop.
    - how air pollution can affect them, and how they can help to reduce it.
2. To achieve a 90% or greater participation rate in walking to school on Zero Heroes Day, June 15th 2012.
3. To provide the necessary materials, plans, and design rationale to allow the program to continue next year, and expand to other schools and boroughs.

Zero Heroes has the potential to succeed because it draws on the successful techniques of previous programs to create a new scheme to encourage walking to school. Using the information gained from our studies of behavior change techniques, the team created a program that incorporates supporting core elements such as incentives, central administration, the addressing of parental fears to gain their support for the program, targeted advertising, and positive peer pressure.

3. Overview of Interviews, Surveys and Observations

This section details the methodology and results of data gathered to support the research described in Chapter 2: Background. The team set up interviews with individuals who had experience running programs similar to Zero Heroes. Additionally, we surveyed parents and students at Norbury Manor Primary and directly observed the traffic flow in front of the school during drop-off and pick-up times.

3.1 Interviews

3.1.1 Interview Methodology and Intents

We set up interviews with those involved in sustainable travel initiatives based on suggestions from our sponsor liaison, and visited Norbury Manor Primary School to meet with the parent-school liaison. For each interview, the team prepared by identifying the interviewee's background and developing questions related to essential components and techniques used in the programs they worked on. In addition to information intended to aid in developing a set of program components to apply to Zero Heroes, the interviews were in some cases meant to collect background information on school transport and pollution issues in general. After each interview, the team analyzed and compiled notes, identified major themes and findings, and allowed the interviewee to review, edit, and approve recorded notes for inclusion in the final report (see Appendices III-VI for full interview notes).

3.1.2 Hena Ahmad, Parent Liaison, Norbury Manor Primary School

In speaking with the parent liaison at Norbury Manor Primary, the team learned about school travel-related issues and how the goals and implementation of Zero Heroes would tie into assisting with those issues. Specifically, Hena stated that many parents and carers frequently disobeyed traffic laws in front of the school, for example, stopping on the zig-zag lines directly outside the school (markers on the road indicating areas where no stopping is allowed) while dropping off and picking up their children. In addition, she informed the team that the road around the school becomes very congested during these times. Hena estimated that at least 70% of the students live within a 20-minute walk, and explained that public transport is accessible via two bus stops and a rail station within a 10-minute walk, as well as nearby parking on Abingdon

Road and Stanford Road. The team concluded from this information that despite problems related to traffic, congestion, and safety at the school, Zero Heroes has the potential to succeed since alternative modes of travel are readily available to parents and students.

Hena informed the team that a positive outcome of the Zero Heroes program for the school would be to increase the number of children that walk and to improve the traffic and safety conditions around the school during drop-off and pick-up times. While the school has not run a program like this before, the students, especially the Junior Road Safety Officers (JRSOs), would be eager to assist with activities related to encouraging safe and sustainable travel habits.

3.1.3 Linda Johnson and Clive Simmonds, Croydon Council Pollution Team

In order to understand air pollution issues in London and Croydon and the best way to involve people in solving these issues, the team interviewed Linda Johnson and Clive Simmonds of the Croydon Council Pollution Team. Linda and Clive explained that the majority of vehicles on the roads in Croydon, aside from commuters traveling through the borough, are vehicles traveling to or from schools. Additionally, Clive estimated that 60% of pollution in Croydon is caused by vehicles. While air quality has stabilized in London in the past 10 years, North and Central London exceed the 40 $\mu g/m^3$ NO_2 air quality standard per annum set forth by the EU, and Norbury in particular has average NO_2 levels of about 70 $\mu g/m^3$ per annum.

Linda and Clive said that based on their experience, the best way to effectively communicate messages to parents about improving air quality, walking to school, or decreasing car idling in front of schools is to do so via their children, rather than having messages come from the Council. In addition, they believe that a single car-free day would have no measurable impact on air pollution due to numerous other variables such as weather and emissions from buildings, and that short-term events such as Zero Heroes Day are therefore more about raising awareness of sustainable travel than actually making a noticeable change.

3.1.4 Jo Hill, Programme Manager, Education, Sustrans

The team interviewed Jo Hill at Sustrans, a charity focused on encouraging people to travel by foot, bike, or public transport, in order to learn about programs she has been involved in and her advice and ideas for Zero Heroes. She explained the motivations and goals of the Sustrans-run programs Bike It, the Big Pedal, and Sustrans Heroes. A technique used that was

key to the success of each of these programs included providing children with incentives for biking, such as the opportunity to earn points towards Olympic-themed medals or to have a cycling team come into the school. In addition, Jo provided us with some advice for implementing programs like Zero Heroes. She emphasized the importance of having someone in the school willing to spearhead the program in order for it to not be forgotten, and the benefits of linking program material with the curriculum - ideally by incorporating it into the school's long-term plans. Additionally, in order for teachers to understand what is expected of them, it may be beneficial to present the program materials at a lunchtime session or after school club, or even teach it to the students firsthand during the initial introduction.

In addition to advice about sustainable school travel programs, Jo provided us with some ideas for Zero Heroes Day events, such as inviting cabinet members and having children write to a supermarket asking them to donate food for breakfast at the school. She also said that if Norbury Manor Primary School completes an updated school travel plan, they may be recognized or awarded for going "above and beyond" by participating in Zero Heroes.

3.1.5 Tannith Cattermole, Project Officer and Ali Lin, Projects Assistant, London Sustainability Exchange

The team interviewed Tannith Cattermole and Ali Lin at London Sustainability Exchange to learn about one of their projects, called Cleaner Air 4 Schools (CA4S), and their involvement in planning "Bubble Day" (developed from the original "Zero Heroes and Bubble Day" project concept) at Christ Church Bentinck School in Westminster. The CA4S project, which was intended to improve students' understanding of the importance of air quality and what they can do to improve it, utilized "champions" consisting of students, parents, teachers, and school governors, to lead the program by measuring air quality. Tannith and Ali found this type of peer-to-peer engagement to be the most effective method of teaching. They used the peppered moth story and a badge design competition (concepts similar to what the team planned for Zero Heroes) and advised us to have the Council, rather than the school, judge any art competitions to ensure that the winning designs convey the appropriate message. Additionally, they cautioned that parents are the hardest group to motivate and that it is necessary to have the head teacher's support in order for time to be allocated to teachers to run program activities. Both Tannith and

Ali stated that certificates are a great incentive that children love, and competitions are strong motivators for both parents and children in programs like Zero Heroes.

3.2 Surveys

3.2.1 Survey Methodology and Intent

The team surveyed the parents and students of Norbury Manor Primary School to gather information about the current state of school transportation. The surveys themselves consisted of multiple-choice questions, which facilitated more efficient administering and analysis. These surveys were previewed by Peter McDonald and Hena Ahmad for clarity and to ensure that the surveys conformed to Council and school standards, respectively. The surveys, as well as a preamble, were given to the school with the intention that the student surveys would be conducted in class and that the parent surveys would be sent home. However, both surveys were sent home with the students resulting in a return rate of 20.00% (72/360), much lower than we had expected. The parent survey had a return rate of 19.44% (70/360), which was approximately what we had expected. See Appendix VII for student and parent surveys and Appendix VIII for full results of the surveys.

3.2.2 Student Surveys

The student surveys gathered demographic information about school year and gender, as well as data on the students' usual method of transport to school, their frequency of walking to school, and their reasons for walking or not walking.

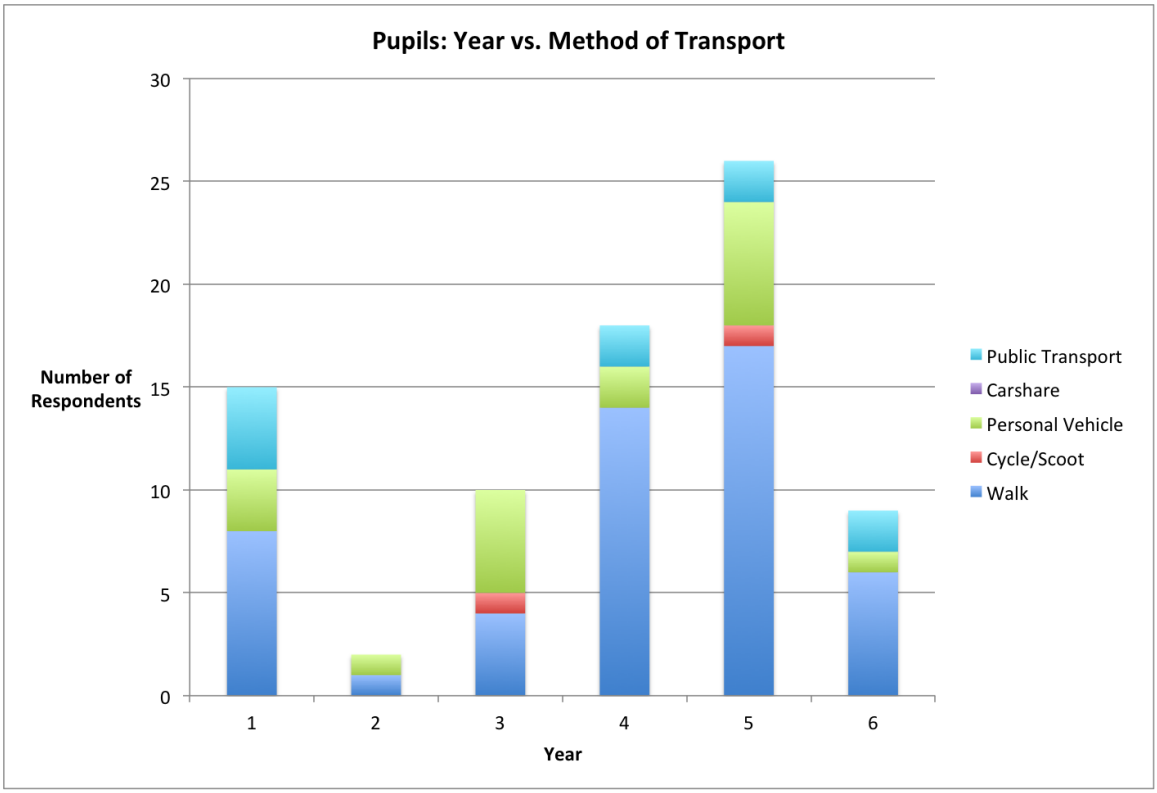

Figure 2: Pupil year vs. method of transport

A majority of the students in every year except for year 3 at Norbury Manor Primary School usually walk to school (Figure 2). This shows that there is no apparent correlation between year and walking to school. However, because only 20% of the surveys were returned, we cannot conclude officially that there is no correlation.

3.2.3 Parent Surveys

The parent survey asked for school year and gender of their children who attend Norbury Manor Primary School and the distance the family lives from the school. Additionally, we asked about parents' attitudes on their chosen form of transportation, and features of programs that they believe will have the greatest impact on their children.

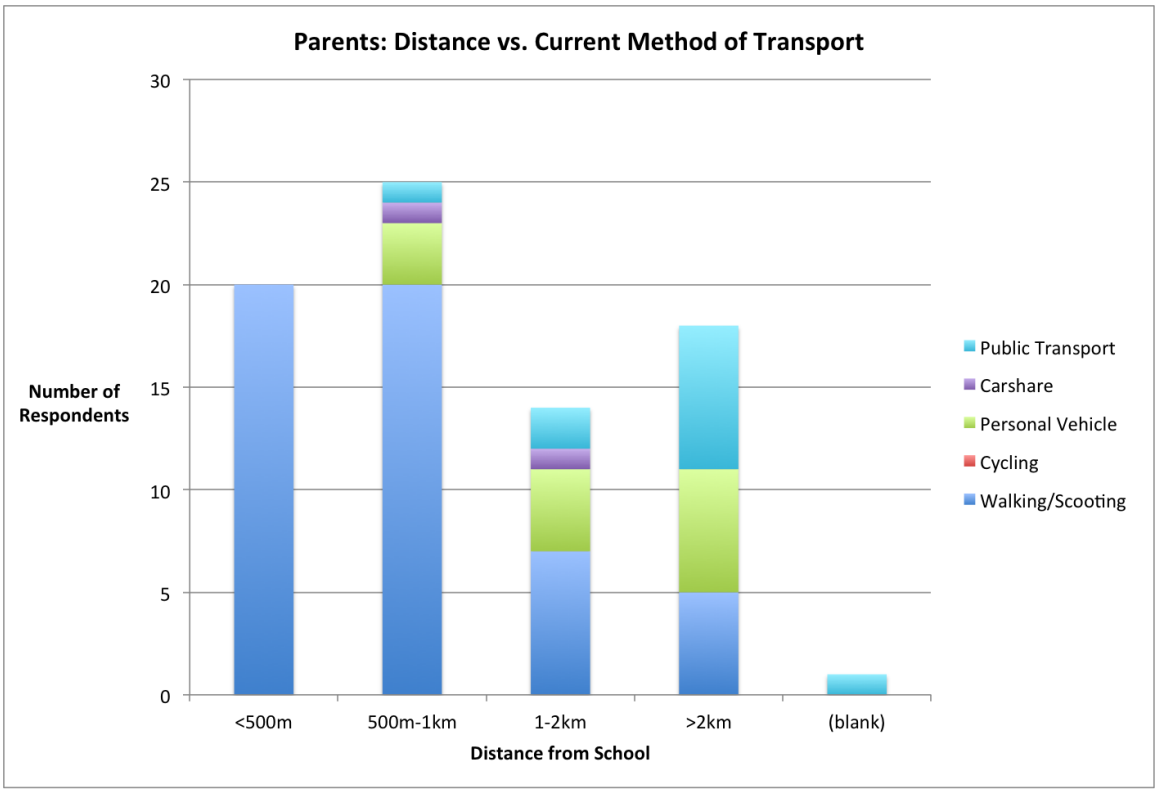

Figure 3: Distance from school vs. method of transport

As shown in Figure 3, it is apparent that the closer a student lives to the school, the more likely they are to walk. For instance, 100% of the parents who responded that they live within 500 meters of the school also reported that they walk. However, as the distance from the school increases to further than 2 kilometers, only 28% of the parents reported walking to school.

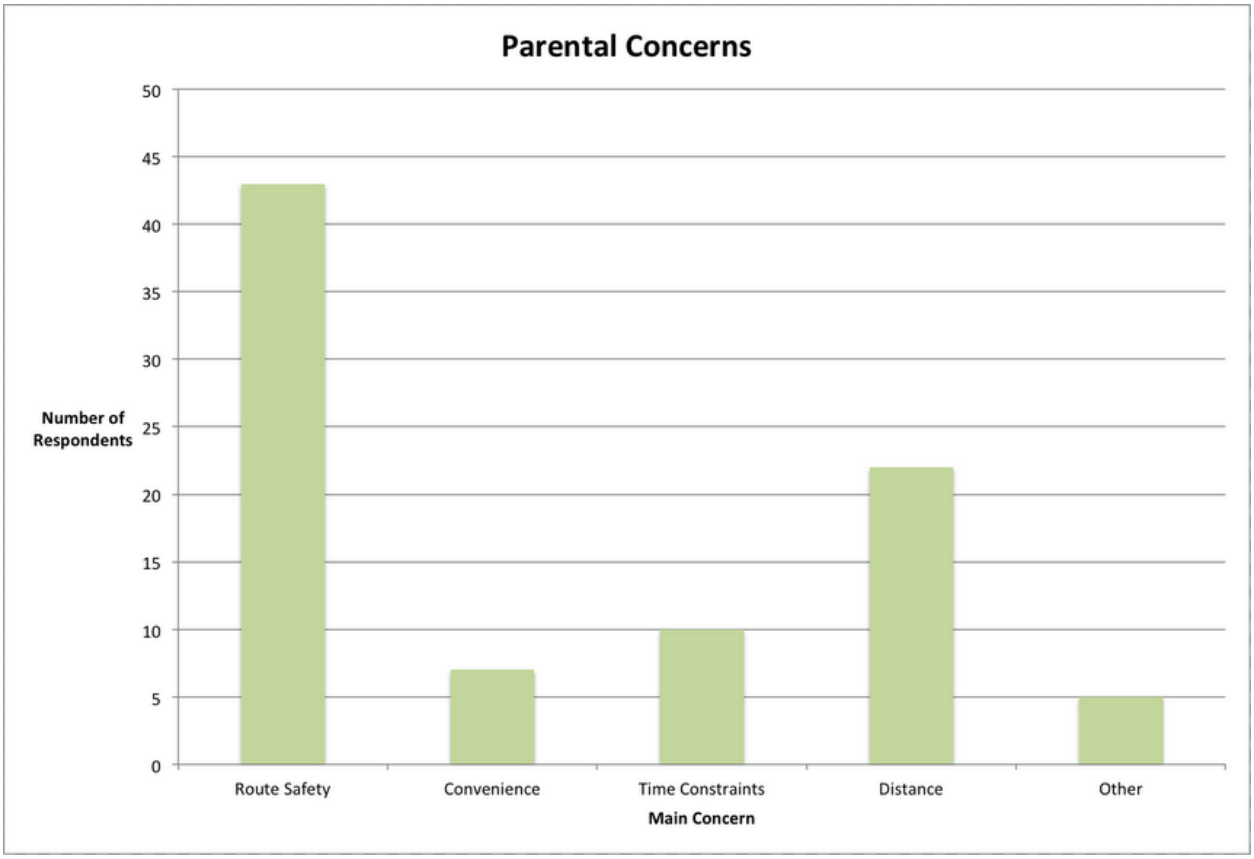

Figure 4: Main parental concerns regarding walking to school

Parents were asked to identify their main concern(s) regarding their children walking to school. Parents were allowed to select multiple answers, and the results are shown in Figure 4. Forty-three out of the 70 parents responded that safety was their main concern. The next highest answer, with just over half as many responses (22), was distance. Some of the "other" responses we received stated that the parent or carer drives by the school on their way to work, amking it convenient to drop off their child.

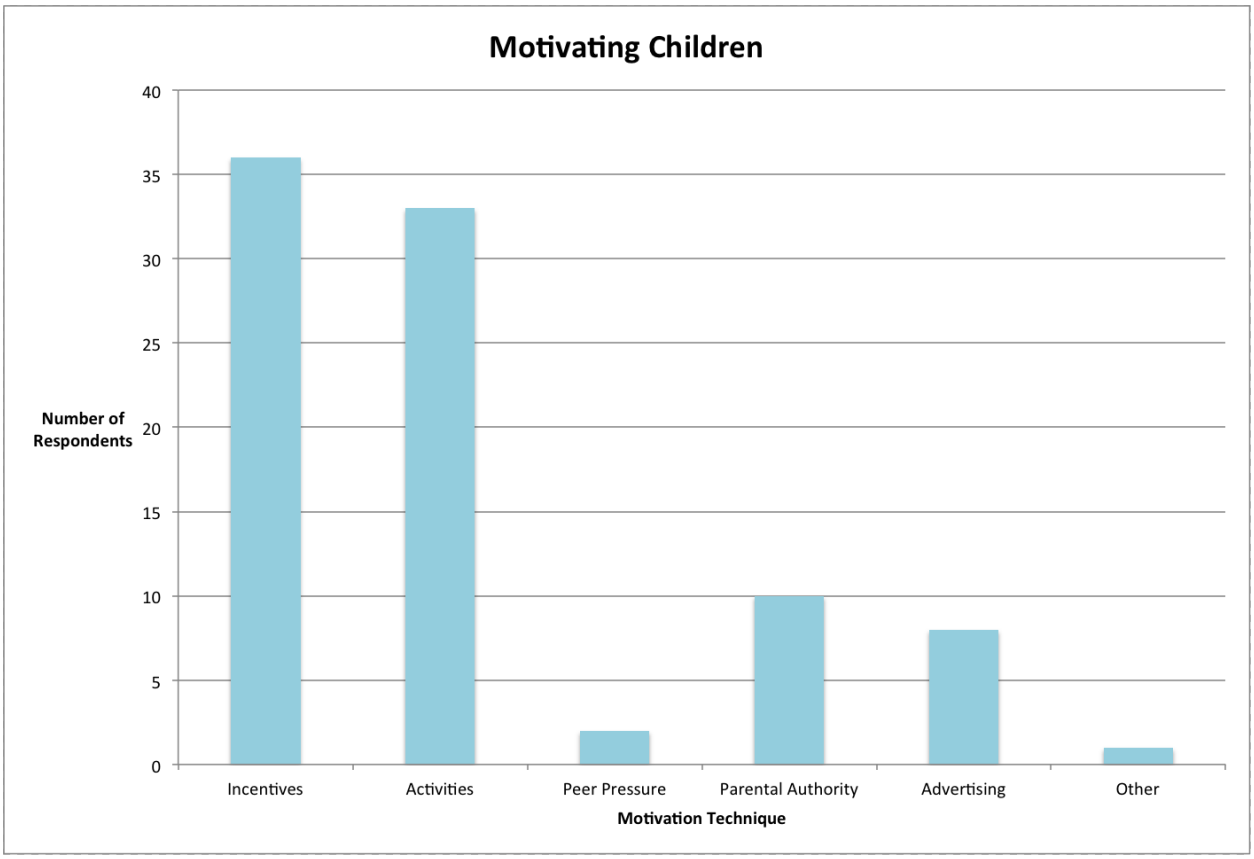

Figure 5: Best ways to motivate children to participate in school programs

Parents were then asked to identify, in their opinion, the best ways to motivate their children in a school program. Parents were allowed to select multiple answers, which resulted in 90 total answers despite receiving only 70 surveys back (Figure 5). Over half of the parents responded that incentives are effective in motivating their child. Additionally, 33 parents responded that hands-on activities motivate their child. In the "other" category, the most prominent comment we received was to allow children to be involved from the beginning and give their thoughts and opinions on the program.

3.3 Traffic Observations at Norbury Manor Primary School

3.3.1 Observation Methodology and Intent

As a means to collect further evidence for the concerns identified by reviewing the school travel plan, interviewing the Croydon Council Pollution Team, and interviewing Hena Ahmad, we observed traffic patterns outside Norbury Manor Primary School during both morning drop-off and afternoon pick-up. To do this, one team member was posted on either side of the school gates, recording the number of occurrences of various events. These events included the number of cars passing by the school during these times and the amount and type of traffic violations occuring(stopping on zig-zag lines or in the middle of the road, making three-point turns and blocking the road while doing so, etc.). Upon completing the observations, the team averaged the number of cars passing through and recorded the maximum of each type of traffic violation.

3.3.2 Observations of School Traffic Patterns

In the morning traffic observation, the team noted 20 minutes of elevated levels of traffic and congestion. Notably speaking, during this time there were 92 vehicles that passed through Abingdon Road, 30 of which committed illegal or dangerous maneuvers such as three-point turns and stopping on the zig-zag lines or in the middle of the road to drop off children. Additionally, due to the number of cars stopped in multiple locations, the road was reduced to one lane for the majority of the time. As an onlooker, it was worrying to see children running across the street in front of cars speeding out of the school parking area, occasionally swerving around other cars to do so.

In the afternoon traffic observation, we observed 35 minutes of traffic congestion during which 80 vehicles were observed passing through. Of these 80 vehicles, there were 13 illegal or dangerous maneuvers which caused the road to be reduced to one lane. Lastly, the team noted a few cars speeding by the school, making the road dangerous for the children. See Appendix IX: School Traffic Observations for complete data.

4. Program Components

This section details the components that the Zero Heroes team identified as being necessary for a successful walk-to-school program. These components were based upon existing academic research and active data gathering techniques such as: interviews, surveys, and observations as documented in Chapter 3: Overview of Interviews, Surveys and Observations.

4.1 Incentives

Incentives are an effective means of promoting involvement in a program because they provide a tangible reward for participation (Arbuthnott, 2009). Several sustainable school travel programs that our group analyzed utilized incentives (such as badges) to encourage participation, notably: Walk Once a Week, Sustrans Heroes, and The Big Pedal. Cleaner Air 4 Schools, another related program, also distributed certificates to all participants in their badge design competition. Furthermore, all five contacts who were interviewed about previously-run school travel programs (Peter McDonald, Jo Hill, Hena Ahmad, and LSx Bubble Day coordinators Ali Lin and Tannith Cattermole) agreed that incentives are essential for a successful program, and noted that competitions leading to or coupled with rewards are usually more effective than just stand-alone incentives. The survey data collected from the parents supports these statements – 36 of the 70 respondents said incentives are an effective motivation for school programs (Figure 5: Best ways to motivate children to participate in school programs – in Overview of Interviews, Surveys, and Observations Chapter). This data supports our background research, covered in section 2.3.1: Incentives.

4.2 Advertising

Advertising for a program informs the target audience what problems exist and what actions can be taken to solve them. Our background research in section 2.3.2: Advertising supports the use of posters and signs to incite behavior change, the importance of well-designed logos and advertising characters, and the effectiveness of interpersonal peer-to-peer messaging (Nomura et al., 2009).

4.3 Student Involvement

One alternative advertising technique uses students themselves, rather than traditional media, to inform their parents and classmates about program details, encouraging participation. The all-student Bike It Marshals, and the Cleaner Air 4 School champions (which include both students and parents) are trained to be student leaders driving their classmates to participate in the programs they represent (see Appendix V: Interview with Jo Hill, Sustrans; Appendix VI: Interview with Tannith Cattermole and Ali Lin, LSx). These student leaders can utilize positive peer pressure to incite participation – leading by example and making involvement in the program "the thing to do," as noted in section 2.3.3: Peer Pressure. However, students are not the only group that needs to be appeased.

4.4 Parental Support

Parental approval is perhaps the critical division between a success and failure in school programs. Research presented in section 2.3.4: Parental Support identified parental support as the primary reason for the failure of school programs such as the Walking School Bus in Christchurch, New Zealand (Mackett et al.). Additionally, Tannith Cattermole of London Sustainability Exchange informed us that parents are often the hardest group to reach through direct means, making more traditional persuasion and advertising techniques more difficult to successfully implement. One way that was found to combat this predicament was the inclusion of parents in the Cleaner Air 4 Schools champion team. Getting the parents directly involved acted to advertise and to strengthen the program. For the parents, problems became nearer to home, and therefore more relevant in their daily lives. This was found in the research literature to be an effective way of gaining parental support for environmentally related programs. Therefore, since parents ultimately have the final say in whether their child walks to school, a successful school travel program should make every effort to persuade parents that traveling sustainably to school contributes to the program's goal and is beneficial to themselves, their child, and their community.

4.5 Coordinators

While parental support is critical in achieving desired levels of participation, having an external program coordinator increases a program's chance for success and longevity by

providing necessary organization and dedicated support. Jo Hill and Tannith Cattermole informed us that an external coordinator is critical to a successful program. This supported our background research in section 2.3.5: Coordinators, describing why a coordinator can help a program survive the troublesome issue of student, parent, and teacher turnover.

4.6 Teacher Support

In addition to having an external coordinator to keep the program running, it is also important to have someone in the school – either a teacher or a member of the school staff – who is willing to champion the program at the school level. All five people involved in school programs that we spoke to (Hena Ahmad, Tannith Cattermole, Jo Hill, Ali Lin, Peter McDonald) told us that support from the school staff, especially the head teacher, is critical to a program's success. The Cleaner Air 4 Schools program, for instance, included teachers and a school governor in their champion team, in addition to the previously mentioned student and parents. This reinforces our background research presented in section 2.3.6: Teacher Support.

4.7 Providing a Complete Package

While the above aspects of a successful program are all relevant, a program that is too much effort for a school to do on its own is destined for failure. The best way to ensure a school program is sustained is to provide all the materials and details necessary for the school to seamlessly implement it. Both Walk Once a Week and Cleaner Air 4 Schools provided a teaching pack and the required materials to participating schools. Jo Hill and the LSx team agreed that a completely-packaged program makes it easier for the school to put into practice. This makes it more likely that the program will be successful on its first attempt, and therefore more likely to become embedded in a school's long-term action plans.

4.8 Summary of Essential Components for a Walk-to-School Program

Based on research and data gathered, the team identified program components that comprise a successful walk-to-school program as follows:

Table 1: Summary of Essential Components

For Involving and Engaging the Students	For Sustaining the Program for Future Iterations
Provide incentives and rewards for participants. Use advertising and promotional materials to raise interest and encourage behavior change. Obtain parental support and involvement. Make use of the peer-to-peer method of teaching by identifying student leaders.	Establish a coordinator external to the school to oversee the program. Identify a program champion within the school. Obtain support of the staff at the school, especially from the head teacher. Provide a full program, for example, a teaching pack, and clear direction to the school.

5. Program Implementation

To create a program that met the requirements outlined in Chapter 4: Program Components, the Zero Heroes team created materials, activities, and plans that contribute to encouraging more students to walk to school. Since the two main aspects of the program are engaging students, parents, and teachers in the program, and sustaining the program for succeeding years, we divided our program materials into two categories accordingly.

5.1 For Involving and Engaging in the Program

5.1.1 Using Incentives

One of the most important elements we employed was the use of incentives for participating in the various activities leading up to and including Zero Heroes Day. We planned for the program to use incentives as rewards for competitions and for walking during Zero Heroes Week, both of which are explained in the following sections.

5.1.1.1 Competitions

Competitions are excellent ways to persuade students to participate in Zero Heroes. Interviewees at both Sustrans (Jo Hill) and London Sustainability Exchange (Tannith Cattermole and Ali Lin) have run successful programs that had competitions for students, and they believe these competitions were a major factor in involving students and sometimes even parents. We designed two competitions, one for artwork and one to promote walking.

Our idea to run an art competition was based upon our interview with Hena Ahmad, who informed us that the students like art and would be willing to participate in such a competition. In addition, our sponsor liaison Peter McDonald has run student programs with art competitions in the past and explained that it would be possible to display winning artwork on a banner for the school, which would give students more ownership and pride in the program. The art competition we designed for the Zero Heroes program will have students create their own version of a Zero Hero – someone or something who produces no pollution on their way to school – including a name and a short description of their design. The competition will run for approximately a week and a half, and the winners will be determined by our sponsor liaison and a small panel of judges. The finalists will receive a prize pack, possibly including Zero Hero-

themed school supplies, a sticker, a badge, and a certificate. The winning students will have their Zero Hero included on a promotional banner, which will be unveiled in late May. (see Appendix XI: Design a Zero Hero Competition for more details.)

The other competition that we created will be started after an assembly introducing students to the peppered moth story, one of the most well-known examples of natural selection. The use of this story for Zero Heroes was suggested during the London Sustainable Schools Forum at which the program was conceived, and our sponsor liaison requested that as part of our work we develop the idea and formulate a plan for incorporating it into the program. We chose to create a competition, again, based on our interviews with staff at Sustrans and LSx and our research supporting the use of incentives. Each participating class will begin with a dark-colored paper moth in their classroom, and every day a student walks to school, they will be allowed to put a small white sticker on the moth. Over the two weeks the competition will run, the moths will gradually become lighter and more peppered. The class that, as a whole, walked the most, will have the lightest colored moth, and will win a prize determined by the school. (See Appendix XI: Peppered Moth Assembly and Competition for more details.)

5.1.1.2 Zero Heroes Week

In addition to incentives for competitions planned to take place before June 15th, students will also have opportunities to earn rewards during the week of Zero Heroes. Students that walk at least once from Monday, June 11th until Thursday, June 14th will receive a small metal badge in the shape of a right foot. This will be complemented by a left foot badge if the student then walks on Zero Heroes Day, June 15th. In this way, the incentives not only will increase student involvement by providing them with motivation to walk, but will support the idea behind the program by giving them a tangible reminder of walking: a badge in the shape of a foot. In addition, there will be Zero Heroes sports balls given to each class during on Activity Day of Zero Heroes Week. This idea was based on our multi-focus approach to designing Zero Heroes, in which physical activity was one component we identified as important to the Council and school. The sports ball will help promote this component of the program by encouraging play and activity. (See Appendix XI: Zero Heroes Week Materials for more details.)

5.1.2 Obtaining Parental Support

While incentives are useful in raising interest in the students, the students must then persuade their parents to let them participate. To make this process easier, we created some materials targeted at the parents to make them more receptive of the Zero Heroes program. We first used the parent survey to let the parents know that the program existed, both through the survey itself and its accompanying cover letter identifying us and Croydon Council as being behind the program (see Appendix VII: Student and Parent Surveys and Preambles). We also went to the school during the afternoon pick-up time to meet with any curious parents, as well was to collect the surveys. As a means of following up with parents about the program while their children will have started other activities such as the competitions, we wrote a brief article for the May issue of the school newsletter to remind them about the program (see Appendix XI: School Newsletter). Finally, one of our poster designs was targeted at parents and will be placed on the bulletin board in the main entrance of the school. It shows the street in front of the school filled with cars and is captioned "How would you feel crossing this street?", in order to hit upon the safety aspects of congestion and to encourage parents to walk with their children instead of driving to school (see Appendix XI: Motivational Posters).

5.1.3 Using Student Involvement

Another aspect of our program focused on getting the students involved. To do so, we ran one assembly that introduced Zero Heroes and planned another that will introduce the peppered moth story and competition, ran a focus group with the Junior Road Safety Officers, wrote instructions for student monitoring of air quality, and drafted a letter to a local supermarket to request a donation of breakfast on Zero Heroes Day, to which students will have an opportunity to contribute their own letters, requests, and thank-you notes.

5.1.3.1 Assemblies

The first school assembly that was prepared and presented included a skit on the benefits of walking to school, written by us and performed by the Junior Road Safety Officers (JRSOs) and two additional students. This made use of peer-to-peer learning since the JRSOs were teaching their fellow students about how walking to school can be fun and enjoyable. While the plot of the skit followed a group of students experiencing the joys of walking as opposed to the

student who was driven to school by a stressed-out parent, we also brought up other themes such as air pollution and exercise. By the end of the skit, the students who had walked to school were happy and ready to start their day, while the student who rode to school was inspired to convince his parents to let him walk to school. This also allowed us to use positive peer pressure to encourage other students who do not walk to start thinking about it.

The second planned assembly will take place in mid-May and will introduce the peppered moth competition described previously (see Section 5.1.1.1: Competitions). The assembly will have a skit or story performed by students explaining the how the peppered moth's coloration and evolution was affected by air pollution during England's Industrial Revolution. Again, this assembly will give students the chance to be directly involved in the program and to teach their peers (see Appendix XI: The Peppered Moth Assembly).

5.1.3.2 Junior Road Safety Officer Focus Group

In addition to the assemblies, we held a focus group with the school's JRSOs and the two other students who also acted in the skit to gather their thoughts on what we had done with the program and give them a chance to express their opinions and ideas on how to motivate their peers to walk to school. We asked what would be the best kind of reward a class could receive, and the answers overwhelmingly supported a "sports day," on which the class receives extra recess time to play outdoor games, and a "Mufti day," on which students are allowed wear their own clothes instead of their uniforms. We incorporated these ideas into our plan for the week of Zero Heroes by including an "activity day" and a day on which students wear bright colors to promote road safety (see Appendix XI: Zero Heroes Week Materials). When asked what prizes would motivate their peers to participate in Zero Heroes, they responded that a sports ball and school supplies were the best prizes to give out.

In addition to asking what types of incentives would motivate their peers, we also sought the students' opinions on drafts of motivational posters we had created. Their responses heavily influenced our decisions on which designs we further developed. For example, they were especially excited about the "Become a Zero Hero" design, and this excitement about a "superhero" character influenced not only our choice of which poster drafts to develop but also our plan for the Zero Hero design competition. More detailed notes from this focus group are presented in Appendix X: Junior Road Safety Officer Focus Group.

5.1.3.3 Supermarket Appeal

As another means of involving students in the program, we decided based on an idea from Jo Hill (Sustrans) to develop a plan for students to write to a local supermarket requesting a donation of food for the morning of Zero Heroes Day. We drafted a letter to be either handwritten by the students or included as a cover letter to other notes from students and sent to local stores asking for donations of breakfast foods (see Appendix XI: Supermarket Appeal). This appeal will not only be more likely to succeed coming from the children, but it will also involve the students in reaching out to the community and, most importantly, in actively promoting the program, giving them a more personal reason to participate.

5.1.1.4 Air Quality Monitoring

To address the original project goal of educating students about air quality, we provided a method of tracking air quality data recorded by the many monitoring stations throughout London, including the area around the school. By graphing and then comparing the pollution of Norbury to places both closer to the center of London that are generally more heavily polluted, and those locations in outer boroughs similar to Croydon, students can have a visual representation of where Norbury stands in relation to other locations. To assist the teachers or whomever in the school takes charge of this aspect of the program, we created a comprehensive set of step-by-step instructions complete with screen captures for retrieving data from the London Air Quality Network website (see Appendix XI: Air Quality Monitoring Instructions). We also arranged for Croydon Council to purchase a set of diffusion tubes that can be used by the students to measure air quality at the school for several weeks leading up to Zero Heroes Day, which will give them direct, hands-on experience with air quality monitoring.

5.1.4 Advertising

5.1.4.1 Posters

Following our background research into the use of posters and graphics to boost program participation, and drawing on the feedback received from the JRSOs, we created four different motivational posters, each targeted at different sections of the program's intended audience. The first poster, the "Become a Hero" design (shown in Figure 13), depicts three superheroes

standing in front of the Zero Heroes logo. It exhorts its readers to "Become a Hero" and asks "Will you be there?" on June 15th. Figure 14, the "Clean Air Bubble" poster, depicts a drawing of a school surrounded by a bubble representing the absence of air pollution on Zero Heroes Day. It focuses on the air quality aspect of the program by telling viewers to "Keep pollution out! Walk to school!" Our third poster, the "Say NO to NO_2" design (Figure 15), is targeted at the older students, who may already know a little about air quality and who also are likely to understand the play on words. It also touches upon the "Be a Hero" theme, asking for help defeating NO_2 by walking to school on Zero Heroes day. Our fourth and final design, the "Safe Crossing" poster (Figure 16), is targeted at the parents. Depicting a busy street filled with vehicles, some maneuvering dangerously, it asks parents for help in reducing danger by walking to school with their children. The designs of all four of these posters are displayed in Appendix XI: Motivational Posters.

The posters were created based on our background research on the importance of a logo and character, and also through communication with several people we spoke to who explained that positive messages such as "walk to school" are generally more effective than negative messages such as "don't drive to school" (McDonald, 2012a); (Portch, 2012). In addition to the motivational posters, we also created posters to advertise the various competitions and activities, such as the art contest and the events of Zero Heroes Week.

5.1.4.2 News Articles

In order to spread information about Zero Heroes beyond the range of the posters, which would only be put up near the school, we wrote a series of articles for several news outlets. A webpage on the Council website will give information to the public wishing to learn about the program, while an article in the May 2012 issue of the school newsletter will remind parents about the event. Finally, an article in the September 2012 issue of the borough-wide magazine *Your Croydon* will report on the results of Zero Heroes and better publicize the event, coinciding with the return of students to school. The articles can be found in Appendix XI in the following sections: School Newsletter, Council Website, and *Your Croydon* September Magazine Article.

5.1.5 Presentation to the School Council

As a final means of ensuring the students were involved in the development of Zero Heroes, we presented our materials and ideas to the school council and Junior Road Safety Officers at the conclusion of our project. The school council is made up of two students from each class, so presenting to them ensured that the program messages would be spread throughout the school. We showed them the posters we had developed as well as presented our plans for the design and walking competitions and the activities for Zero Heroes Week.

5.2 For Sustaining the Program for Future Iterations

Although several elements of the program have been developed to boost interest and ultimately participation on Zero Heroes Day, the program will be hard-pressed to continue unless it is designed to be sustainable in future years. To that end, we created as complete a program as possible within the timeframe of our project. This includes detailed instructions on the Design a Zero Hero competition, air quality monitoring activities, and the previously discussed peppered moth assembly and competition. We also filled out a calendar detailing what actions need to be taken on a given date by either Peter McDonald at Croydon Council or by staff at Norbury Manor Primary School. The calendar takes into account school events such as the midterm holiday during the week preceding Zero Heroes Week. Together, these instructions can be packaged and kept for reuse in successive years, reducing the effort either Norbury Manor Primary or any other future participating school needs to commit to Zero Heroes (see Appendix XI: Program Action Plan).

6. Recommendations

Based on our experience implementing the Zero Heroes program at Norbury Manor Primary School, as well as our research and data supporting the principles behind that implementation, we have formulated some recommendations for the program as it continues this year and in future years. These recommendations are applicable to others designing a similar walk-to-school or sustainable travel behavior change program. Essential program components that have not yet been applied to the Zero Heroes program are included. In addition, the team has made practical suggestions relating to the design and implementation of surveys and assemblies in schools that may be useful for those running similar programs.

6.1 Recommendations for Future Implementation of Zero Heroes

We found through research and our own investigations that establishing a central program coordinator is the key to the success of the Zero Heroes program. A program coordinator would create program activities, help the school carry out those activities, ensure that the program persists, and maintain consistency among multiple participating schools (see Section 2.3.5: Coordinators). In addition, a program coordinator would facilitate the spread of Zero Heroes to other schools in Croydon and in other boroughs. To establish a coordinator for Zero Heroes, Croydon Council could identify someone within the Council (and similarly, each council where the program exists could do the same), and/or at a pan-London level.

We also recommend that within each participating school a "program champion" be identified (see Section 2.3.6: Teacher Support). Through this, teachers have an ability to incite young children to become more involved and interested (Law, 2011). These champions could be teachers or other staff members at their respective schools who are particularly interested in promoting the program goals and willing to serve as a link between the overall program and their specific schools' needs.

Program champions can be instrumental in identifying student leaders, which are another important component needed for program success. We utilized a peer-to-peer method of teaching by having the Junior Road Safety Officers perform a skit to introduce the program to the school and to serve as a focus group to examine some of our initial program materials. We recommend that in the future, the program champions establish student leaders in every class in order to

ensure the program message is communicated to all students. These classroom leaders should be provided with incentives as motivation for them to take on this role, and could have responsibilities such as measuring air quality and writing and performing skits, for instance, at the peppered moth assembly.

A skit that utilizes methods of peer teaching and student leadership was successful in our design of the Zero Heroes program. In order to use these same techniques while bolstering parental support for the program, we recommend that in the future, one of the skits used in the program be performed as a school play. A school play performance would result in a higher attendance by parents as compared to an in-school assembly, and in this way, program messages would be communicated directly from students to their peer and parents.

Activities such as skits and school plays are effective build-up activities to Zero Heroes Week and Day. We recommend that for future iterations of the program, there should be multiple activities during the weeks leading up to Zero Heroes Day to introduce and inculcate the program to students and staff at the school. Examples include developing and posting advertising materials, beginning air quality measurements, and starting competitions. These activities that we planned and began to introduce in the school served to spread awareness of the program and build excitement among students in order to increase the likelihood Zero Heroes Day is successful, i.e., most, if not, all students walk to school.

Finally, as a measure to sustain the Zero Heroes program, the team recommends that the Council have the program plan incorporated into each participating school's long-term plans, as suggested by Jo Hill at Sustrans (see Section 3.1.4: Jo Hill). To do so, the program coordinator, champion, or a school staff member could adapt the materials into a teaching plan format, and then assist the schools in fitting the material into the curriculum.

6.2 Practical Suggestions

The aforementioned suggestions for running a school assembly and administering student and parent surveys may be useful for other school travel programs. Specifically related to the survey questions, based on feedback from advisors and peers and the fact that several students wrote in answers, some of our student survey questions were missing answers in the list of choices. For the student survey question: "If you don't walk to school, why not?" and for the parent survey question: "What is your main concern(s) regarding your child walking to school?"

there should be a choice indicating that the parent drops the child off at school on the way to work. Additionally, if others were to use these surveys again, we recommend adding "Every day" as a choice for the question "How often do you walk or cycle most of the way to school?"

The team also recommends making sure that questions and answers are consistent between parent and student surveys, as well as making them consistent with Council standards. For example, in asking how students travel to school, two of our categories on the parent survey were "walking/scooting" and "cycling," but on the student survey, these methods were classified as "walking" and "cycling/scooting," which made interpreting results more difficult. In general, walking and scooting should be classified together, with cycling classified separately (McDonald, 2012a); (see Appendix II: Transport for London Behaviour Change Pan London Meeting).

In our experience of handing out parent and student surveys on the same day, with the intent that the parent surveys would be brought home and the student surveys would be completed in class, both types of surveys were brought home by the students, resulting in a much lower response rate for student surveys than we would have liked or expected. We therefore recommend one of three possible methods to correct this: (1) make it understandable that the student survey is to be done in class (i.e. via written instructions for teachers), (2) if there are several types of surveys, they should be brought to the school on different days, or (3) ideally, whoever designed the surveys should personally go into the classrooms to administer them. The team also suggests providing the school front desk or your liaison in the school (for example, the program champion) with extra copies of surveys in case parents do not get one from their child.

Finally, the team recommends that two assemblies be run for different age groups, with content for the younger group shorter and more simplified in order to retain their interest. This suggestion is based on our observation that younger students in Key Stage 1 lost focus more than their older counterparts.

In conclusion, the team has developed a number of essential components in designing a walk-to-school or similar program and the background rationale for these components, which was provided by both literature research and interviews. We applied these design components in creating materials and a plan for the Zero Heroes program, as well as recommendations for its continued success. It is hoped that with our program design and recommendations, the Zero Heroes program will become a solid part of the curriculum at Norbury Manor Primary School

and at other schools throughout London, emphasizing the values of good air quality and sustainable travel.

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Appendices

Appendix I: Sponsor Description

The London Borough of Croydon, the southernmost of London's modern boroughs (Figure 6), was formed in 1965 with the merging of the Coulsdon and Purley Urban District with the County Borough of Croydon. However, the history of the town of Croydon stretches back to the Neolithic Age. The first signs of settlement in the Croydon area occur at Croham Hurst, a Bronze Age village, now a forested Site of Special Scientific Interest (SSSI). Although the town first developed as a Roman settlement along the Londinium-Brighton way, the town's name is believed to have originated during the Britannic Kingdoms era: the name Croydon likely derives from the Anglo-Saxon "*croh denu*," meaning "Crocus valley" due to its lucrative saffron trade. Croydon continued to be a major market town well into the 19th century. The early 20th century saw a continuation of industrial growth, begun during the Industrial Revolution, eventually leading to the introduction of heavy industries, namely automobile manufacturing and metalworking ventures. The Age of the Aeroplane also brought about the construction of the Croydon Aerodrome, which until 1959, served as London's main aerial transportation hub. Although damaged by bombing during World War II, Croydon's economy recovered during the 1960's and this recovery brought about the construction of many independent businesses and retail shops with the Croydon Corporation Act – a proposal which, in hindsight, largely succeeded.

Figure 6: A map of London's boroughs (Croydon highlighted in yellow)
Source: City of London, 2011

Croydon's economy today is dominated by the retail and service sectors – as shown in Figure 7 and somewhat in line with its historic market-based economy. A number of large shopping centers and a sophisticated and popular transit system continue to make Croydon a viable and important economic center for the city of London. For example, in 2010, the Borough was ranked second in London in overall retail income with £909 million (CACI, 2010). Its location as a suburb of London also makes it an ideal place to live for those who work in London's busy and often prohibitively expensive city center. In fact, the Borough of Croydon is London's most populous borough, with over 340,000 inhabitants (Croydon Observatory, 2010).

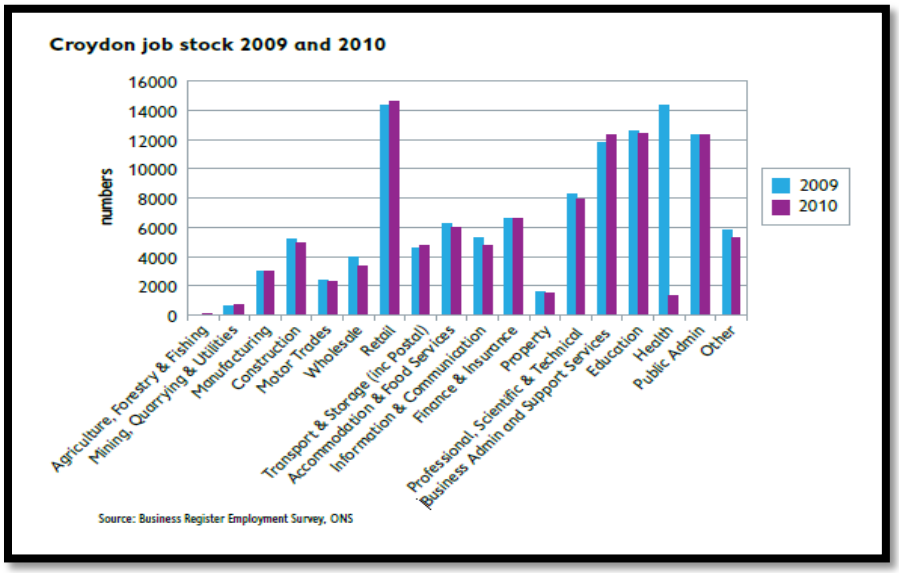

Figure 7: A chart displaying Croydon jobs in 2009 and 2010 (Croydon Economic Bulletin).

Although Croydon was historically an economic and industrial powerhouse, it has sought in recent years to reduce its impact on the environment and bring additional greenery to its regions within the cityscape. In fact, as of June 2010, £43 million are spent on 'Environmental services' or about 7% of the Borough's total expenditure (Croydon Council, 2010).

Figure 8: A map exhibiting the Parks and Greens (shaded green) of the Borough of Croydon (London Tenders 2011).

Over 127 parks and open spaces make up the majority of the recreational space in the Borough (Figure 8). Croydon is not just committed to providing these open spaces to its residents, but also to preserving and improving those spaces. In late 2011, the borough set aside £1.5m and asked the residents to vote on the parks they wanted the money to be spent on. Nine

parks were ultimately chosen and the selected improvements range from a wildflower meadow to a new outdoor gym (Croydon Council, 2010D).

Aside from these special projects, most of the everyday services provided to residents, including housing, health, waste disposal, local planning, and arts and leisure, are run by the Council, the governing body of the London Borough of Croydon (Operation Black Vote, 2010A). The Council, as in other London boroughs, is structured as a cabinet system, and its decisions and actions are guided by ten elected councilors who make up the executive, or cabinet. Some of the responsibilities of the executive include managing the chief executive and the corporate management team and making decisions about the use of the council's resources (Operation Black Vote, 2010). Every four years, 70 councilors are elected to represent the people living in the 24 wards within the borough (Croydon Executive Recruitment, 2010).

Thirty-seven members of the Croydon Council belong to the Conservative Party which dominates the south of the borough (Figure 9) and 33 belong to the Labour Party, which dominates in the less affluent and more ethnically diverse northern parts of the borough (Croydon Council, 2010A).

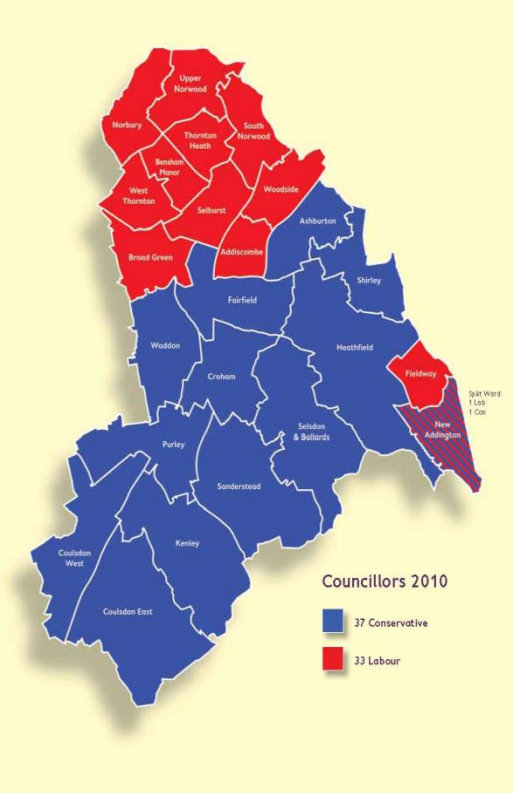

Figure 9: Map of wards within the London Borough of Croydon, showing the distribution of councillors by political affiliation (East Coulsdon Residents Association).

The departments of the Croydon Council, each of which is run by a non-elected director, are: Adult Services and Housing; Children, Young People, and Learners; Community Services; Planning, Regeneration, and Conservation; Democratic and Legal Services; Human Resources and Organizational Development; Strategy and Communication; and Public Health (Operation Black Vote, 2010B). Some of the largest departments by expenditure are children, community, and customer services, as shown in Figure 10. The department of Planning, Regeneration, and Conservation, one of whose goals is to "tackle climate change by reducing CO_2 emissions," represents only 2% of the total gross expenditures by department (Croydon Council, 2010B).

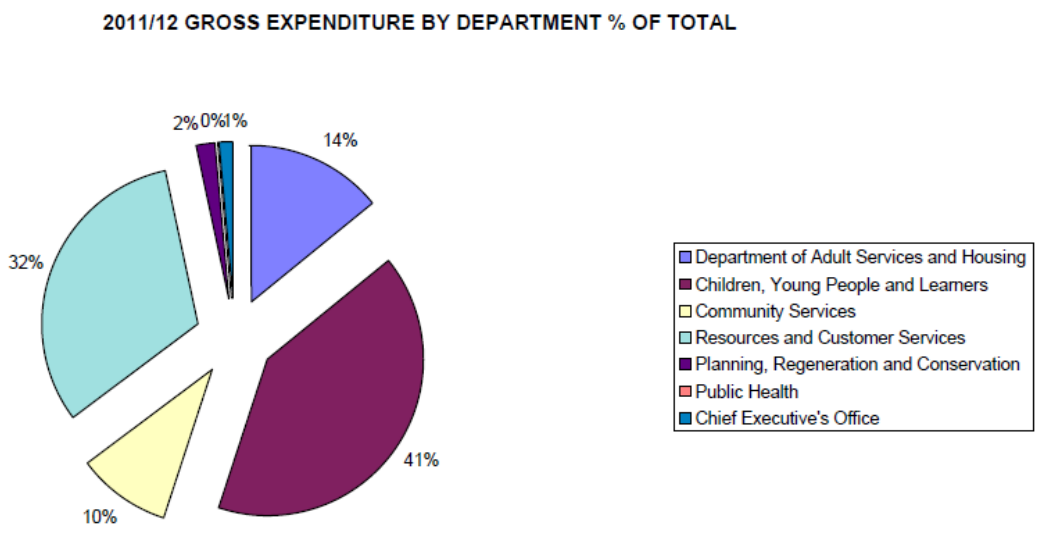

Figure 10: Gross expenditures of the Croydon Council, for 2011-2012 (*Draft revenue budget and capital programme 2011/12)*.

The council's large role in education is illustrated by the fact that the department of Children, Young People, and Learners represents the largest percentage of total department expenditures, at 41%. In Croydon and in other London boroughs, the borough itself is the Local Education Authority (LEA). This means the Borough of Croydon is legally responsible for providing education to all children. LEAs are run by a councillor and a Chief Education Officer. In addition to providing education, the LEA must also conduct assessments for special needs and recruit school governors (Operation Black Vote, 2010A).

The borough of Croydon has on its website many environmentally friendly strategies available for public use. Various tools allow site visitors to find walking directions and sign up for automatic notification of elevated air pollution, as well as find information about the air monitoring stations throughout the borough (Croydon Council, 2010). On a borough-wide level, Croydon also promotes several programs to help reduce emissions and raise environmental awareness, especially in schools. Croydon participates in several national programs that aim to reward schools that make environmentally conscious improvements, such as the Eco-Schools Awards program and a government-funded, full-time school transport adviser to research and implement ways to make school transportation more efficient and less polluting (Croydon Council, 2010E).

Croydon has been steadily improving its housing to be more energy efficient as well. Since 1995, the percentage of homes with some form of space heating has jumped from 55% to 98%, and carbon dioxide emissions have been reduced 30%. Croydon is also looking into new technologies such as solar cell water heating and photovoltaic electricity generation to further bolster their program to reduce emissions (Croydon Council, 2010C). As part of the Vision 2020 program, Croydon is seeking to complete a major overhaul of its infrastructure. This includes improvements such as more efficient street lamps for use at night, energy-conserving construction materials, and preserving and planting trees in the borough (Croydon Council, 2010F). All told, Croydon is committed to staying on course to be as environmentally friendly as possible and seeks to promote a brighter, greener future for its citizens.

Appendix II: Transport for London Behaviour Change Pan-London Meeting

Agenda

Behaviour Change Pan London Meeting
55 Broadway, London, SW1H 0BD
14 March 2012 9am-4.30pm

9.00-9.30 am **Registration**

09.30 am **Welcome and introductions –** *Hannah Wood, TfL*

09.35 am **Behaviour change senior level update -***Clare Mulholland, TfL*
High Level update on Road Safety, Active Travel and Cross Cutting Activity

10.05 am **Q&A for the manager's panel**

10.20 am **Regional meeting/workshops** – *Behaviour Change Steering Group*
Projects, barriers and solutions

11.10 am **Break**

11.30 pm **Borough Presentations**

Oaks Park School 'Travel Green Team'- *Julie Ward, London Borough of Redbridge and pupils from Oaks Park School*

Borough experience of promoting 'Driver Certificate of Professional Competence', – *Richard Evans, Hammersmith & Fulham and Lee Thornton, Barking and Dagenham*

Secondary school cycling training projects – *Neil Simpson, Royal Borough of Kensington & Chelsea*

12.30 pm **Working lunch –** *Your chance to put your questions to us.*

13.30 pm **Behaviour change Updates**
Four short updates on current TfL and London wide Behaviour change initiatives.

New teen road safety campaign – *Sarah Elliott, TfL*
Bike It – *Jo Hill, Sustrans*
Walking initiatives – *David Graham, Living Streets*
Cycle training procurement – *Jennifer Calvert, TfL*

14.45 pm **Break**

15.00 pm **Behaviour workshop sessions**

Workshop 1 – Road Safety and the 2012 Games, A discussion on TfL's road safety communications plan. **–** *Leon Girling and Zoe Cotton, TfL*

Workshop 2 – Driver Certificate or Professional Competence, overcoming barriers – *Mick Kemp, TfL and Richard Evans & Lee Thornton*

Workshop 3 – Hands up surveys, which modes should be counted? –*Ross Butcher, TfL*

16.00 pm **Discussion summary**
16.30 pm **Wrap up and close**

Notes from Meeting

Behaviour change senior level update – *Clare Mulholland, TfL*

High Level update on Road Safety, Active Travel and Cross Cutting Activity

- Effective method – teach older children how to educate the younger children, and they don't realize that they're also learning
    - This may apply to our group of students – the "creative group" for the assembly
- Incentives and prizes – effective features in behavior change related campaigns
- Parental fears about cycling not necessarily related to the mode of travel, more related to the route and safety concerns associated with independent travel
    - More effective get messages about safety directly to parents
- Cycling program – the best way to ensure program is sustained is to offer a full program, i.e. provide equipment and materials (then all the school needs to provide is the students to participate)
    - Also the best value (economically) for the boroughs was found to be targeting a particular age group, i.e. one year
    - The main obstacles for schools are usually funding and time

Break – Speaking with Jo Hill (Sustrans)

Potential contacts for the Zero Heroes program:

- Jenni Davies, London Sustainability Exchange
- Daniel Barrett, Greater London Authority
    - Advice on and access to air quality monitoring devices
- Jane Greatholder, School Travel Advisor, Wandsworth Council
    - One of the other boroughs that had planned to do Zero Heroes
- Westminster
    - Another borough that had originally planned to do Zero Heroes, but through a different group instead of the Council

Behaviour change Updates

Four short updates on current TfL and London wide Behaviour change initiatives.

New teen road safety campaign – *Sarah Elliott, TfL*

- Peer-to-peer method of behavior change (Posters: "My friend saw her bus. She didn't see the car.")
- Emotion-based advertising seems to be working better than old method that was more information-based

Bike It – *Jo Hill, Sustrans*

- Sustrans Heroes – Program includes a booklet for children to work through and earn points towards winning "medals" (Olympic theme)
    - Children who can't walk due to various circumstances can design a poster instead to earn these medals

- The best way to ensure a program is sustained is to provide the whole program, including materials, equipment, support, resources
- Main obstacles for schools are usually funding and time

Walking initiatives – *David Graham, Living Streets*

- In London, Walk once a Week is in over 10% of primary schools
  - There are more than 900 schools participating in over 25 boroughs
- Some incentives used in WoW: passports, stickers, certificates, badges
- Schools are using the program materials in different ways depending on their needs
- Program is currently being analyzed for children's opinions
- Fundraising pack includes tips for specific schools to raise money
- Future plans: Whiteboard technology – students input data on how they walked to school, data is fed into a larger system
  - Goal: make school transport advisors' jobs easier

Behaviour workshop sessions

Workshop 3 – Hands up surveys, which modes should be counted? – *Ross Butcher, TfL*

- Consensus for scooting – legally classified as pedestrian, do the same for survey purposes (classify under walking, not cycling)
  - However, separate data should be collected for schools that have specific scooting initiatives
- Consensus for bus classification – divide into two categories: independent versus public (no more, to avoid confusion)
  - Positive outcome would be an increase in public transportation use as opposed to provided buses
- Classify "park and stride" under driving?
  - On surveys, write something that clarifies or defines it
  - This mode is not possible in all boroughs
  - Younger children won't have much sense of how far they're walking versus driving
- Preferred mode of travel – is this useful data?
  - Case for yes
    - Shows behavior change if measured at beginning and end of year
    - Provides support for funding new programs (if more children say they would like to walk, scoot, or cycle)
  - Case for no
    - It doesn't matter what the children think, as it's the parent's choice
    - Sometimes responses end up being dictated by teacher's preferences
    - The data rarely used in accreditation, so it could be a waste of time
  - Consensus

        - Clarify the wording (children often think it means they have to pick a new method, when they might actually be using their preferred method already)
        - Make the question optional, but recommended
            - Each borough can decide
            - Possibly only include as part of a full review
        - Not robust enough to be reported on a national level, but interesting
    - For children younger than 5, data on mode of school travel should ideally be provided by the parents

Appendix III: Interview with Hena Ahmad, Norbury Manor Primary School Parent Liaison

March 15th, 2012, 10:00am
In attendance: All WPI team members, Hena Ahmad

Interview Questions

Background information

- What is the walking rate for students at Norbury Manor Primary School?
- How much emphasis does the school put on walking?
- What modes of public transportation do students commonly use to get to Norbury Manor?

Walk-to-school programs and Zero Heroes

- Has Norbury Manor ever participated in Walk once a Week?
- How much do the students, staff, and parents know about Zeroes Heroes?
- Has anything been done for the Zero Heroes program so far?

Logistical

- How much interaction will we be able to have with the students here?
- Which years/classes can we survey?
- What are our options for running a parents' evening?
- What are our options for running an assembly?
    - How long should it be?
    - Any other suggestions?

Interview Notes

- About 70% of the students are within a 20-minute walk of the school
- Norbury Manor Primary School has a problem with limited parking
    - There is parking close to the school on Abingdon Road and Stanford Road, but parents drop their children off right in front of the school gates
    - Parking on zig-zag lines not allowed but parents park there anyway
    - Outside the school is very congested
- Public transport is accessible: train, buses
    - Children ages 5-18 who are currently in education can travel free on buses (and other public transport)
    - There are two bus stops less than a 10-minute walk from the school
    - The Norbury rail station is about an 8-minute walk from the school
- The school has not participated in Walk once a Week
- As of this interview (3/15/12), only Hena and the head teacher know about Zero Heroes; nothing related to the program has been done in the school yet
- Parents' evenings – one 3/15, the next not until June
    - As an alternative – we could set up a table at beginning and/or end of day for the parents, and come in a few times in the morning and in the afternoon
    - School gates open at 8:40, school begins at 9:00, finishes at 3:10
- School assemblies
    - We would come in on a day when the students don't already have one
    - We would do two – one for older students and one for younger
    - There is a projector in the assembly room
    - Assemblies usually run 9:15 to 9:40 (15-20 minutes plus 5 minutes for questions)
- Air quality devices
    - Discussed how Imperial College doesn't have the funds
    - Hena thinks the children would be willing to do this
    - Come up with a timeframe for when we can obtain devices
- Surveys
    - Start in year 1
    - There are six years with two classes each and 30 students in each class
    - Some children speak English as a second language and wouldn't be able to do the surveys, but we can try
    - We can send home the parent surveys with the students (we would reach more people), but it might be better (more detailed responses) with personal contact after and before school
- Hena to look into walking distance map of where students live
- Zero Heroes drawing competition a good idea – students like art

- In general, the students would be eager to participate in this program, especially the Junior Road Safety Officers (JRSOs)
- Plan dates we can come in for: an assembly, and to talk to the parents
    - Any day except Friday (normal assembly day)
    - Students have two-week holiday March 30th – April 16th

Appendix IV: Interview with Linda Johnson and Clive Simmonds, Croydon Council Pollution Team

March 16th, 2012, 2:00pm
In attendance: All of WPI team, Linda Johnson, Clive Simmonds, Peter McDonald

Interview Questions

- Are there other ways that Croydon measures local air quality besides the monitoring stations?
- Do you have any recommendations for types of air quality monitoring devices to use for the Zero Heroes program?
- Will one day of no cars on the road impact air pollution?
- How is the air pollution in Norbury?
- What are common misconceptions about air pollution?
- Is air pollution inside a car worse than the exposure one would get from walking?
- What has been done to reduce emissions from vehicles in Croydon?
- How can individuals make a difference in local air pollution?

Interview Notes

- Nationally, air quality should be given higher priority.
- In London it is sometimes perceived that the need for revenue from car parking takes precedence over other schemes.
- Much commuting in Croydon consists of people passing through the borough; much car travel within the borough is school-related. An estimated 60% of the pollution in Croydon is from vehicles.
- There is a car culture that has to be examined to change people's behavior.
- People often don't realize a walk could be shorter than a tube ride.
- About one million vehicle journeys a day in London are less than a mile in length.
- If personal car use in London was completely eliminated, pollution may reduce by at least 50%.
- In school programs, the way to reach the parents is often through their children.
- School travel plans
    - The borough has responsibility for "children in its care" – this results in some gray areas (where does this responsibility end?)
    - STPs are part of borough responsibility for students' travel to school.
    - Air quality is starting to become part of some schools' curricula (Zero Heroes would be good at these schools because it would tie in.)
- Switch Off Engine program
    - TfL campaign now, but started by LB Croydon in 2005.
    - £20 potential fine for idling, if the driver refuses to switch off engine. However, no fines have been issued as all drivers have complied with advice to 'switch off'. The campaign is about awareness rather than fund-raising.
    - There are 'switch off' signs outside 20 schools in the borough of Croydon. There are 20 more such sites to be identified.
    - Giving information to children to give to their parents is often more effective than informing parents directly.

- Air pollution in London and Croydon
    - In Croydon, monitoring has been going on for at least 20 years
    - There are 20 diffusion tube sites in addition to the continuous monitoring stations.
    - The results from diffusion tubes are not usually that dissimilar to the monitoring stations.
    - Diffusion tubes have a metal gauze with a reagent to attract NO_2. Acetone is used in labs to measure the NO_2 levels.
    - In the past 10 years, London's air quality seems to have stabilized.
        - However, north and central London are exceeding the NO_2 air quality standard (40 $\mu g/m^3$)
        - In Norbury, the levels are often close to 70 $\mu g/m^3$
    - The Low Emission Zone has had some success.
        - Pollution levels increase as car use increases.
        - Lorries are cleaner now, but their pollution traps have decreased particulate pollution while sometimes increasing NO_2 levels.

- The main problem pollutant is NO_2, PM_{10} to a lesser extent (ozone even less so because much of London is urban and reactions with oxides of nitrogen sometimes decrease levels)
- Some pollution is contributed from Europe, especially dust or aerosols.
- Linda to look into hand held air quality devices for the school that measure nitrous oxides and carbon monoxide.
- A car-free day may only have a limited effect on air pollution, but its intention is to raise awareness, allowing people to see how they can live without a car.
    - A car-free month would have a greater impact on pollution levels.
- The middle of the road is probably the most polluted area of it.
    - It's possible that a car driver with their window open is exposed to more pollution than pedestrians.
    - Cyclists are more exposed than pedestrians.
- Indoor air pollution is also a problem – including VOCs (volatile organic compounds) from cleaning products.

- Websites to look at:
    - airtext.info
        - Gives people (especially those with health problems) information on predicted air pollution levels
        - Goal is to change behavior – i.e. if the air pollution is high, people will hopefully stay home
    - Walkit.com
        - Allows you to choose a less polluted route
    - Croydon Council pollution page – Air Quality Action Plan (10 projects)
    - londonair.org.uk
        - Great website for air quality data from Croydon

Appendix V: Interview with Jo Hill, Sustrans

March 30th, 2012, 12:00pm
In attendance: All WPI team members, Jo Hill, Peter McDonald

Interview Questions

Sustainable travel programs similar to Zero Heroes

- What programs have you had a large part in?
- What were the goals of the programs and how effective were they at achieving these goals?
- Was long-term behavior change a goal and if so, was it attained?
- How did you promote the programs?
- What techniques and materials did these programs use, and how effective would you say each technique was?
- Do you have any data on how many people participated?
- Would you run the programs again?
- What would you do differently?

Zero Heroes

- What have you done for Zero Heroes?
- What other boroughs are doing Zero Heroes this year?
- Have the program goals changed since the initial Zero Heroes project brief?
- What is your opinion on focusing the program on road safety/traffic, physical activity, and air pollution, as opposed to just air pollution?
- What are your ideas for events on Zero Heroes Day?
- What are your opinions on our ideas for the program?

Interview Notes

- Jo has been at Sustrans for 7 months
- Bike It
    - Goal: to make children confident in biking
    - The program doesn't train children to bike but aims to make it fun and a habit
    - Measure of success: doubled cycling rates in the schools they worked in
    - Worked intensively with 12 schools in 12 boroughs each year
    - From there, the schools transition to just being supported by Sustrans in the program
        - Support by providing curriculum resources, such as for planning children's routes to school or incorporating lessons into PE classes
- Sustrans Heroes
    - Materials include a booklet that students work through to earn points and medals
    - Program is based on the seven Olympic and Paralympic values:
        1. Respect
        2. Excellence
        3. Friendship
        4. Courage
        5. Determination
        6. Inspiration
        7. Equality
    - Schools that take part in Bike It and Sustrans Heroes can have a few students go to pre-Olympic events
- Big Pedal
    - National competition
    - Counts each cycle journey
    - So far, over 800,000 school journeys counted
    - An important technique: providing incentives
        - Students could win a bike, books, have BMX or cycling teams come into the school
        - Important to develop habits in children and to make them comfortable cycling
- London Greenways
    - Seeks to improve green spaces, walking and cycling routes
    - Diffusion tubes set up on greenways
        - Through Hyde Park (paths and cycle routes) and on main roads (Payne Rd.)
    - Results (provided at http://www.sustrans.org.uk/what-we-do/london-greenways): Air cleaner on greenway than main road
    - There may be a route that was monitored in Croydon
    - How long do diffusion tubes have to be in place (compared to a hand-held monitor)?
        - They had them in place for 6 weeks
        - Obtained very comprehensive data

- Potential contacts
    - Jenni Davies, London Sustainability Exchange
    - School in Westminster
        - Just off the A40 near Paddingdon – one of the most polluted areas in London
        - They have an air quality project manager
        - Jenny Preen
- Overall Sustrans goal: Promote active travel as a whole for 5-18 year-olds
- Activities that have been done:
    - For Bike It in secondary schools: "Bling your bike" – bicycle decorating
    - Assemblies
    - Playground games
    - Take bikes out on trips around town and to nature places
    - For secondary schools: mountain bike training
        - Teenage version of cycle skills
- General advice for programs like Zero Heroes:
    - Link program messages with environment, transport, health
    - Enforcing zig-zag lines would reduce a lot of aggression around the school
    - In case students can't walk or bike, provide an alternative method for program participation so they don't feel left out
    - It is essential to have someone in that school that is really willing to push the project, otherwise it will get forgotten
    - Give children responsibility with prizes and incentives
        - Example incentive: t-shirts
        - Bike It has "Bike It Marshals" – 6-10 students who pump up bicycle tires, hand out prizes, and encourage staff to plan the next Bike It event
    - For teachers, provide a lesson pack with plans (essentially a script for delivering material)
    - Try to get the material pre-linked into the curriculum and written into the school's long term plans
        - Long term plans: 1-2 years ahead
        - Medium term: planned by term
        - Short term: planned by weeks
    - Deliver the program material yourself the first time, and the next year the teachers will feel more confident to deliver it on their own
    - Educate teachers about the program at a lunchtime session or after school club
    - You are more likely to have success if the head teacher is behind the program
    - Make the program part of the environmental policy in the school travel plan (STP), related to air quality, traffic, etc.
    - An important lesson was that you start programs thinking the school will understand what you want, but you have to "hold their hand"
    - In order to solidify the program at a school, it has to be done more than once, maybe 2 or 3 times
    - It's important to demonstrate for it to really sink in
    - In general, programs like this are about
        - Incentivizing and prizes

        - Making the behavior safe and fun
        - Creating a habit
- What has been done for Zero Heroes already
    - Information is on Project Dirt page (http://projectdirt.com/group/air-quality-around-schools)
    - Look at Walk once a Week resource for planning walking routes
- Ideas for Zero Heroes Day and student presentation of results after
    - Invite cabinet members
    - Breakfast
        - See if a local supermarket near the school would provide food for event
            - Have children write to supermarket asking them to donate
    - Have pictures taken, and collect anecdotal data
        - Quotes from parents, teachers, students
        - Evaluation sheet
    - Student presentation of results – good for students and the school
        - City Hall
        - Hampton Hill School in July when all other programs are being presented
        - Have students go to a Transport for London quarterly get-together
        - Jo to ask Daniel Barrett if there is something they can go to
    - Accreditation
        - STAR – School Travel Accredited and Recognized
        - Schools get bronze, silver, or gold levels
        - Register the school's travel plan – if they are achieving above base-level they may be honored and invited to an awards ceremony for the area
- Possibilities for continuing Zero Heroes
    - Develop materials into a pack and sell to other borough councils
    - Credit on pack could go to Sustrans, and it could say "developed by Croydon Council"
    - Croydon could also purchase air quality monitors and hire out the monitors to the schools for use
- Survey advice
    - For the Bike It 2011 annual report in Hounslow, the percentage of students who bike was reported as having declined after the Bike It program. Reasons:
        - Hands up survey of September was only a snapshot, not very reliable
        - One hands-up survey was done again in July
        - Factors that affect hands-up (one day) surveys: weather, who is delivering the survey (students may feel obligated to raise their hands saying they bike if a Bike It officer is asking the question)
    - More reliable to use data on average bicycle counts throughout year

Appendix VI: Interview with Tannith Cattermole and Ali Lin, LSx

April 4th, 2012, 3:00pm

In attendance: All WPI team members, Tannith Cattermole, Ali Lin, Peter McDonald

Agenda

LSx
London Sustainability Exchange

Bubble Day Sharing 4th April 2012

Attendees:

LSx; Tannith Cattermole and Ali Lin

London Borough of Croydon; Bubble Day team including Peter MacDonald, Erin-Marie Agar

Agenda:

- Cleaner Air 4 Schools briefing
- Share Cleaner Air 4 Schools Toolkit
- Zero Heroes Bubble Day ideas
    - Croydon
    - LSx
- Shared funding opportunities?

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Zero Heroes Bubble Day

London Sustainability Exchange (LSx) will utilise citizen science as a tool to engage and bring alive the issue of poor air quality with Christ Church Bentinck school, located in one of the most polluted areas in London, Marylebone Road. Through a programme of citizen science activities, we will enable and empower the school community to test their local air quality and learn about ways to tackle the causes of air pollution at home, at school, with family, friends, teachers and governors.

Zero Heroes Bubble Day will see the whole school community - parents, staff and pupils - make a combined effort to create a 'bubble', within which everybody will travel sustainably and pledge to cause as little pollution as possible. We will deliver a **half day's programme of science-based activities for Bubble Day, holding a range of demonstrations, participatory activities, workshops and games for the children, staff and parents in order to educate the community about local air quality in a fun and engaging way.**

Activities will include **demonstrations by LSx scientists of pollution-sampling methods such as diffusion tubes, ghost wipes, and leaf sampling. Pupils, staff and parents would take part in air quality monitoring activities such as hand-held particulate matter monitors, lichen monitoring, leaf wiping and ozone badges.**

On the day LSx scientists will deliver a schedule of citizen science activities and demonstrations including using **badges to detect ozone, using diffusion tubes to measure NO2 concentrations, using wipes to visualise particulate matter and using a handheld meter to measure particulate matter around the school area**. Pupils, staff and parents will also **participate in quizzes and seek-and-find activity trails with prizes**, that aim to educate them about local air quality. LSx scientists will use a mix of methods to survey pupils to assess learning, **including 'hands up' surveys and mini questionnaires**. Parents, teachers and pupils will be invited to **make pledges to reduce air pollution and to match obstacles with solutions**.

Other possibilities: raffle, prize draws, treasure hunts, activity trails/educational quiz activity, badge prizes, bike maintenance workshops.

<u>Other schools involved</u>

LSx propose to work exclusively with CCB, however we will cascade learning from our work to a broad audience through our website and newsletter, and a final inter-school inter-borough event in July. We would welcome participation from other schools in the area if funding is secured. Nearby St Edwards Roman Catholic Primary School has expressed an interest in being involved if funding for resources were sufficient to support an event for both schools.

Interview Questions

Cleaner Air 4 Schools program

- What does the project seek to do?
- What are some of the aspects of air quality that the project focuses on?
- Does CA4S have a central coordinator? If not, how is the program administratively organized?
- Does CA4S push behavior change for sustainable transportation alternatives like cycling or walking to school?
- What methods does the program use?
- If you used surveys, what kinds of questions were asked and what was the response rate?
- Explain a bit more about "citizen science" – what role does it play in CA4S?
- What are some of the art activities that CA4S has done? What were the results?
- Were there any other school activities (i.e. field day, dress down day, etc.) or incentives that were made for CA4S?
- Did CA4S utilize flyers or motivational posters to advertise the program in schools? If so, what did they look like? What about promotional items like toys or balls?
- Tell us a bit more about the toolkit – is it aimed at students, teachers, or both? What does it include?
- Have any aspects of the program been evaluated? If so, how successful has it been?

Zero Heroes

- What school are you working with on the program?
- What are the planned activities for the program?
- What are some of the ideas that have been developed for "Bubble Day" (the name of Zero Heroes Day at the school in Westminster)?

Interview Notes

- Cleaner Air 4 Schools
    - Delivered to 3 schools in Westminster
    - Use of "citizen science" techniques
    - Project objectives:
        - Improve students' confidence, knowledge and skills
        - Help the school community understand importance of air quality and things they can do to improve it
    - Trained 8 champions in the school to lead the program and teach their peers
        - Champions included some students, parents, teachers, and school governors
    - Baseline surveys (3):
        - Travel survey of students (hands-up)
        - Parent and teacher travel questionnaire
        - Idling survey
    - Surveys then run again at end of program to measure behaviour change
    - Air quality champions measured nitrogen dioxide air pollution with diffusion tubes and heavy metal particulate pollution with ghost wipes. They also surveyed lichen distribution as a measure of nitrogen in the air
    - CA4S used the results to raise awareness of poor air quality in the area, empowered champions to measure local air pollution with citizen science, and advised the school community how they can change behaviour that reduces air pollution
    - Used the peppered moth story: students make pledges relating to improving air quality and each time they complete a pledge action, they add a white dot to a black moth
        - We could use the peppered moth material from the toolkit; it's easy to implement in schools since all they have to do is make a black moth cutout
        - Peter – June 15 is soon, so providing all of the toolkit to NMPS would be too much at this point, but 1-2 activities might be good, then repeat in following years with a complete pack
    - Other social marketing methods included a badge design competition for the air quality champion team – the winning designs were turned into real badges to be used as prizes for individuals who successfully completed pledges
    - The CA4S toolkit (for schools) was created at the end of the CA4S project based on focus group feedback from the air quality champion team
        - It provides the tools for other schools to roll out the same project
        - LSx ended up modifying the toolkit to:
            - specify which activities were best for each year (age group)
            - include advice about the season/weather to do each activity
            - include more free or low-cost activities
    - Tannith: Students learn better from peer-to-peer engagement rather than us coming in to teach them
    - In future roll-outs, LSx would consider initiatives that engage the whole school community, including staff who work in delivery and kitchen

- Bubble Day
    - Being carried out at Christ Church Bentinck School in Westminster
    - Ideas for Bubble Day:
        - Half day festival of CA4S activities:
        - Treasure hunts and activity trails: students have to go various stalls to collect information
        - Morning breakfast 1-2 hours
        - Air quality monitoring: ozone badges (instant analysis), sticky tape and cotton wool ball analysis of particulate pollutant
        - Hand-held air quality monitoring if funding/donor can be secured
        - Raffles and prize draws
        - Hands up quizzes
        - Bike maintenance workshops

- Advice for Zero Heroes program
    - Based on their experience, it was better for LSx to judge student art competitions rather than letting the school do it to ensure that the right message was promoted
    - Awarded two air quality champion badges designed by pupils for each school, and provided certificates for runners-up (Tannith – Kids love certificates)
    - Contact Archbishop Lansfranc School. Sports leaders may be able to help organize activities with active lifestyle team
    - Living Streets, WWF, and Sustrans may all be interested in Zero Heroes and could potentially partner in sustainable travel initiatives
    - Air quality measurement demonstration – maybe Clive or Linda
    - Diffusion tubes are £8-10
    - Ghost wipes measure up to six heavy metals, but you can cherry pick which metals to analyse to reduce costs
        - The people who provide these and diffusion tubes are open to price negotiations; if we get a price point on air quality monitors Ali and Tannith would be interested to know
    - As part of 'Mapping for Change' University College London developed a handheld air quality monitor which is £2000 to rent http://www.ucl.ac.uk/news/news-articles/1007/10070101
    - "Air quality egg" – another method to measure air quality - http://www.wired.co.uk/news/archive/2012-03/29/pachube-air-egg
    - Look up
        - a game called "traffic snake" that schools in Denmark use: http://www.schoolway.net/index.phtml?id=1203&ID1=1071&sprache=en
        - other projects: Schoolways, Project Connect: http://www.schoolway.net/index.phtml?id=1086&ID1=1074&sprache=en
        - Living Streets walking pack
    - It is recommended that project officers become friendly and familiar with the school receptionist and make sure they are aware of program
    - The head teacher's support is necessary because they will allocate time for the program to teachers

- To overcome the problem of communicating with teachers, who are mostly in class and not able to speak by phone, cc reception in all emails and have them print the email and put it in teacher's "pigeon holes" so they remember to call
- In LSx experience, the parents were hardest to engage with the project
    - Solution: have children write a play on the issue and perform it for parents (ensures that parents will show up and get the program message)
    - Once you get the message to parents, they then sometimes come to teachers and say they didn't realize -- was an issue and asking what they can do to help
    - Make the play part of drama class, or write a story about a Zero Hero in English class
- Ali: Might be beneficial to increase the number of champions (they engaged 8, and had more at the end than what they started with)
    - People want to participate, but the main obstacle was time
- Tannith – students *and* parents love competitions, so it's a good way to involve both groups

Appendix VII: Student and Parent Surveys

Student Preamble

Dear Pupils,

This survey was created by a group of students from Worcester Polytechnic Institute in the United States. We are working on creating a walk-to-school programme called Zero Heroes for your school. You can help us out by answering the questions on this short survey that will tell us about your habits in walking to school. You may choose to participate or not, and you may skip any of the questions. Your response will remain anonymous. Please return the survey to your teacher when you are finished. Thank you!

Sincerely,

WPI Zero Heroes Project Team
Erin Agar, Christian Iamartino, Caitlin McMahon, Christian Mortensen

Student Survey

Zero Heroes Student Survey

Thank you for taking the time to fill out our survey.
Please circle your answers or mark the boxes with a check ☑

Question 1:

What year are you? 1 2 3 4 5 6

Question 2:

Are you a boy or a girl?

Boy

Girl

Question 3:

How do you usually get to school?

- ☐ I walk
- ☐ I cycle/scoot
- ☐ I'm driven to school
- ☐ I take the bus/train/tram

Question 4:

How often do you walk or cycle most of the way to school?

- ☐ Almost never
- ☐ 1-2 times per week
- ☐ 3-4 times per week
- ☐ Almost always

Question 5:

If you do walk to school, why?

- ☐ It's fun for me
- ☐ My parents make me
- ☐ I like to walk with my friends
- ☐ Other: _____

Question 6:

If you don't walk to school, why not?

- ☐ My parents won't let me
- ☐ Too far to walk
- ☐ It's unsafe
- ☐ I don't know the way
- ☐ It's boring
- ☐ Other: _____

Parent Preamble

Dear Parent/Guardian/Carer,

We are a group of students from Worcester Polytechnic Institute in the United States working in conjunction with Croydon Council and Norbury Manor Primary School to develop Zero Heroes, a programme that seeks to have every student to walk to school for one day in mid-June. We would appreciate your feedback on this short survey about you and your child's walking habits. Your participation is voluntary and you may skip any of the questions. Your response will remain anonymous.

We will be on-site before and after the school day on Thursday, 29 March to collect surveys and to answer any questions you may have about the programme. Additionally, you may return the survey to Norbury Manor Primary School with your child at any time before our visit. If you have any further questions, please contact us at:

lon-d12-croydonzero@wpi.edu.

We appreciate your help greatly. Thank you.

Sincerely,

WPI Zero Heroes Project Team
Erin Agar, Christian Iamartino, Caitlin McMahon, Christian Mortensen

Parent Survey

Zero Heroes Parent Survey

Thank you for taking the time to fill out our survey.
Please mark the appropriate answers with a check ☑

Question 1 :

What is the school year and gender of your child/children?

Year	Gender

Question 2 :

About how far from Norbury Manor Primary School do you live?

1 mile = 1.6 km

1.25 miles = 2 km

	Less than 500 metres
	500 metres to 1 kilometre
	1 – 2 kilometres
	2+ kilometres

Question 3 :

How does your child <u>usually</u> get to school?

	walking/scooting
	cycling
	personal vehicle
	carshare
	public transport

Question 4 :

How would you like your child to get to school? (can be the current method)

	walking/scooting
	cycling
	personal vehicle
	carshare
	public transportation

Question 5 :

What is your main concern(s) regarding your child walking to school?

	route safety
	convenience
	time constraints
	distance
	Other:

Question 6 :

In your experience, what would best motivate your child to take part in a school-based community project?

	incentives (e.g. prizes or give-aways)
	peer pressure
	parental authority
	advertising (flyers, posters, banners)
	hands on activities
	Other:

Appendix VIII: Survey Results

Student Surveys

Table 2: Year vs. Gender

		Gender		
		Boy	*Girl*	**Total**
Year	1	10	4	**14**
	2	0	2	**2**
	3	2	6	**8**
	4	7	10	**17**
	5	10	12	**22**
	6	3	6	**9**
	Total	**32**	**40**	**72**

Table 3: Year vs. Method of Transport

		Method				
		Walk	*Cycle/ Scoot*	*Drive*	*Public Transport*	*Carshare*
Year	*1*	8	0	3	4	0
	2	1	0	1	0	0
	3	4	1	5	0	0
	4	14	0	2	2	0
	5	17	1	6	2	0
	6	6	0	1	2	0
	Total	**50**	**2**	**18**	**10**	**0**

Table 4: Method of Transport vs. Gender

		Gender	
		Boy	*Girl*
Method	Walk	25	25
	Cycle / Scoot	0	2
	Driven	7	11
	Carshare	0	0
	Public Transport	5	5

Table 5: Count of frequency of walking to school

Frequency	**Count**
Almost Never	17
1-2 times a week	2
3-4 times a week	9
Almost Always	44
Total	**72**

Parent Surveys

Table 6: School year of children

Year	Count
Reception	2
Year 1	15
Year 2	6
Year 3	9
Year 4	17
Year 5	24
Year 6	9
Unknown	2

Table 7: Gender of children

Gender	Count
Female	39
Male	36
Unknown	3

Table 8: Distance vs. Method of Transport

		Method					
		Carshare	*Personal Vehicle*	*Public Transport*	*Walk/ Scoot*	*Cycle*	**Total**
Distance	*<500m*	0	0	0	20	0	**20**
	500m-1km	0	1	1	20	0	**22**
	1-2km	1	2	2	6	0	**11**
	>2km	0	6	7	3	0	**16**
	(blank)	0	0	1	0	0	**1**
	Total	**1**	**9**	**11**	**49**	**0**	**70**

Table 9: Preferred vs. Current Method of Transport

		Current Method				
		Carshare	*Personal Vehicle*	*Public Transport*	*Walk/ Scoot*	**Total**
Preferred Method	*Public Transport*	0	1	6	1	**8**
	Carshare	1	0	0	1	**2**
	Personal Vehicle	0	7	6	7	**20**
	Cycle	0	1	0	1	**2**
	Walk/Scoot	**1**	**1**	**1**	**48**	**51**

Table 10: Distance vs. Preferred Method

		Preferred Method				
		Public Transport	*Carshare*	*Personal Vehicle*	*Cycle*	*Walk/Scoot*
Distance	*<500m*	0	0	0	0	20
	500m-1km	1	1	5	1	20
	1-2km	0	1	5	1	7
	>2km	6	0	10	0	4
	(blank)	1	0	0	0	0

Table 11: Main concern regarding child walking to school

Main Concern	**Count**
Route Safety	43
Convenience	7
Time Constraints	10
Distance	22
Concern: Other	5

Other included:

- Drop off on way to work
- We walk all the time, don't live far away from school
- Strangers
- Nan drives to work past school
- Security

Table 12: Best method to motivate child to take part in school-based community project

Persuading Child	**Count**
Incentive	36
Peer Pressure	2
Parental Authority	10
Advertising	8
Hands on	33
Motivation: Other	1

Other included:

- Children being involved from start to finish. Giving their opinions and thoughts on projects that matter to them.

Appendix IX: School Traffic Observations

Table 13: School Traffic Observations

	Morning	**Afternoon**	
Date	19 March 2012	21 March 2012	
Weather	Partly cloudy, ~50°F	Sunny, ~60°F	
Start Time	8:41am	2:48pm	
End Time	9:01am	3:23pm	
Traffic Data		*Location 1*	*Location 2*
Total thru-traffic vehicles	92	79	82
Violations			
Stopping in street	14	4	2
Parking on zig-zags	6	4	1
Dangerous 3-point turns	3	2	5
Improper parking/partial parking	7	no data collected	
Other notes	- Traffic reduced to one lane - Speedy passing on zig-zags	- Traffic reduced to one lane - Trucks passing through - Speedy passing on zig-zags - Blindly backing up to let traffic through	

Appendix X: Junior Road Safety Officer Focus Group

March 27th, 2012
Norbury Manor Primary School

What would be effective ways to get your peers excited about Zero Heroes and walking to school?

- Leaflets that show the positives of walking and the negatives of driving, for example:
    - walking uses less petrol, less pollution, makes you healthier, gets your brain awake
    - show the difference between a traffic jam and walking
- Humorous and/or colorful poster
- An art competition

What incentives would get your peers to walk on Zero Heroes Day?

- Sports activities – races, PE day
- Inter-class competition – class with highest percentage of walkers wins:
    - "mufti day" (where students can wear normal clothes instead of uniforms)
    - a party with games, dance, food
- A "race your neighbor to school" day, except that might not work for all students since some do not have neighbors who go to the school
- Ideas for prizes
    - Football
    - T-shirt
    - Cup
    - Bag
    - Badge
    - Medal
    - Model bike

Appendix XI: Zero Heroes Program Materials

Walking to School Assembly and Skit

Tuesday, March 27, 2012
Norbury Manor Primary School

Skit Design Process

One of the activities we created and carried out at Norbury Manor Primary School was an assembly plan consisting of a skit and some brief follow-up questions. This skit was designed to show children at Norbury Manor Primary School the benefits of walking to school and to introduce them to the Zero Heroes program. We decided to create a skit because our sponsor liaison had cautioned against using a slideshow since it would not hold the students' interest for very long. Additionally, we chose this method to apply our research related to the positive impacts of peer-to-peer engagement for learning, and did so by having the Junior Road Safety Officers and several other students at Norbury Manor Primary School perform the skit.

In addition to demonstrating how walking can be good, the skit also touched upon the issues of air pollution (in the play, one character's mother was an environmental scientist) and emphasized road safety when the students paused to check the street before crossing in front of the school.

At the conclusion of the skit, we asked the children how the student who was driven could convince his parents to allow him to walk. This was to reinforce that ultimately, parental support and approval is needed in order to walk to school. Coupled with questions about where air pollution can come from, with a brief accompanying demonstration of an air pollution monitoring device, we were able to get the students thinking about the behavioral and environmental issues raised in the skit.

Script

- Brief introduction by WPI team
- Explain the Zero Heroes program
- Ask students how many of them already usually walk to school
- Introduce skit and performers

A Walk to School

Written by:
Christian Iamartino

With edits made by:
Erin Agar
Caitlin McMahon
Christian Mortensen

Part 1: A Morning at Home
Setting: *In the kitchen at Child 1's house where Child 1 and parent are sitting at the table. Child 1 is eating breakfast, Child 1's mother is reading a magazine.*
Child 1's Mother: [*Mother lowers her magazine*] So, your father and I have been talking about what you asked us yesterday. [*pause – Child 1 waits intently*] We have decided that you are old enough to walk to school on your own.
Child 1: Yay! Thanks mum! I can't wait!
Child 1's Mother: We talked to Mr. and Mrs. Parent Name and Parents Name and learned their children walk together, so you'll be walking with your friends. The school's not too far; you won't have any trouble getting there. We've walked it many times before and I'm sure you know the way by now. But in case you get lost, I made this little map for you. It marks the two streets, our home, and the school and the path that we take. *[Mother points to locations]*
Child 1: [*Child rolls eyes*] Yes, mum, I know where I'm going…
Child 1's Mother: All right, well better get going, or you'll be late for school! Meet up with Parent Name and Parent Name on your way! I'll watch to make sure you meet up with them at the end of the street. Have a good day at school!

Setting: *In the kitchen at Child 2's house where parent is rummaging around. Child 2 is standing around while his mother frantically searches for the keys. Parent is somewhat cross about not being able to find keys and complains about being late for work.*
Child 2's Mother: Uh oh, we're going to be late! Have you seen my car keys anywhere?
Child 2: No!
Child 2's Mother: Well, can you help? I've looked everywhere!
Child 2: [In a weary tone]Yes mum.
Child 2's Mother: Ahh here they are! Come on, you're making me late, let's go!
Child 2: But mum, I didn't get to-

Child 2's Mother: Enough! I'll give you some money for lunch – you can figure something out, right? You're old enough.
Child 2: [In a droning tone] Yes, Mother.
Scene ends as child and Mother walk off-stage

Part 2: The Walk to School
Setting: *The scene opens with Child 1 walking out of the door, opening a gate, and beginning the walk to school.*
Child 1: Ah, such a nice day today: even the birds are singing to greet such a lovely day! [Child stops] Is that Parent Name and Parent Name? Yes! They're waving to me.
Child 1 walks over to her friends
Friend 1: Hey Child 1, we heard your parents are letting you walk to school!
Child 1: Yes! I was so excited when I heard that they had let me. I've been begging them for months now.
Friend 2: We're so happy you could come with us. Friend 1 here sometimes gets a bit boring [*jabs friend 1*] – just kidding Friend 1. But yes, it will be nice having you around.
Child 1: Well, thanks. I'm glad to be here. Should we start walking?
Friend 1: Yeah. Let's go.
Friend 2: It's a short way; takes only a few minutes.
Friends walk together, glancing about.
Friend 1: You know, I never noticed how nice the outdoors was until I started walking to school.
Child 1: Did you see the sun over there peeking from behind the clouds? [*Child looks in the distance*]
Friend 1: Wow, what a sight! It's beautiful this morning.
Friend 2: I'm glad I'm not cooped up inside today!
The wind begins to pick up.
Child 1: Look at the tree branches swaying in the wind – it looks as if the tree itself is moving!
Friend 2: Woah! It does!
Friend 1: Listen [*a moment passes*] can you hear the wind through the tree's branches? I love that sound, so peaceful.
Child 1: Me too. It makes me want to just lie down in the grass and fall asleep!
Friends continue walking
Friend 2: Hmmm, I wonder what that thing is in the tree up ahead. [*Child investigates*] Wow, look! Look at that colourful bird. Let me take a closer look at it. [*Bird chirps*] Listen…he's singing about spring!
Child 1: What a pretty bird! You don't see one like that every day. I think I'll try to draw it in art class today.
Friend 2: Oooh, I should try that too!
Child 1: Of course, you'll probably 1-up me… [*Child 1 rolls eyes*]
Walking continues
Friend 1: Would you look at that - there's a lot of traffic on that road over there. I'm glad I wasn't driven to school today! The cars aren't even moving!
Friend 2: Glad I'm not in that mess.
Child 1: Well, I can say for sure that I definitely prefer walking, because I feel good after a long walk. Mum always told me that walking was one of the best ways to stay healthy.

Friend 2: Well, your mum would know – she's a scientist.
Child 1: Yeah, she's been telling a lot of people about the bad pollution from cars - it's what she reads nowadays - so I guess that's another good reason to walk. We also had a talk about it last year in school, remember.
Friend 1: Oh yeah, that's right.
Child 1: [Child 1 looks up**]** Hey look! It's the school, right up ahead! That didn't seem long at all!
Friend 1: Yep, Friend 2 and I notice how much faster the time passes when you have someone to talk to.
Friend 2: Yeah, definitely - especially when the weather's nice.
The trio arrive across from the school
Friend 1: Make sure you look both ways before you cross, Child 1, cars sometimes drive really fast around here.
Child 1: I know, Friend 1, it's not my first time walking to school!
Friend 1: Sorry, sorry, just making sure.
[Child 2 appears on the other side of the street.]
Friend 2: Hey look! It's Child 2! [Smile to Frown] Oh, he must've been stuck in that traffic we saw earlier. Oh dear, he doesn't look happy. Maybe we should go talk to him quickly before school starts.
Child 1: Good idea, let's go.

Part 3: At School
Child 1 and friends go to visit their good friend Child 2 who is walking towards the school gate. Child 2 does not look happy and Child 1 and friends are concerned.
Child 1: Hey Child 2, how are you?
Child 2: My morning was pretty bad.
Friend 1: What happened, Child 2?
Child 2: Well, you all know that my mum likes to get to work early. Today she was running late because she couldn't find her keys.
Child 1 and friends cringe at the statement, knowing that Child 2's mother hates to be late and is easily stressed.
Friend 2: I can just imagine. Did you get yelled at?
Child 2: Not quite, but we were in a big rush. Mother was really frustrated. I didn't even get to have anything to drink before I left. I'm really, really thirsty.
Friend 1: Here, I've got an extra bottle of water in my bag. I took it for the walk to school, but I wasn't thirsty. You can have it. Speaking of which, Child 1 joined us today on the walk, it was really fun. Better than having Friend 2 go on about birds all the time.
Friend 2: We really enjoyed the sun and the wind through the trees, and a very colourful bird started singing when we were near. It was amazing!
Child 1: Yeah, you know I walk to school with my parents most days, and I have to say, being with friends is just as fun – if not better!
Friend 1: Maybe you should join us sometime Child 2. You live on the street next to ours, right?
Child 2: Yeah. After today's morning, I'm definitely thinking about it! All I ever get to see is the boring grey buildings along the main road. It's not fun.
Child 1: [With concern] Doesn't sound like it.
Friend 2: Well, why don't you join us then?

Child 2: I'd have to convince my mum that it's a good idea. She's really strict about safety and such. I don't get to go many places on my own.
[Friends look glum]
Child 2: [Child 2 looks up] Maybe you can help me come up with the good things about walking with you - convince her that it's a good idea. And you can ask your parents to talk to my parents about it! Yes! I'm sure that would work!
Friend 1: Well, school's about to start – let's talk about it at lunch.
Child 2: Alright, see you all then! Thanks!
Children exit.

Follow-up Questions

- What reasons can you think of that would help Child 2 convince his mother that walking to school is a good idea?
- WPI team demonstrates and explains air quality monitoring device
- Do any of you know what air quality and air pollution mean?
- Where do you think air pollution comes from?

Design a Zero Hero Competition

Competition Guidelines

WHEN

- Competition kick-off – posters go up: Week of 23-27 April
- Reminder about due date for competition at the Friday 27 April assembly
    - Or to parents via text message
- Submissions due by Wednesday 2 May
- Finalists selected by Friday 11 May
- Winners also selected and their entries submitted to design team by Friday 11 May
- Banner unfurled at school and finalists and winners awarded with prize packs at 25 May Friday assembly

WHAT

Competition

- Guidelines for designing a Zero Hero (as outlined on design competition poster)
    - Use A4 size (8.25in x 11.75in) paper
    - Draw your Zero Hero and give him or her a name
    - Write a brief description of what your Zero Hero does to promote walking, make the roads safer, or make the air cleaner
        - Possibly make this optional for Key Stage 1
    - Be creative

Judging

- To account for the difference in artistic ability between ages, judge separately:
    - Key Stage 1 (years 1 and 2)
    - Key Stage 2 (years 3, 4, 5, and 6)
- Choose 3-5 finalists from each of the two age groups, depending on quality of submissions (total 6-10 finalists)
- Choose 1-3 designs (mix of Key Stage 1 and 2) from the chosen finalists to be winners
- Send these winning designs to design team to go on banner

Prizes

- Possible prizes – dependent upon approval and funding
    - Certificate
        - Participation certificate (says “artist”) for all who submitted something
        - “Finalist” certificate for finalists
        - “Winner” certificate for the pupils whose designs are chosen for the banner
    - “Prize Pack” – include in bright yellow road safety backpacks:
        - pencil, sticker, a foot badge (one of the purplish blue solid ones, because there are fewer they could be the “special” foot badges)

    - Other appropriate prizes could be used, but they should promote walking, clean air (environment), and/or road safety
- Certificates and prize packs to be distributed at 25 May assembly
- Photographs at 25 May assembly
    - Group photograph of all finalists
    - Photograph of winners with banner

WHO

- Distributing this guideline document and competition posters to school
    - WPI Team
- Competition participants
    - Students in years 1-6 at Norbury Manor Primary School
- Competition judges (to choose finalists and winners)
    - Peter McDonald
    - Peter to choose other appropriate judges. Possibilities:
        - A school staff member
        - Hena Ahmad, NMPS parent liaison
        - Member of Croydon Council pollution team
        - Other Croydon Council officer(s)
- Unveiling banner at school, finalists presented with prizes by
    - Peter McDonald
    - Possibly other judges

School Instructions

Croydon Zero Heroes
Croydon Council and WPI Zero Heroes Team
Norbury Manor Primary School

To whom it may concern,

The handout which appears below is to be distributed to all students in Key Stage 1 and Key Stage 2 at Norbury Manor Primary School on **Tuesday, 17 April 2012**. These handouts have been broken down into packets of 30 in order for easy distribution to each of the classes.

Please make sure to distribute these handouts to each class by the **end of the day** on **Tuesday 17 April**, to be taken home.

If there are any further questions, please email the Zero Heroes team at:

lon-d12-croydonzero@wpi.edu

Thank you for your help in this matter.

Sincerely,

The WPI Zero Heroes team

Norbury Manor Primary

CROYDON
www.croydon.gov.uk

Advertising Poster

Figure 11: Design a Zero Hero Competition Poster

Judging Guidelines

Criteria for Judging the Zero Heroes Design Competition

Background Information

The "Design a Zero Hero Competition" had pupils create a Zero Hero of their own by drawing, naming, and describing him/her/it.

Participants: Pupils at Norbury Manor Primary School
To account for the difference in artistic ability between ages, judge separately:

- Key Stage 1 (years 1 and 2)
- Key Stage 2 (years 3, 4, 5, and 6)

Finalists: 3-5 designs from each of the two age groups, depending on the quality of submissions (total 6-10 finalists)
Winners: 1-3 designs (a mix of Key Stage 1 and 2)

What is a Zero Hero?
From the design competition poster and handouts that were given to students:

A Zero Hero is someone who produces no pollution on their way to school.
Have you ever wondered what a Zero Hero might look like?
Could they be a superhero? An animal? A magic machine?
Now is your chance to design your own Zero Hero and
win exclusive Zero Heroes prizes!
Your submission must:
Be drawn on A4 size (8.25in x 11.75in) paper
Include your Zero Hero's name and a short description of your Zero Hero

Criteria to Look for in a Submission

1. **Banner Elements**
    a. Although this is not a category to be scored, if the submission has a particularly effective part, such as a well-drawn Hero or road crossing, it should be noted and described for possible inclusion in the final banner design, even if overall the submission might not be a winner.
2. **Message**
    a. The submission should have a heroic character in some form that represents what a Zero Hero stands for – making zero emissions while traveling to school, or helping someone else reduce their emissions such as by teaching road safety, helping them cross the street, or just walking with them. This category includes looking at the description of the Hero to better understand the Hero's identity.
3. **Relation to Target Audience**
    a. The submission's message should be clear to a primary school age child. It could be aimed at one or more of the Reception, Key Stage 1, or Key Stage 2 groups.
4. **Overall Look and Feel**
    a. This is a subjective category, but it judges the submission based on the quality of the artwork, its impact, aesthetics, use of colour and patterns, and other artistic techniques.

Sample Grading Rubric

Name		
Class		
Banner Element?	**Y / N**	Description:
	Score (1-5)	**Notes**
Message		
Relation to Audience		
Overall Look and Feel		
TOTAL		

Air Quality Monitoring Instructions

Greetings,

Welcome to the Zero Heroes Air Quality Monitoring Programme.

In order for students to gain an understanding of air quality in the local area, the Zero Heroes team has come up with a set of instructions for easy monitoring of air quality, using the LondonAir website, in several locations throughout Croydon and the Greater London Area. The team asks that Years 5 and 6 do the air quality monitoring. Ideally, classes should choose sites and create a chart to track measurements during the week of 23 April – 27April, and begin monitoring on Monday, 30 April.

Suggested instructions for choosing an air quality site:

- **First, each class will select one site in London (not including Croydon) to monitor.** It is advised to select a site within or near central London, where air quality is usually the poorest. These monitoring sites can be found by using the LondonAir website. Instructions for utilizing the website are outlined on the following page.

- **Second, students will select an air monitoring site in Croydon.** This will be the baseline for comparing air quality in your area with air quality in other locations.

- **Third, students will create a classroom chart in order to record and plot out pollution levels at two air quality monitoring locations.** Doing this will not only provide a good visual representation of air quality over time, but will also show them how air quality in their area compares to other areas in London. Guidelines for creating an effective chart can be found at the end of the document under "*Guidelines for effective measuring.*"

- **It is suggested that classes monitor air quality at their two selected locations for one month, after which they can either continue or discontinue monitoring, depending on level of interest, etc.**

We hope that this activity will be of use in educating children about the importance of air quality.

Thank you for your time.

Sincerely,

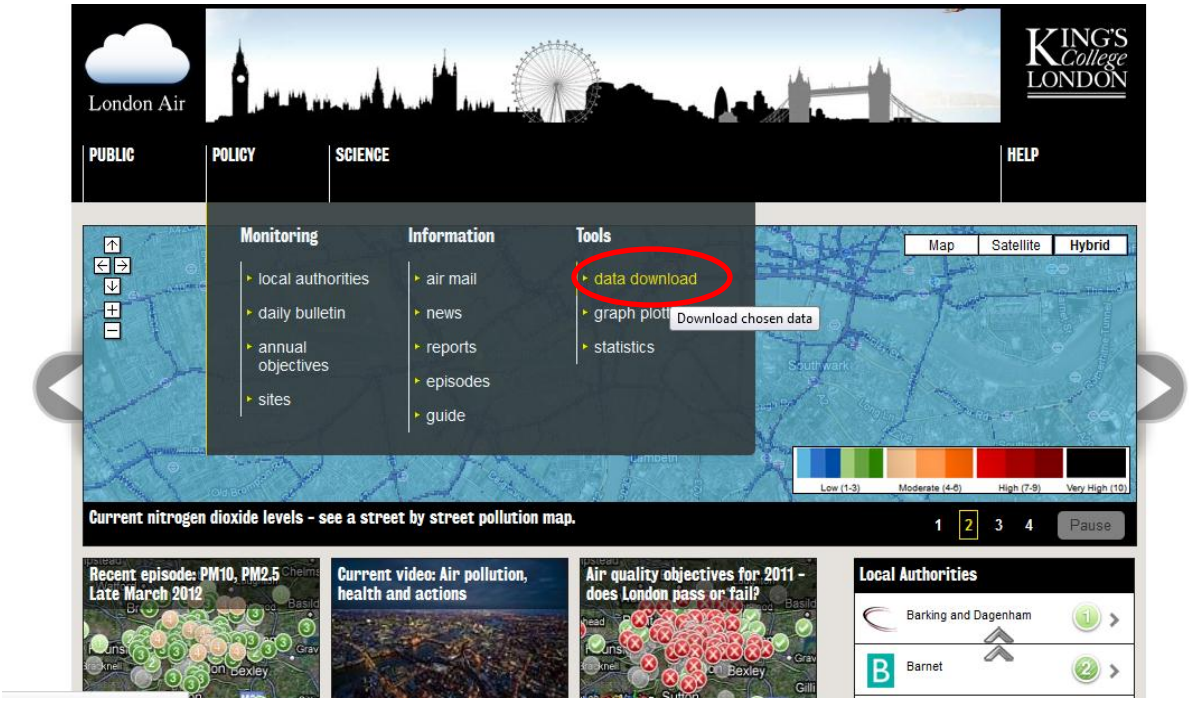
The WPI Zero Heroes team

Gathering Air Quality Data for the Zero Heroes Program

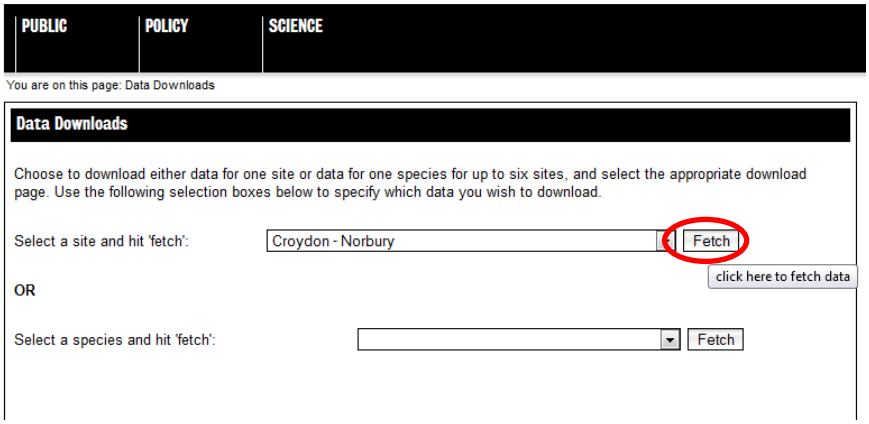
These instructions will teach you how to access the LondonAir website and read the data gathered by the air monitoring stations throughout London.

Using the LondonAir website

1. Go to londonair.org.uk
2. At the top of the page, click on Policy → Tools → Data Download



3. Select the station you want to get data from, for example "Croydon – Norbury," then click "fetch."

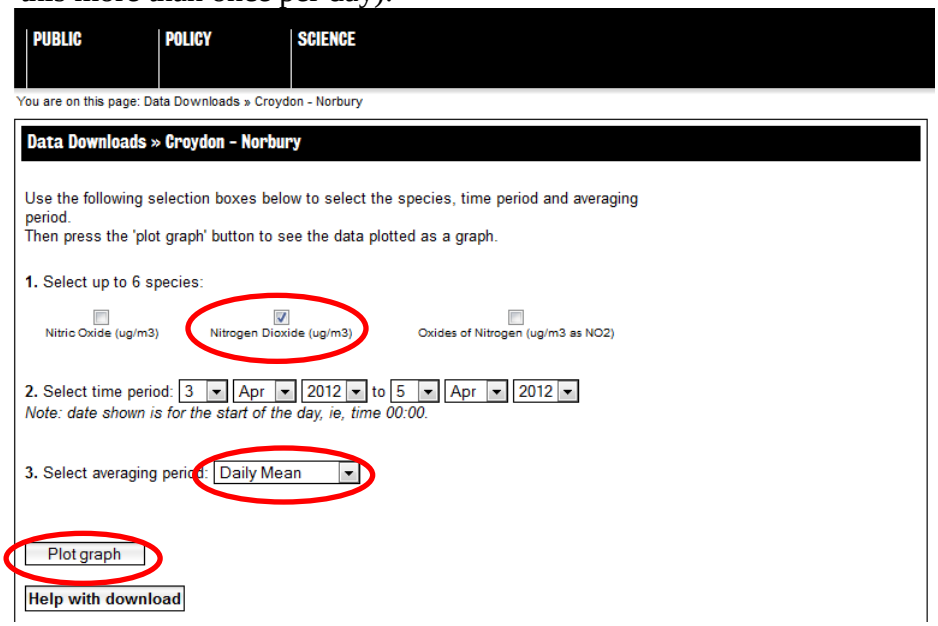


4. Select what type of pollution you want to look up.
   (**Nitrogen Dioxide ($\mu g/m^3$ = micrograms per cubic metre**).

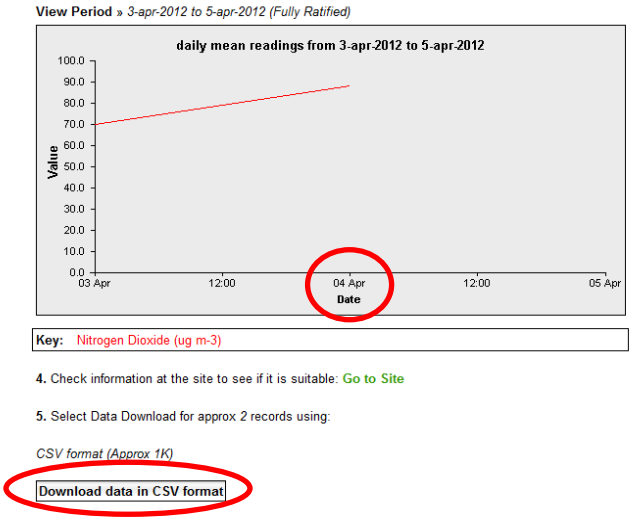
   What is Nitrogen Dioxide (NO_2) and why are we monitoring it?

   NO_2 is a volatile and noxious gas that is produced by motor vehicles. London has many motor vehicles on its motorways and so there is a lot of NO_2 produced. NO_2 also tends to linger in the air and so it is a good indicator of the amount of vehicle pollution in a certain area. As you will see, the highest concentrations of NO_2 usually occur in the vicinity of well-travelled motorways and streets. NO_2 causes coughing, wheezing, and amplifies other breathing problems, such as asthma.

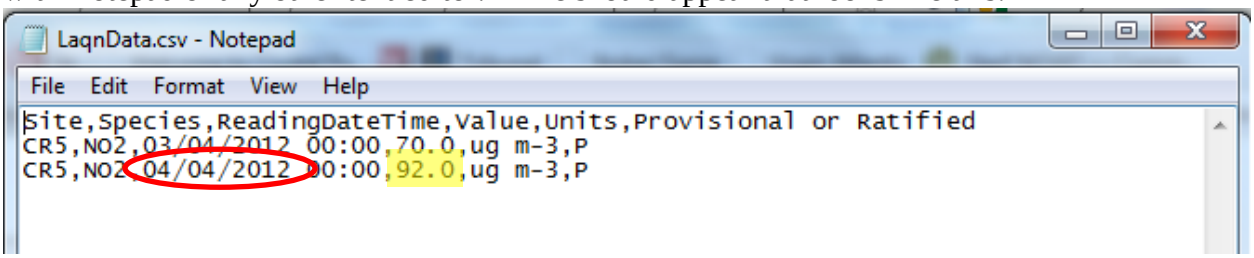
5. Set the date range. Since the data for today's date won't be complete yet, we are looking for yesterday's daily mean. Set the date range as two days ago to today.
   a. For example, if today is 5 April, set the date range 3 April 2012 – 5 April 2012
6. Select the averaging period. Choose Daily Mean (or Running 8 hour if you want to do this more than once per day).



7. Click “Plot graph,” and verify that yesterday’s date is displayed in the middle of the x-axis.
    a. In our example, this would be 4 April.



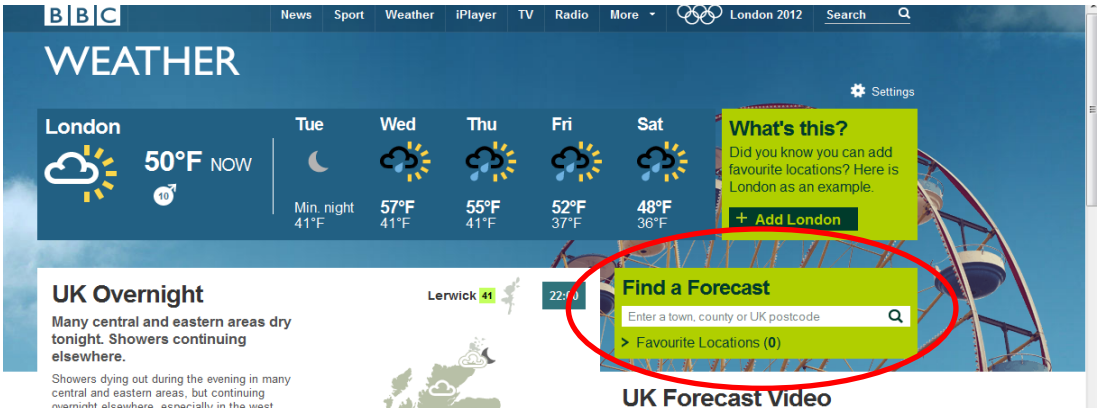
8. Click the link below the graph that says “Download data in CSV format.” Open the file with Notepad or any other text editor. A file should appear that looks like this:



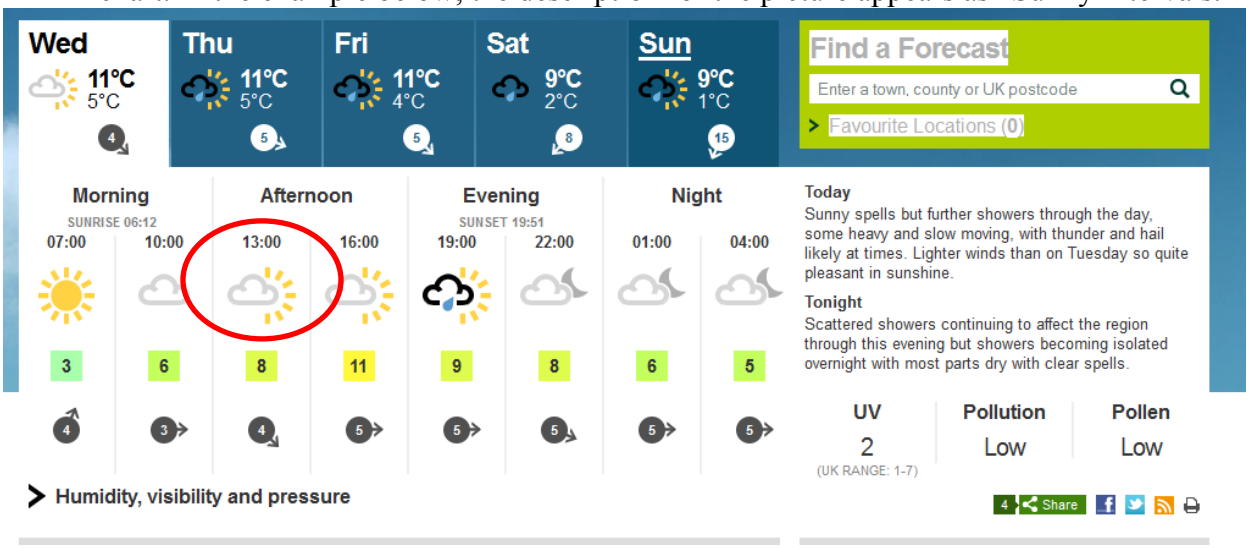
9. Read the air pollution value
    a. The first column is the station you are looking at (in our example, “CR5”).
    b. The second is the type of pollutant (“NO_2”).
    c. What we want is the right date (“04/04/2012”, circled above) located in the third column, and the value of the pollutant (“92.0”, highlighted above), located in the fourth column. We can ignore the other columns since they aren’t needed for the monitoring that we are doing.
    d. Record the pollution value for the date you want on your chart.

Gathering weather data

1. Go to http://www.bbc.co.uk/weather/
2. Type the postcode for the monitoring station into the forecast search box.
    a. Croydon – Norbury: SW16 4BU
    b. Croydon – George Street: CR0 1TY
    c. Croydon – Purley Way A23: CR0 4RF
    d. Croydon – Thornton Heath: CR7 8NJ
    e. Westminster – Marylebone Road – Roadside: NW1 5LS

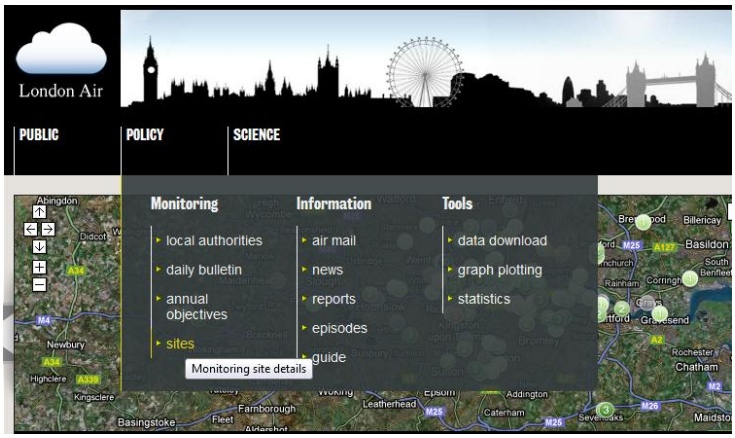


3. Hold the mouse cursor over the image for 13:00 for today's weather. A description of the conditions will appear; record this description in the weather column of your monitoring chart. In the example below, the description for the picture appears as "Sunny Intervals."

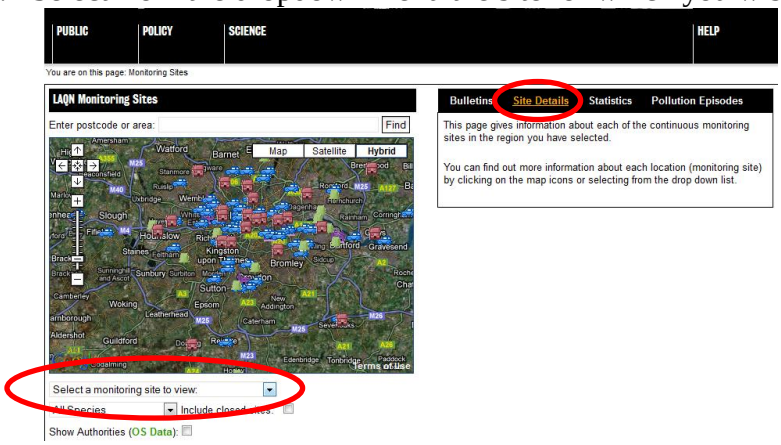


Directions for obtaining postcodes for other stations, if necessary

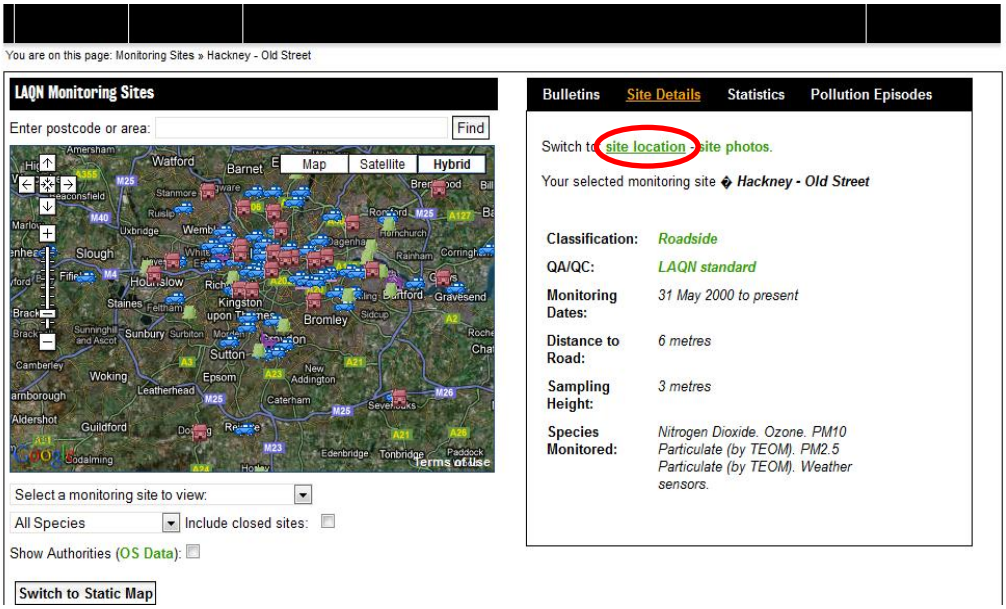
1. Go to londonair.org.uk
2. At the top of the page, click on Policy → Monitoring → Sites



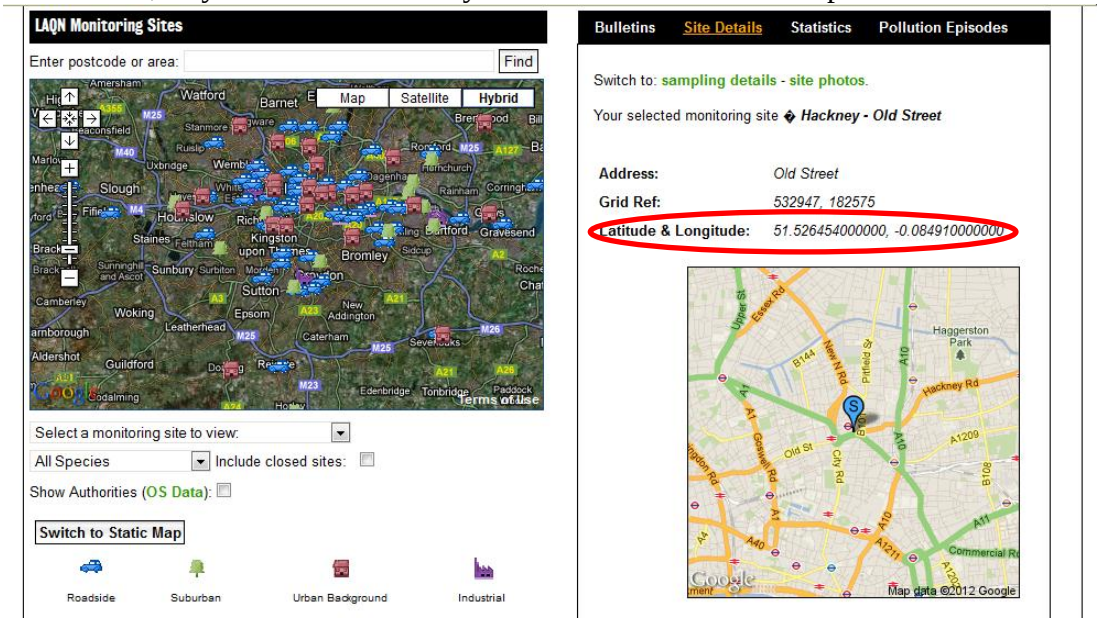
3. Select from the dropdown menu the site for which you wish to obtain the postcode.



4. Once you've selected a site, on the right-hand menu, select "Site Details," and then "site location."



5. The "site location" will give you a latitude and longitude, which can be copy/pasted into maps.google.co.uk. On Google Maps, it will either tell you the postcode on the left hand side, or you can find a nearby address and determine the postcode.



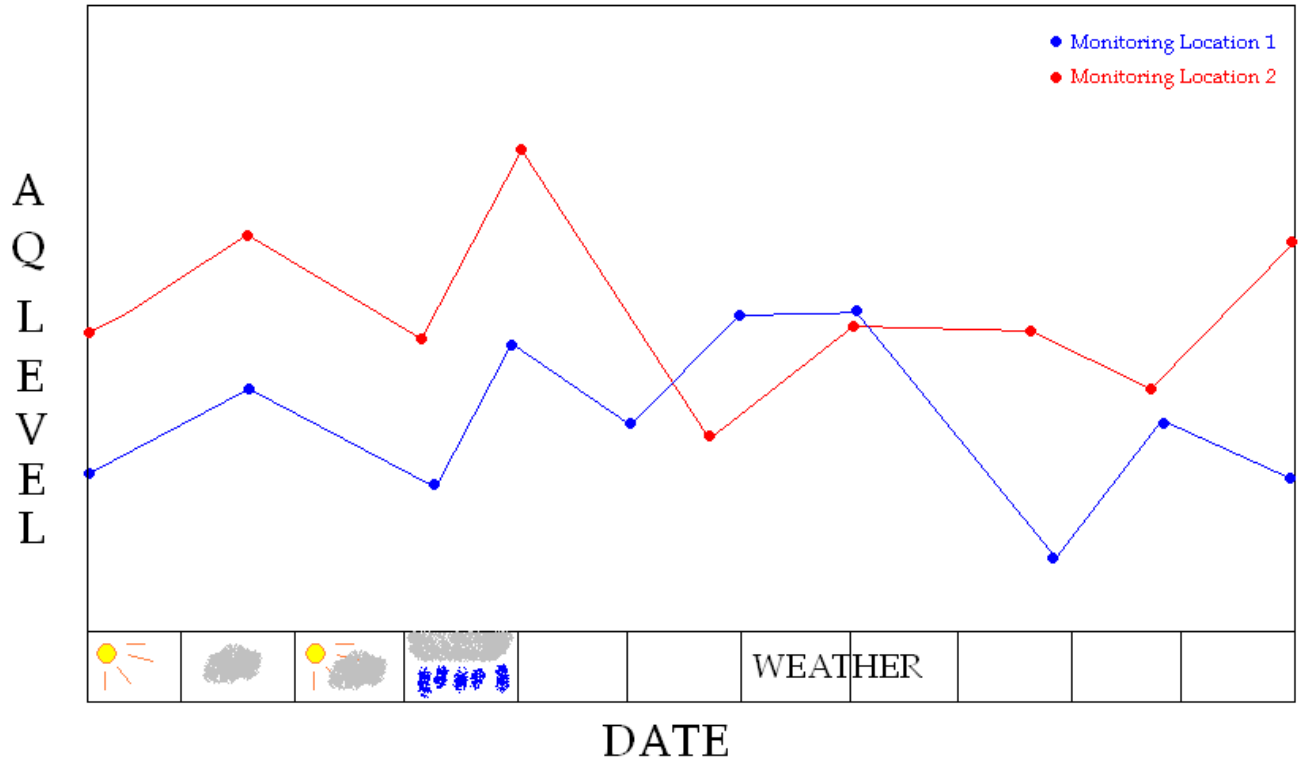
Guidelines for effective measuring

1. Two types of data should be collected: the value of NO_2 and the weather on the day.
2. At regular intervals (for example, every Monday, Wednesday, and Friday) record the day's weather as described above for each location.
3. The day after recording the weather, get the previous day's data from the air monitoring device as outlined above for each location
4. If air quality monitoring devices become available, also measure the NO_2 in schoolyard or just outside the gates.
5. Add the NO_2 data to the school graph (you may only want to do this once a week, depending on the hassle involved).

Sample Chart

Location:			
Date	**Weather**	**NO_2 ($\mu g/m^3$)**	**Who Collected It**

Example graph



Suggestions for Locations to Monitor

In Croydon

- Croydon – Norbury (Closest to Norbury Manor Primary School)
- Croydon – George Street (In central Croydon near the Council building)
- Croydon – Purley Way A23
- Croydon – Thornton Heath

Outside of Croydon

- Westminster – Marylebone Road – Roadside (This is one of the most polluted areas of London)

Peppered Moth Assembly and Competition

WHEN

- Pupils begin planning the story and assembly Wednesday 2 May
- Pupils finalize plans for assembly by Friday 11 May
- Hold assembly and introduce competition week of 14 May
- Classrooms create or print moth templates week of 14 May
- Competition officially begins Monday 21 May
- Competition ends Friday 1 June
- Total length of competition: 10 days (2 full weeks)
- Winning class determined by and revealed on Monday 11 June

WHAT

Assembly

- Pupils research peppered moth background information.
- Pupils create a story based on the peppered moth situation, with a narrator to explain what happens and other students to act out different roles. General ideas:
    - Introduce white peppered moth(s), camouflaged by white trees
    - Introduce pollution into the environment, turns the trees black
    - Have a bird character eat white peppered moth(s), who are now visible
    - Describe/show evolution of black peppered moth, who now can survive better
- If desired, pupils create a PowerPoint slide show with images from the internet to go along with the story.
- Pupils performing the story should also include questions to ask of the audience during or after the story. Start with easier questions. Examples:
    - What is a moth?
    - Has anyone ever seen a moth?
    - Where have you seen a moth?
    - Has anyone ever been to the woods near here?
    - Why can't the birds see or eat the white moths at first?
    - What does the pollution do to the trees?
    - Where does the pollution come from?
    - Why are there more black moths as the air and trees become more polluted?
- At the peppered moth assembly during the week of 14 May, pupils perform/tell story and ask questions.
- Perform twice: two different assemblies for Key Stage 1 and Key Stage 2.
    - For the Key Stage 1 assembly, the story and questions could be shorter or simpler, if teachers and pupils think this will be necessary.
- Possible recommendation: Perform this same assembly at a parents' night or as a school play, allowing other students to be involved.

Class Competition

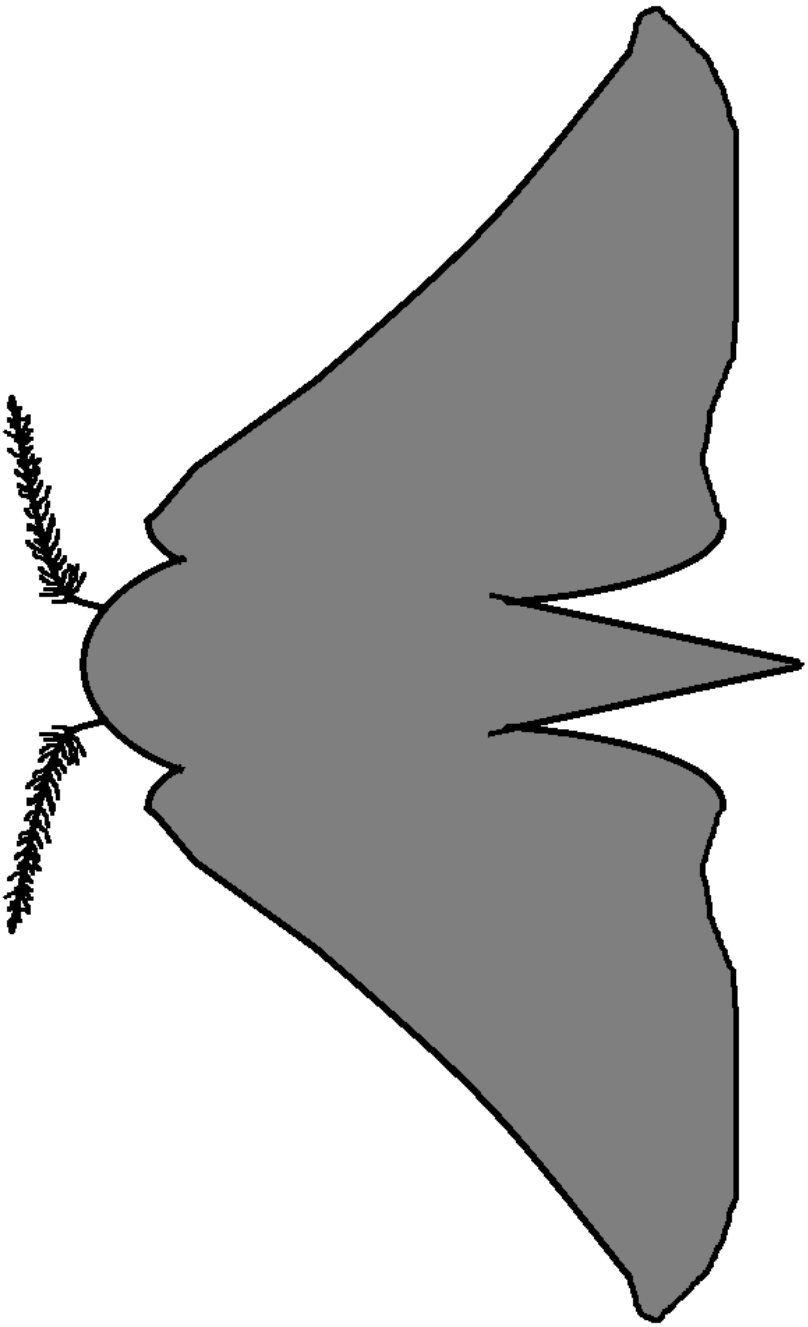
- Black Construction paper can be ordered in large quantities and is pretty inexpensive
    - Amazon.com has several packages of 50 sheets of 18"x24" black paper for under $10 per pack

    - Each class would likely need two sheets of 18”x24” paper, so 24 sheets total
- Each classroom in Key Stage 1 and Key Stage 2 creates a black moth.
    - Example templates are provided in the “Moth Images” folder. Feel free to change the designs or make your own.
    - The sample pictures were adapted from http://www.clker.com, a public domain image repository. More images of butterflies, moths, and other insects are also on the website, if you would like more ideas.
    - Classrooms may choose a provided template and print the image (large) if possible, trace a template (from a large printed image) and cut out the moth shape, or create a new moth design.
    - Regardless of the chosen method, the suggested dimensions of the moth are 32”x18”.
    - Each class will post their moth on the classroom wall, where pupils can access it to add stickers.
- Small, round white stickers will be provided to classrooms.
- Every day during the competition from 21 May to 1 June, each student that walks to school gets to add a white sticker to their classroom’s black moth.
- Teachers should ensure that pupils do not place stickers on top of one another, to facilitate counting the stickers at the end of the competition.
- Whichever class has the “cleanest” or “most peppered” moth (i.e. most stickers) by the end of the competition on 1 June ends gets a prize during Zero Heroes week.
- Accommodate those who can’t walk to school by allowing alternative ways to add stickers.
    - If a student makes a poster about pollution, road safety, sustainable travel, or a related topic, then they can add a few stickers.

WHO

- Distributing this guideline document and peppered moth templates/link to school
    - WPI Team
- Performing the peppered moth assembly: any interested pupils, which may include:
    - Junior Road Safety Officers
    - School council
- Creating classroom moths
    - Teachers
    - Pupils
- Distributing white stickers to school
    - Peter McDonald
- Distributing white stickers in class for pupils who walk to school to add to the moth during the competition
    - Teachers
- Collecting moths from classrooms on 1 June and totaling number of white dots on each to determine winners. Possibly:
    - Hena Ahmad
    - Other staff or teachers

Below is a silhouette of a peppered moth. This may be used as a guideline for creating a customized moth for a classroom activity.



Zero Heroes Week Materials

Monday 11 June	Tuesday 12 June	Wednesday 13 June	Thursday 14 June	Friday 15 June
Zero Heroes Introduction Day	Road Safety Day	Environment and Air Quality Day	Activity Day	Zero Heroes Day
Classroom that won the peppered moth competition revealed at assembly. Winning classroom awarded prize. Pupils reminded to wear bright colors for Road Safety Day. Hena to text parents reminding them children can dress up as Zero Heroes on Friday Peter to confirm Clive Simmonds' presentation at school on 13 June	Pupils wear the brightest colors they have, to maximize vision on the road. JRSOs and/or other pupils with safety officers from the area could set up a temporary road crossing in front of the school for the morning and/or afternoon. Pupils reminded to wear green for Air Quality Day.	Clive Simmonds from Croydon Council Pollution Team gives a 20-minute presentation and demonstration on air quality, with questions and answers to follow. Pupils wear green for environmental awareness.	Extended recess with Zero Heroes balls *-and/or-* Pupils go for a supervised walk during recess *-and/or-* Any activities planned by the Archbishop Lanfranc School. Pupils reminded to dress up as Zero Heroes for ZH Day.	Pupils walk to school in Zero Heroes costumes. Pupils who walk earn left foot badge. Breakfast provided. Hena Ahmad and/or other school staff can collect quotes from pupils about Zero Heroes Day, walking, etc. *-and/or-* Hena and teachers post several posters on which pupils can record their thoughts. Photos taken of pupils, parents, and visitors. Peter McDonald to speak and thank the school for participating in the program.
Ongoing: Every pupil has the opportunity to earn one right foot badge if they walk to school any day Monday through Thursday. (Then if they walk on Friday, Zero Heroes Day, they will earn a left foot badge and will have a complete set of two foot badges.)				

Figure 12: Zero Heroes Week Poster

ZERO HEROES WEEK

MONDAY: Kick-off Day

Peppered Moth class winners announced!

TUESDAY: Road Safety Day

Be seen! Wear bright colours to school!

WEDNESDAY: Air Quality Day

Special presentation on air quality!

Support the environment by wearing green!

THURSDAY: Activity Day

Get active! Extended Activity Day recess!

Special prize for each classroom!

FRIDAY: Zero Heroes Day!

Be a hero! Walk to school in the morning!

Wear a Zero Hero costume to school!

Norbury Manor Primary

ZERO HEROES - WALKING - CYCLING - SCOOTING

CROYDON
www.croydon.gov.uk

Motivational Posters

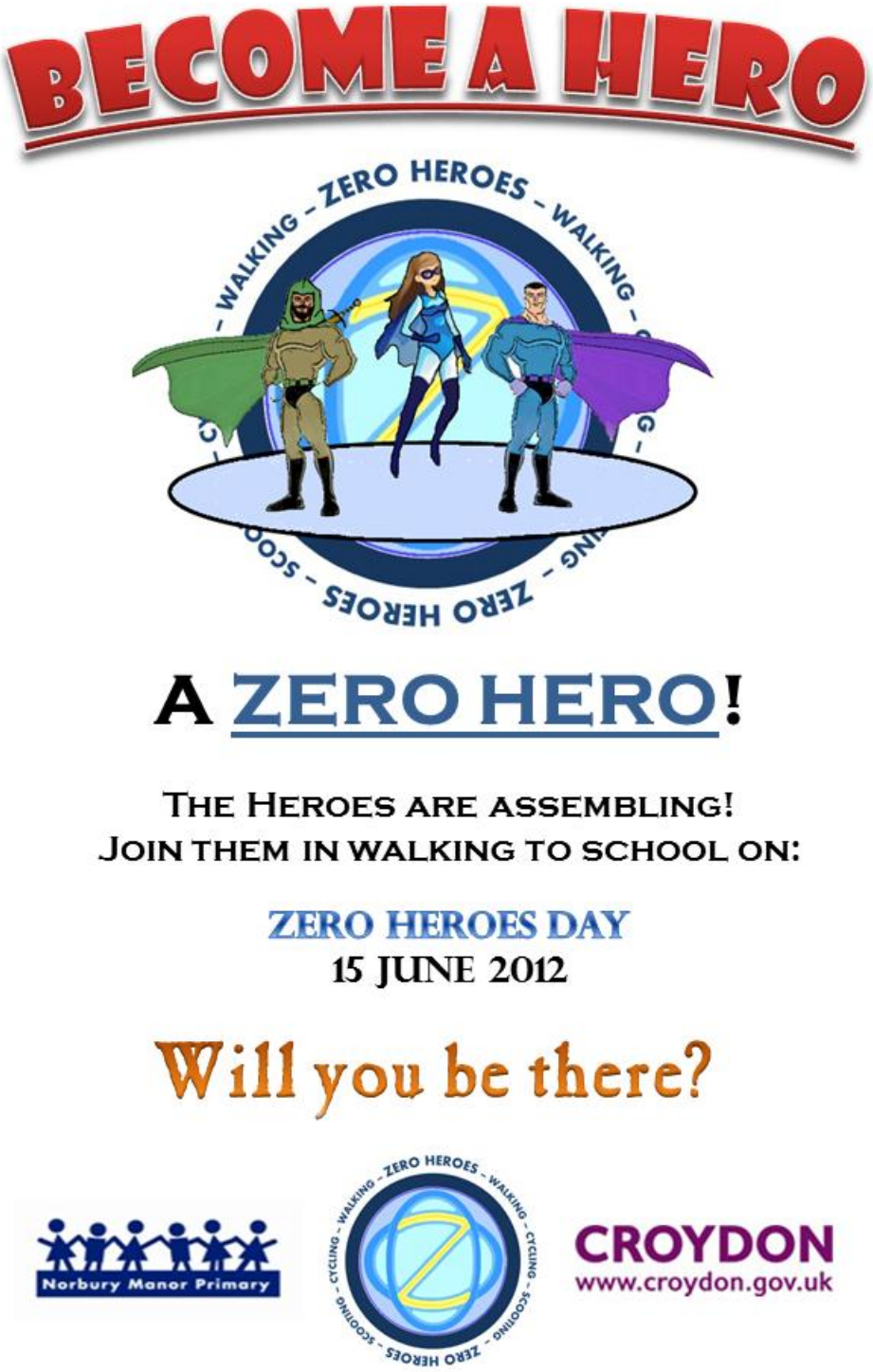


Figure 13: “Become a Hero” Motivational Poster

Figure 14: "Clean Air Bubble" Motivational Poster

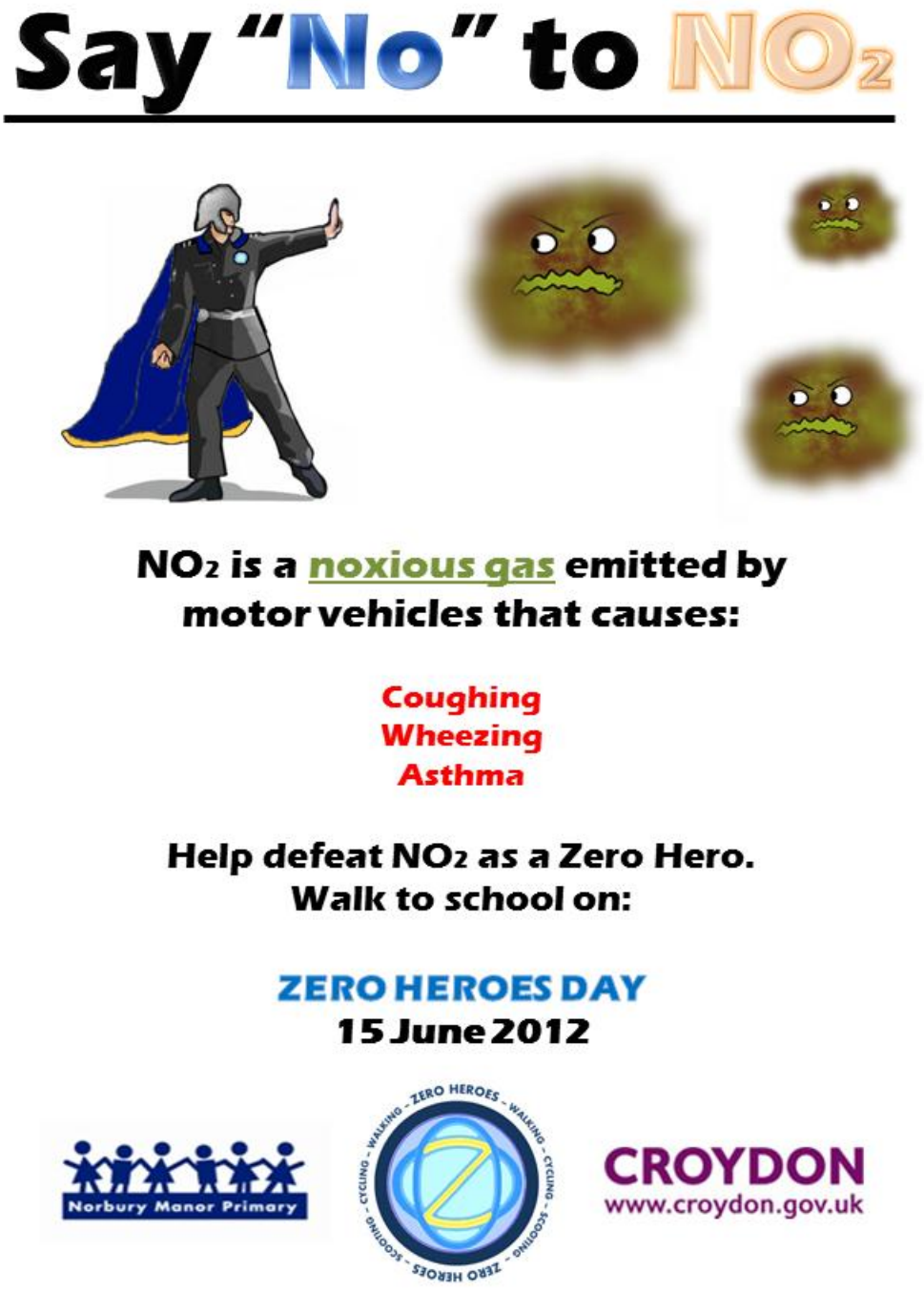


Figure 15: "Say No to NO_2" Motivational Poster

How would you feel crossing this street?

DO YOUR PART IN MAKING

Abingdon Road

A SAFE PLACE FOR ALL PUPILS!

Walk to school and support road safety on:

ZERO HEROES DAY

15 JUNE 2012

Norbury Manor Primary

ZERO HEROES - WALKING - CYCLING - SCOOTING

CROYDON

www.croydon.gov.uk

Figure 16: “Safe Crossing” Motivational Poster

Supermarket Appeal

To obtain a breakfast for students and parents on Zero Heroes Day, edit this cover letter draft as you see fit and send to the manager of a local supermarket you think may be willing to help. The pupils may include artwork, an invitation for the manager to show up to Zero Heroes Day, and any other sort of appeal that you find appropriate. It would be best if you get the pupils to handwrite this cover letter.

Cover letter draft
Dear _____,

Norbury Manor Primary School is running a new programme this year, Zero Heroes, sponsored by the Croydon Council. The programme teaches pupils about the importance of healthy living, good air quality and traveling sustainably, and culminates in one day where every student at Norbury Manor Primary walks to school. Zero Heroes Day is 15 June, and to commemorate the occasion, we would like to provide the pupils and their parents with a breakfast in the morning as they arrive at the school gates. We ask for your support through donation of food or other supplies for the approximately 450 pupils and their parents that we would like to feed. Any donation would be greatly appreciated. Any businesses who donate will be invited to the school on Zero Heroes Day, and be included in the press releases about the event.

Enclosed are some (drawings/letters/etc.) that our pupils have made to help gather support for our program.

If you would like to make a contribution or if you have any questions, please contact us via email at (whatever email you want) or by phone at (whatever phone you want).

Sincerely,

(name)

List of supplies – (this is merely a sample, feel free to edit it to fit school needs)

- Fruit
- Croissants
- Juice boxes
- Recyclable drinking cups or plates

Ideas for materials for the children to include

- Handwritten note saying “thanks,” explaining something about Zero Heroes, or why they walk to school
- Handwritten invitation to Zero Heroes day

Artwork showing Zero Heroes or walking-related subjects (this could even include some of the entries from the contest)

School Newsletter

Zero Heroes Day!

This year, Norbury Manor Primary School has been working with both Croydon Council and research students from the United States on a program to encourage more children to travel sustainably to school. The Zero Heroes team developed and implemented several activities at NMPS to engage the pupils in learning about topics related to walking to school, such as the impacts cars have on the environment and the importance of road safety.

If everyone travels sustainably to school on one day (15 June) not only will pupils have a great start to their morning, but there will be fewer cars around the school – making the area less hectic, less polluted, and most importantly, safer. We encourage children and their parents to walk, cycle, scoot, take public transport and walk the rest of the way, or if necessary, drive but park several streets away. Everyone's efforts will help create a "clean air bubble" around the school.

So what is a Zero Hero? A Zero Hero is someone who creates no pollution on their trip to school. Children are encouraged to dress up as Zero Heroes, and breakfast will be provided in celebration. We look forward to seeing everyone on **15 June, Zero Heroes Day**!

Council Website Article

On 15 June 2012, Norbury Manor Primary School, working with Croydon Council and American university students from Worcester Polytechnic Institute, will be hosting Zero Heroes, a program seeking to improve air quality and road safety at the school by encouraging all pupils to walk to school on one day. Initially proposed at a London Sustainable Schools Forum, Zero Heroes has been further developed by the American students, working alongside Travel and Transport Planning Officer Peter McDonald of Croydon Council. With a number of exciting and educational activities, the group hopes to get children, their parents, and teachers involved in making an impact on the borough's air quality. This year, only one other school (Christ Church Bentinck School, Westminster) is piloting the program. LSx, the coordinators of the program there, selected the school because it is along the Marylebone Road, one of the most polluted motorways in London. If Zero Heroes proves to be successful in these schools in Croydon and Westminster, then it is planned to expand to other schools and eventually throughout London.

Worcester Polytechnic Institute is a private university located in Worcester, Massachusetts in the United States. Founded in 1865 as one of America's first engineering universities, WPI has long proven itself as a leader in creating and conveying scientific research and technological innovation in ways that are most beneficial to society.

In order to graduate, WPI students must complete an interdisciplinary project that applies engineering design principles to solve a real-world, non-engineering problem. This project is called the Interactive Qualifying Project (IQP), which embodies WPI's motto *Lehr und Kunst*, "Theory and Practice" – providing a link from the world of academics to today's global society.

adapted from http://www.wpi.edu/about/index.html

Your Croydon September Magazine Article Draft

"Zero" Heroes at Norbury Manor Primary School

Insert photograph from Zero Heroes Day here

On 15 June, Norbury Manor Primary School in Norbury hosted a new event titled Zero Heroes Day. Developed by American students working in conjunction with Peter McDonald, Travel and Transport Planning Officer at Croydon Council, the Zero Heroes program sought to promote road safety, air quality, and exercise by encouraging sustainable school travel habits, such as walking, scooting, or cycling. But what is a Zero Hero? One student, _____ will tell you that "A Zero Hero is _____." Pupils had the chance to design their own Zero Hero in the Zero Heroes design contest. Winners were ____, _____, and _____ who had their design printed on the official Zero Heroes banner, unfurled in front of the school in late May. Norbury Manor Primary hosted a number of activities leading up to Zero Heroes Day in June, including a school assembly on air pollution and in-class air quality monitoring. During Zero Heroes week in June, activities focused on some of the positive aspects of walking to school related to road safety, the environment, and physical activity (Add detail on activity outcomes). On 15 June, pupils dressed up as Zero Heroes and walked to school to an event that included breakfast provided by _____. In attendance were _____, _____, and _____. _____ said of the event, "_____." (Add sentence explaining plan for the program in the future.)

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adapted from http://www.wpi.edu/about/index.html

List of Incentives

Table 14: Incentives for the Zero Heroes Program

Activity	Type of Incentive/ Material	Location	Quantity
Design Competition	Road Safety Backpack	Council	5-10
	ZH Pencil (normal size)	Order	5-10
	ZH Sticker (~2" circular with logo)	Order	5-10
	Badge, Left foot "Purple"	Council	5-10
	Certificate (thick A4 sheet)	Produce	Up to 457, but you will know for certain once the contest ends
Peppered Moth Competition	Badge, Left-foot "Tiger"	Council	30 (1 for every pupil in winning class)
	Small White Circular Sticker (25mm to 38mm)	Order	3000 (If every child walked every day in years 1-6, 3600 would be needed
Zero Heroes Week	Foot Badge, Right foot, "Speckled"	Council	500
	Foot Badge, Left foot, "Quadrant"	Council	500
	38mm Zero Heroes Button (tentative)	Order	Up to 457, if you want to give one to every student regardless of if they walk
Activity Day	ZH kickball (rubber material, ~12-15 inches in diameter)	Order	24-30 (2 per class with some spares)

Program Action Plan

LEGEND	
blue	action item for Peter McDonald
green	action item for Norbury Manor Primary
purple	combined action for Peter and Norbury Manor Primary
orange	action item for WPI students
red	school holiday
Completed	Action Completed
Confirm	Action needs to be confirmed that it can be incorporated into the school schedule

When	Who	What	Materials Needed	Status
April	**April**	**April**	**April**	**April**
Monday, 23 April 2012	School	Begin Design Competition	Posters – Design Competition	Completed
Wednesday, 25 April 2012	School	Send reminder text to parents about ZH competition		Confirm

Wednesday, 25 April 2012	Peter and Hena	3:30 WPI team final presentation		Completed
Thursday, 26 April 2012	WPI Team	If diffusion tubes are in, check with pollution team on best implementation of devices		
Thursday, 26 April 2012	School	Add Zero Heroes week/day to school website diary		Confirm
Thursday, 26 April 2012	School	Hena and selected students create air quality monitoring charts	Air Quality Monitoring Instructions	
Friday, 27 April 2012	School	Remind pupils about design competition and due date at assembly		
Monday, 30 April 2012	School	Hena and selected students to begin monitoring air quality	Air Quality Monitoring Instructions	
Monday, 30 April 2012	Peter	Order white stickers for the Peppered Moth competition	Incentives Master List	
Monday, 30 April 2012	Peter	Order black paper for the Peppered Moth Competition	Peppered Moth Assembly and Competition	

Monday, 30 April 2012	Peter	Submit Zero Heroes promotional materials to design team to get a quote	Incentives Master List	
Monday, 30 April 2012	Peter	Hire photographer for Zero Heroes Day		
Monday, 30 April 2012	Peter	Work with Pollution Team to create instructions for the diffusion tubes, to be given to the school	Diffusion tube instructions that came from manufacturer	
May	**May**	**May**	**May**	**May**
Tuesday, 1 May 2012	Peter	Confirm visit to school tomorrow to collect design competition submissions		
Wednesday, 2 May 2012	School	ZH design competition ends		
Wednesday, 2 May 2012	Peter	Collect design competition submissions from the school and bring white stickers if available		
Wednesday, 2 May 2012	Peter	Begin judging the submitted Zero Hero Designs (Deadline: 11 May)	Zero Hero Competition Judging Guidelines	

Wednesday, 2 May 2012	School	Have pupils involved in Peppered Moth assembly start planning the story/PowerPoint	Peppered Moth Assembly and Competition	Confirm
Wednesday, 2 May 2012	School	Distribute supermarket appeal instructions to teachers	Peppered Moth Assembly and Competition	Confirm
Thurs 3 May - Mon 7 May		NO SCHOOL	Supermarket Appeal	
Monday, 7 May 2012	Peter	Email Diffusion Tube Instructions to the school		
Tuesday, 8 May 2012	School	Have pupils write supermarket appeal letters/drawings	Diffusion tube instructions (Peter + Pollution Team to devise)	Confirm
Tuesday, 8 May 2012	School	Put up 1st diffusion tube (depending on advice from pollution team), have one year 5 or 6 class attend	Supermarket Appeal	Confirm
Thursday, 10 May 2012	Peter	Publish council website article	Diffusion tube instructions (Peter + Pollution Team to devise)	
Friday, 11 May 2012	Peter	Deadline to choose finalist for ZH Design Competition	Council Website Article	

Friday, 11 May 2012	Peter	Choose winners from the finalists and send to design team	Zero Hero Competition Judging Guidelines	
Friday, 11 May 2012	Peter	Deadline to order the Zero Heroes Promotional Materials	Zero Hero Competition Guidelines	
Friday, 11 May 2012	School	Take down 1st diffusion tube and send in for analysis	Incentives Master List; Design Team's quote	Confirm
Friday, 11 May 2012	School	Pupils finalize plans for Peppered Moth assembly for next week	Diffusion tube instructions (Peter + Pollution Team to devise)	Confirm
Monday, 14 May 2012	School	Sometime this week: Peppered Moth assembly and introduce peppered moth competition	Peppered Moth Assembly and Competition	Confirm
Monday, 14 May 2012	Peter	Confirm with school they are sending supermarket appeal	Peppered Moth Assembly and Competition	
Monday, 14 May 2012	School	Put up 2nd diffusion tube (depending on advice from pollution team), have another year 5 or 6 class attend		Confirm
Tuesday, 15 May 2012	School	Sometime this week: classrooms create moths for competition	Diffusion tube instructions (Peter + Pollution Team to devise)	Confirm

Thursday, 17 May 2012	Peter	Sort/have someone sort foot badges to be used as prizes for design competition, and for walking during ZH week	Peppered Moth Assembly and Competition; Peppered Moth Supplemental Images	
Friday, 18 May 2012	School	Submit supermarket appeal to local grocery store(s)	Incentives Master List	Confirm
Friday, 18 May 2012	School	Deadline for classrooms to create and post black moths	Supermarket Appeal	Confirm
Friday, 18 May 2012	School	Take down 2nd diffusion tube and send in for analysis	Peppered Moth Assembly and Competition; Peppered Moth Supplemental Images	Confirm
Monday, 21 May 2012	School	Peppered Moth Competition officially begins	Diffusion tube instructions (Peter + Pollution Team to devise)	Confirm
Monday, 21 May 2012	Peter	Contact Hena to confirm your visit on Friday 25 May to unveil ZH banner	Peppered Moth Assembly and Competition	
Monday, 21 May 2012	School	Put up 3rd diffusion tube (depending on advice from pollution team), have another year 5 or 6 class attend		Confirm
Friday, 25 May 2012	Peter and School	Unveil ZH banner to school at regular Friday assembly; present prize packs and take photos	Diffusion tube instructions (Peter + Pollution Team to devise)	Confirm

Friday, 25 May 2012	Peter and School	Tell students they can dress up as Zero Heroes on Zero Heroes Day		Confirm
Friday, 25 May 2012	Peter	With Hena: (1) confirm school has newsletter article (2) determine results of supermarket appeal		
Friday, 25 May 2012	Peter	If supermarket providing food; ask Hena to text/send letter to parents asking for volunteer support on ZH Day		
Friday, 25 May 2012	School	Take down 3rd diffusion tube and send in for analysis		Confirm
Monday, 28 May 2012	Peter	Contact school to determine times for activities on Zero Heroes week (Clive Simmonds presentation, etc.)	Diffusion tube instructions (Peter + Pollution Team to devise)	
Monday, 28 May 2012	Peter	Email Zero Heroes Week poster to school		
Monday, 28 May 2012	School	Put up 4th diffusion tube (depending on advice from pollution team), have another year 5 or 6 class attend	Poster – Zero Heroes Week	Confirm
Tuesday, 29 May 2012	Peter	Contact Hena about results of parent volunteer request	Diffusion tube instructions (Peter + Pollution Team to devise)	

Wednesday, 30 May 2012	School	School newsletter printed with Zero Heroes article	School Newsletter	Confirm
June	**June**	**June**	**June**	**June**
Friday, 1 June 2012	School	End of peppered moth competition - collect moths from classrooms	Peppered Moth Assembly and Competition	Confirm
Friday, 1 June 2012	School	Determine winning class by Mon 11 June	Peppered Moth Assembly and Competition	Confirm
Friday, 1 June 2012	School	Put up posters with the schedule for Zero Heroes week	Poster – Zero Heroes Week	Confirm
Friday, 1 June 2012	School	Take down 4th diffusion tube and send in for analysis	Diffusion tube instructions (Peter + Pollution Team to devise)	Confirm
Mon 4 June - Fri 8 June		NO SCHOOL		
Monday, 11 June 2012		**ZH Intro Day**	Zero Heroes Week Materials	

Tuesday, 12 June 2012		**Road Safety Day**	Zero Heroes Week Materials	
Wednesday, 13 June 2012		**Environment and Air Quality Day**	Zero Heroes Week Materials	
Thursday, 14 June 2012		**Activity Day**	Zero Heroes Week Materials	
Friday, 15 June 2012		**Zero Heroes Day**	Zero Heroes Week Materials	
Friday, 22 June 2012	Peter	Fill gaps in Council magazine article draft (results of ZH day) and submit	Zero Heroes Week Materials	