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Business Biking in Croydon

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Sponsor:
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Abstract

Our team created guidelines and recommendations for the development of a bike sharing program for the Croydon Council. We researched best practices at London bike share schemes, evaluated the Council's bicycle sharing potential, and designed promotional materials. Our recommendations focused on how to proceed in the short-term, with regard to safety and liability, awareness and promotion, and bike registration. We also included long-term recommendations on cycling culture in Croydon, bicycling infrastructure improvements, and additions to pool bike facilities.

Executive Summary

In 2010, The Mayor's Transport Strategy was released by Transport for London, a government agency dedicated to improving transportation in London. The strategy sets out several initiatives to promote London's transport over the next 20 years, including enhancing residential quality of life and reducing the city's impact on the environment. It also focuses on the transport objectives of London's respective boroughs and how they can achieve the same at a local level, stressing that the boroughs should identify key connections between local centers and other forms of transportation, such as bus and Tube stations. As London begins to improve its cycling culture, many Boroughs are looking for ways to increase bicycle usage. One such Borough is Croydon, where its government Council is seeking to establish a pool bike program.

Currently, the Council has been using Zipcars as a reliable mode of transportation for council staff. The Council believes that a pool bike scheme would reduce the number of trips that people take with Zipcars. This reduction would improve air quality and the health of Council staff members, while reducing transportation costs.

As the Council began to research a possible pool bike scheme, a series of issues emerged with translating theory into practice. The Borough of Croydon faced the problem of how to make a bicycle sharing program work efficiently, safely, and economically. There were many logistical barriers to overcome such as facility access, administration of the program, and liability and insurance needs. Our goal for this project was to work with the Croydon Council to create guidelines and recommendations for developing a bike-sharing program for the Council staff.

Methodology

To accomplish our goal we completed the following objectives: (1) Research best practices in London bike share schemes; (2) Evaluate the Croydon Council bicycle share potential; and (3) Design innovative and creative materials bringing attention to the new program.

To complete our first objective, we researched three best practice bike sharing programs in London to evaluate how they functioned and to determine what factors led to their success. We visited the Ealing and Lewisham Council's programs, as well as one at Better Bankside, a non-profit organization. We conducted site assessments and semi-standardized interviews to learn general information, understand user experience, and to evaluate how they manage the liability and safety of the schemes. We also noted unique aspects of each program such as the loan process, promoting cycling, and problems that have occurred.

In accordance with our second objective, our team evaluated the bicycle share potential of the Croydon Council. By touring the Council's facilities and participating in a tour of the Croydon Borough, we identified the current capacity for a pool bike scheme and the feasibility of cycling in the Borough. We also interviewed two potential staff user groups of the pool bike scheme to understand possible concerns and to develop further suggestions to improve our design.

Finally, to meet our third objective, we created promotional materials such as a brochure and numerous posters with information regarding the pool bicycle scheme. This information was

displayed in the Council to create awareness about the program during "World Environmental Day," an event to promote environmentally friendly behaviors. In addition to the advertisement, our team created registration forms that are posted on our new pool bike scheme intranet page. These forms will be used to register a staff member for the scheme and provide information on the program's insurance coverage and liability.

Results and Discussion

Research best practice in London bike share schemes

After conducting site assessments and semi-standardized interviews with the Ealing and Lewisham Councils as well as the non-profit community organization Better Bankside, we made observations on user experience and liability and safety of the schemes. Some of these details include methods that these Councils used for registration, bicycle booking, and administration of the program. We discovered that Ealing Council uses Outlook as a bicycle-booking tool. Meanwhile Lewisham is also considering the platform, but worries about its dependability. We also identified differences between the two programs in terms of their insurance coverage. Tradeoffs were also discussed, one being, is it worth it to improve safety conditions with mandatory helmet and cycling training at the cost of less pool bike users. Other features observed included gate access, facilities, and the types of bicycles used by each scheme.

Evaluate the capacity at Croydon for a bicycle-sharing program

Our research on best practice bike share schemes helped in the assessment of the Croydon Council cycling capacity. We looked for specific elements of successful programs such as proper shower facilities and a simple bicycle booking process in Croydon. The Council facilities were excellent as the new building was constructed with cycling in mind. Shower facilities are clean and are conveniently located next to the Sheffield stands. Problems discovered during our evaluation included limited access to basement facilities, a shortage of lockers, and an automatic gate to the street that only opened for automobiles.

Design innovative promotional materials

Our team produced promotional materials in order to bring attention to the new scheme and aid in its adoption. During World Environmental Day, we displayed these materials to raise awareness for our program. As well, we advertised free cycling confidence lessons provided at the Croydon Arena. The promotional materials included a brochure and numerous posters, some of which are shown to the right (Figure 1).

Figure 1: Poster created for World Environmental Day

Recommendations and Conclusion

After researching best practices in London bike share schemes, evaluating the capacity for cycling at the Croydon Council, and designing promotional materials, our team developed recommendations for the establishment of a Council staff business biking scheme. The recommendations were divided into two main categories, which included short-term and long-term recommendations, that each held specific subcategories.

Short-Term Recommendations

Our short-term recommendations offer a guideline to the establishment of a pool bike scheme for the Croydon Council. They focused on three management strategies: user experience, safety and liability, and awareness through promotional material.

There were several recommendations made to improve user experience for the Croydon pool bike scheme. Detailed suggestions were formed regarding program registration, facility access, key management, the bicycle booking system, and information posters. For the registration process of our new program we recommend putting all registration forms on the intranet. By having these forms in one place the process will be simple. Also, when completing the pre-registration document by selecting certain options automatic emails will be sent to give access to the facilities and request a free helmet. We also suggest 1st floor concierge holds the bicycle keys and that Outlook is used as an online booking system. The second management strategy concerns safety and liability. In order to finalize the pool bike scheme, safety requirements and liability coverage details should be determined. Detailed recommendations on equipment availability, maintenance, emergency planning, liability forms, and cycling training were provided. To raise awareness to the new program our team designed an advert campaign consisting of posters, a brochure, and an intranet webpage.

Long-Term Recommendations

Our long-term recommendations focus on ways to streamline the new pool bike scheme and to increase the cycling culture in Croydon. These suggestions are divided into three topics: Croydon cycling culture, bicycle options, and facility improvements.

After researching London best practice pool bike schemes, additional measures to improve cycling culture were discovered. One effective way to increase cycling not only in the Council, but also in the Borough as a whole, is to have a cycle loan program for anyone that lives, works, or studies in Croydon. This loan program would be provided at the mere cost of ten pounds a month. Another recommendation is to encourage the use of smart phone applications, such as the Hackney Mobile app, to record miles biked and display safe cycling routes. Finally, in order to increase the safety of cycling in Croydon, we recommended infrastructure improvements such as cycle lanes and semi-segregated lines.

Our team also recommended long-term improvements that are not necessary to start the program but could be used to further improve it. If there is a program expansion, we believe Brompton (folding) bicycles should be used. After assessing the Ealing Council, which operates a Brompton bike scheme, the potential for folding bikes and their ability to be used in conjunction with public transport were made apparent. Issues such as long distance travel and what to do in the event of a breakdown could be resolved by taking the folding bikes onto a bus or tram. Another future improvement would be the use of Spybike GPS. This technology is attached to the bike and notifies the user if the bike is being moved after being locked up, preventing theft.

To further improve the Council cycling facilities, our team made suggestions to improve safety. These suggestions are not mandatory to establish the pool bike scheme, but can be used to improve the program in the long-term. First, signage and a convex mirror should be placed where the driveway meets the street to warn drivers of cyclists exiting the Council. Additionally, to ensure proper maintenance of the pool bikes, an in-house repair service could be offered. Finally, more lockers would need to be added to the facilities in order to expand cycling capacity. The lockers are currently limited and staff must be waitlisted to receive one.

Conclusions

In conclusion, developing a pool bike scheme requires considerable planning and preparation. We used site assessments and interviews of best practice pool bike programs in combination with an evaluation of the Council's facilities to provide recommendations on the establishment of a pool bike scheme.

Cycling is not merely a form of transport, but is also a great way to improve one's health while helping the environment and limiting transport fees. Our recommendations, based on our research, were mainly focused upon establishing guidelines towards the implementation of a pool bike scheme. However, we also sought to raise awareness to the benefits of cycling, as well as provide insight on future improvements to the pool bike program and cycling in Croydon as a whole.

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Authorship

During the past seven weeks tasks were divided equally among the team. The main accomplishments of each team member are listed below.

Jason Klein: Accomplished most of the editing, creation of online website and formatted the final report.

Shuhan Liu: Created promotional material and presentations for the team. Also photographed all site visits.

Kevin Lynch: Lead writer for the paper. Also led interviews and presentations.

Alex Manternach: Contributed in both the writing and editing of the report.

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Chapter 1 Introduction

Rising sea levels, oil spills, air pollution, and contaminated water. These are just a few problems facing the world as we begin to see the consequences of using fossil fuel to meet our growing energy demands. There is a pressing need for countries to adopt sustainable practices including both production of sustainable energy and the reduction of energy consumption. In 2012, The United Kingdom's transportation sector consumed over 53 thousand metric tons of oil. This represented 36% of the country's total energy consumption. Specifically 76% of transportation energy was used for road travel (Energy Consumption, UK 2013). Fortunately, there are numerous options to reduce energy usage in the transportation sector, including promoting more fuel-efficient cars, choosing public transportation, and reducing the number of people using cars. An easy way to reduce the number of cars on the road is increased cycling.

Bicycle-sharing programs have been around for many years. Each program has faced challenges, however many are still successful and widely used today. The potential for these sharing programs rests in their ability to adapt to numerous circumstances. Numerous cities have successfully implemented bicycle-sharing systems, the largest being in Hangzhou, China, with over 50,000 bicycles and approximately 2000 bike share stations (Press, 2011). Other notable cities with successful programs include Amsterdam, Paris, New York City, Boston, and Barcelona.

An important challenge to start a bicycle program is funding. To combat high upfront costs, private companies have been financing public bike-share programs in exchange for advertising. New York City's bicycle-sharing program, for example, is funded by Citibank, and does not receive any funding from the government. Citi paid $41 million dollars for 5 years of sponsorship. The Citi brand name now appears on every bicycle, station, cardkey, and the Citi bike website (New York City Department of Transportation, 2014). Barclays Cycle Hire in London and The New Balance Hubway in Boston are privately sponsored by Barclays and New Balance respectively (Hubway, 2011). These companies also offer funding in return for advertising and the positive public image.

London's Barclays Cycle Hire began in 2010, as part of a plan by the city of London called "The Mayor's Transport Strategy" ("Mayor's Transport Strategy," 2010). The transport strategy sets out several initiatives to promote London's transport over the next 20 years, including enhancing residential quality of life and reducing the city's impact on the environment.

It also focuses on the transport objectives of London's respective boroughs and how they can achieve the same at a local level, stressing that the boroughs should identify key connections between local centers and other forms of transportation, such as bus and Tube stations.

In a southern borough of London, the Croydon Council has been using Zipcars as a reliable mode of transportation for council staff. The Council believed that a bicycle-sharing program might reduce the number of trips people take with Zipcars. The reduction in Zipcar use could help air quality, reduce transportation costs, and improve the health of Council staff members. Furthermore, this strategy could also solve parking shortages in Croydon, since there would be fewer vehicles on the road.

As the Council began to research a possible bicycle pool, a series of issues emerged with translating theory into practice. For instance: Where to get funding to purchase and maintain these bicycles? What kind of insurance is required? Which level of riding skill should bike share participants have? What kind of training should be offered to promote riders' safety? The Croydon Council wanted to make careful strategic plans with research and evaluation.

The Borough of Croydon faced the problem of how to make a bicycle sharing program work efficiently, safely, and economically. Upfront and ongoing costs to keep the bicycles properly maintained were to be compared to the financial savings that would result from reducing parking demand and Zipcar costs. There were also many physical barriers to cycling, such as a gate that would not open, and limited staff access to bicycle storage.

Our goal for this project was to work with the Croydon Council to create guidelines and recommendations for developing a bike-sharing program for the Council staff. In order to accomplish this goal we first evaluated the pre-existing bike-share program and identified problems impeding its establishment. After determining solutions to these problems, we delivered an organized set of guidelines and recommendations toward the establishment of a biking sharing scheme.

Chapter 2. Literature Review

This chapter presents the locale and stakeholders of our project in greater depth; it also presents our research into the benefits and drawbacks of bicycle sharing. Finally, we analyzed best practices of bicycle sharing programs around the world.

2.1 Site Description

Our team worked with the Croydon Council, a government body employing over 3,000 people. The Borough of Croydon, where the Council is located, has a population of 340,000 and is the southernmost Borough of London ("London Online," 2014). The borough's location in greater London can be seen in Figure 1.

Figure 2: Map depicting the greater London area with the Borough of Croydon shown in red (Source: WikiMedia TUBS)

If Croydon were to stand-alone as its own city it would be the eighth largest city in all the United Kingdom ("London Borough of Croydon," 2014). Despite its expansive population, Croydon has invested little into its cycling infrastructure. While the borough spent roughly £4.5 per resident, between the years 2006 and 2010 on the "London Cycle Network Plus," a network of cycle friendly streets, this amount is modest compared to the £11.05 per resident that the top 25% of London Boroughs spend ("Cycling in Croydon," 2014).

2.2 Participants and Organizers

The bicycle-share program was designed for Croydon Council staff, but stakeholders involved in the implementation of the system included the Council's legal team, Council teams that could use the pool-bike scheme, vendors, and facility personnel. Each party had its own role in the bicycle-sharing program. Communication between these parties was critical to ensure a recommendation that worked for everyone involved. In order to create a bicycle-sharing program for the Council, legal issues had to be resolved. The Croydon Council's legal team has the responsibility of limiting the liability toward the Council in the event of a biking accident involving one of the staff members. For example, to ensure safety and reduce liability, the Council plans on having the staff participate in an instructional program of cycling safety

fundamentals. Insurance must also be purchased to compensate in the event of stolen or damaged bicycles. This insurance also covers injury due to accidents. Before implementation, a risk assessment of the program met the needs of the insurers.

2.3 Economics

The Recession of 2008 put further emphasis on economics when making government decisions. In order for a bike-sharing system to be successful, the economic costs and benefits must be thoroughly researched. The largest cost for bicycle sharing systems is the initial investment in equipment and infrastructure. Bicycles must be purchased, storing stations established, and bicycle booking systems set up. The table below outlines the expected setup and maintenance costs associated with business biking programs. These expenses such as cycle parking stands, cycle staff training, maintenance, and bicycle purchase were identified by Transport for London in 2012.

Table 1: Setup and maintenance costs for business biking programs (Transport for London, 2012)

Bicycle (purchase)	Full size £400+	Folding £500+	Electric £1000+
Bicycle (leased annually, may include maintenance)	£300s	£375	£750
Safety: helmet, lights, reflective jacket, leg/arm bands	£80		
Security: locks, security devices	£40+		
Accessories: basket	£80+		
Practical items: pump, puncture kit, tools	£30		
Maintenance per bike (may be included in bike purchase/lease)	£80 annually		
Insurance	10% of bike cost		
Cycle parking (excludes installation): • Single Sheffield stand • Covered storage shelter (for 10 bikes)	Variable		
Lockers (excluding installation)	£150 per unit		
Other (Changing/showering facilities)	Variable		
Cycle mileage (if providing an allowance to staff) HMRC approved amount for mileage allowance payments – for business mileage	20p per mile		
Cycle training (often subsidized or free)	£25-50 per person		
Bicycle booking system	£330 annually		

Despite these upfront costs, bicycles can actually reduce the cost of business transportation. The Borough of Southwark ran a six-month trial bicycle-sharing program and reported an average savings of £25 per month per bike (Transport for London, 2012). These

programs are cost effective because they can be used as a substitute for automobiles. Council members predominantly use cars when traveling around the borough. The Croydon Council has a zip-car fleet of 27 cars that meets this transportation need. Unless the travel is in walking distance, the only options for a Council member are public transportation or car. By having bicycles as a third option, Zipcar use could be reduced. Croydon also faces parking shortages, which waste time while employees search for parking spaces and money to pay for parking. Reducing car travel through increased bicycle usage can effectively solve these parking issues.

2.4 Incentives for Cycling

Cost savings of a bicycle share program are not the only return. Other benefits and incentives from using bicycles as an alternative mode of transportation include cleaner air, improved health, and an enhanced urban environment.

Air Quality

In the spring of 2014, a smog occurrence in London demonstrated the need for particulate air pollution reduction (Tran, 2014). Dust from the Saharan desert combined with air pollutants created a haze over London that lasted for about a week. Because the transportation sector is a main source of this pollution, alternatives to automobiles should be encouraged. Paul DeMaio states in his article from the Journal of Public Transportation, "Bike-sharing has had profound effects on creating a larger cycling population, increasing transit use, decreasing greenhouse gases, and improving public health" (DeMaio, 2009). By reducing greenhouse gas emissions, Council members can fulfill their civic duty to make the borough they work in a cleaner place. Table 2 puts further emphasis on the non-polluting nature of bicycle use. By not having CO_2 emissions, cycling produces even less air pollution than public transportation.

Table 2: CO_2 emissions by mode of transportation (Transport for London, 2012)

Mode of transport	CO_2 emissions (kg CO_2/pkm)*
Cycle	Nil
London bus	0.06
National Rail	0.06
Underground	0.08
Moped (up to 125cc)	0.09
Taxi	0.16
Black cab	0.17
Motorcycle (125cc+ average)	0.19

Figures have been rounded

Health

The World Health Report estimated that 10% of strokes and 20% of coronary heart diseases in developed countries are due to physical inactivity (World Health Organization, 2002). To combat this inactivity, the Centers for Disease Control and Prevention suggest that adults

should exercise approximately 150 minutes every week to stay healthy while dividing it into multiple shorter sessions (Bird, 2010). The nature of business cycling, and the multiple short trips a rider takes, could meet the CDC's recommended exercise. By improving the rider's health, cycling can be used to minimize the risk of heart disease (Marsh & Ritzau-Kjaerulff, 2012). Furthermore, a study of Dutch cyclists found a significant relationship between regular cycling and absenteeism (Hendriksen, Simons, Garre, & Hildebrandt, 2010). The study found that with increased regular cycling, there was a decline in the frequency of employee absences. The UK has the highest number of employee absences per year in Europe, stressing the importance of increasing bicycle use ("Absence Management Annual Report," 2010).

Convenience

Bicycles take up less space than vehicles, and allow for a larger degree of freedom than both cars and public transportation (Marsh & Ritzau-Kjaerulff, 2012). In dense urban environments, traffic problems impede a car's ability to travel. Bicycles can be ridden within the same roadway space as vehicles and can weave between them to more effectively navigate through traffic. Public rail transportation avoids congestion problems, however there are geographical limitations to where riders can board and depart. Bicycles have both the ability to flow through traffic and the freedom to go directly to a destination (Marsh & Ritzau-Kjaerulff, 2012). According to the Public Health Development Manager, from The National Health Services at Kensington & Chelsea, cycling was a quicker way to get to the town hall than walking or public transportation (Transport for London, 2012).

Implementing bicycle paths is a convenient way to encourage people to safely travel by bike (Rietveld, 2001). Automobile drivers and cyclist both benefit from this since each is isolated onto their respective roadway. In Munich, the implementation of one-way streets for cars, open to bicycle contraflow along with roads that are reserved only for bicycles, have assisted the bicycling community significantly (Marsh & Ritzau-Kjaerulff, 2012). By allowing both cars and bicycles to safely travel, the movement of people around the city was greatly improved.

2.5 Cycling Deterrents

Although the benefits are clear, there are many challenges to increasing public cycling. There are major concerns regarding rider safety, public support, and ease of bicycling. We outline each challenge in greater depth below.

Topography

When cycling, a major factor to consider is the topography of the area. In general, cyclists dislike riding up 4% inclines and avoid 8% or larger inclined hills. Therefore, a city that has less than 4% inclinations is not going to greatly limit the usage of bicycles. On the other hand when inclinations are larger than 4%, the ease of cycling is greatly reduced (Midgley, 2011). The figure below illustrates the Borough of Croydon's topography (Croydon Council, 2011). North Croydon sits over London's Clay Formations while South Croydon is in the upper chalk. Several main roads in the southern part of the region run north-south and the slopes are in the same direction Figure 3.

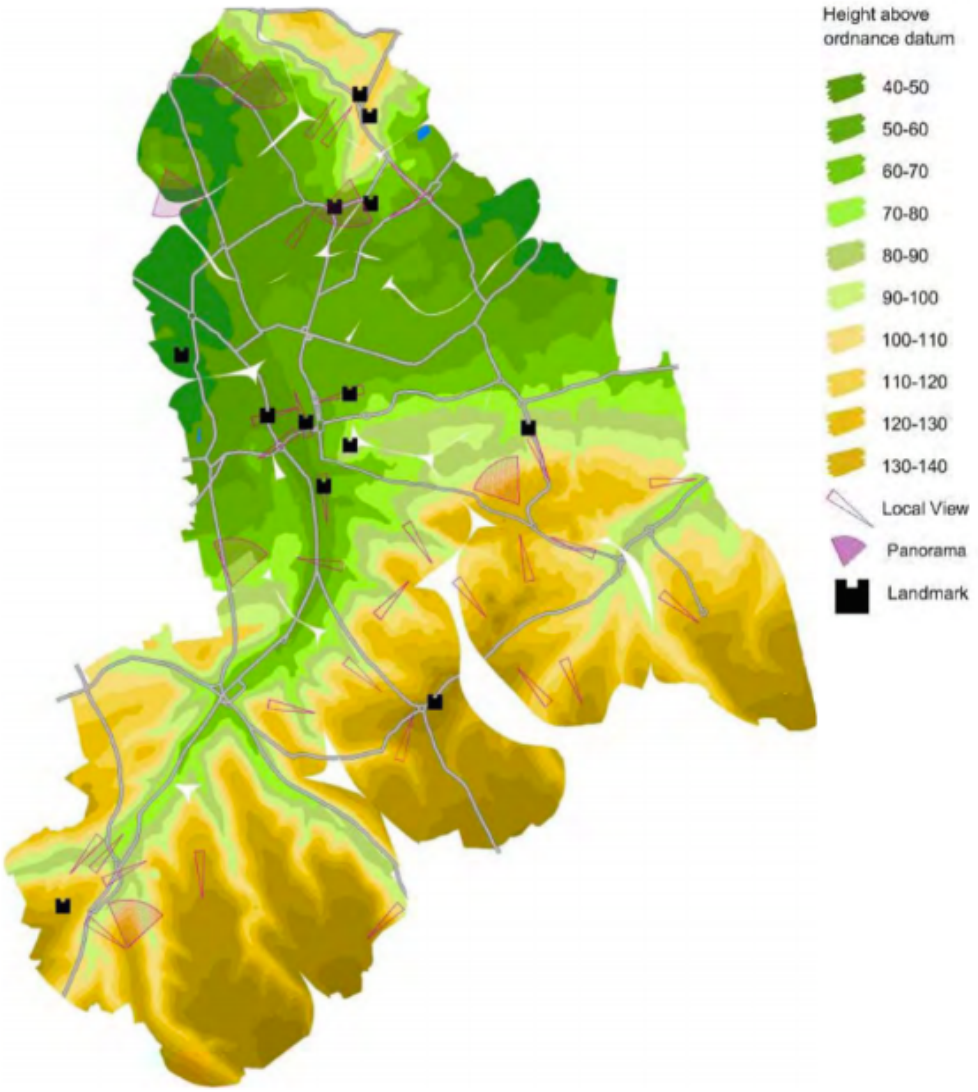

Figure 3: Topography of Croydon (Borough Character Appraisal, 2011)

Because of the upper chalk in South Croydon, cyclists have to ride up and down hills. Additionally some hills in Croydon have an inclination greater than 8%, which induces preference to use other means of transportation. Thus, Croydon is not an ideal place to cycle but it can still be done.

Safety Risk

J. Scott Osberg and Sarah C. Stiles, in their article "Bicycle Use and Safety in Paris, Boston and Amsterdam" examined bicycle use, safety behavior and the specific policies in each of these three cities. The authors found that safety policies were better developed in Holland than in the United States or France. Holland has a high number of cyclists and is sometimes seen as the "bicycle monarchy of Northern Europe" (Osberg & Stiles, 1998). In order to promote bicycle safety, the Netherlands does not focus on helmet use (unlike the US), but on road architecture and extensive bicycle safety education. This focus on education and infrastructure demonstrates how to improve safety without imposing strict helmet laws. Educational programs could also be available for participants that use cars, as it focuses on both car and bicycle users. Finally, the more people that cycle reduces the number of cars on the road. This increases safety, mobility, and willingness to cycle as pollution and congestion is reduced (Osberg & Stiles, 1998).

Even if it is unpopular, wearing a helmet is a proven way to increase bicycle safety. After a law was established requiring cyclists to wear helmets, Melbourne, Australia saw an "increase in average helmet-wearing rates from 31% in March 1990 to 75% in March 1991" (Cameron, 1994). Subsequently, the number of insurance claims from bicyclists killed or admitted to a hospital after sustaining a head injury decreased by 48% and 70% in the first and second years respectively (Cameron, 1994). Despite the benefits, a study of cycling in France found that requiring helmets would discourage people from using bicycles and therefore should not be mandatory (Osberg & Stiles, 1998). Even though helmets increase a rider's safety, some cyclists would rather not wear them.

Awareness and Infrastructure

According to a study of Munich's transport policy, many people do not realize the efficiency and comfort of using a bicycle. They are overly concerned with safety as well as the perceived social status related to bicycle users. Munich's bicycle campaign is trying to solve this problem through increased marketing, in addition to building infrastructure, but its success has not been determined (Marsh & Ritzau-Kjaerulff, 2012). The bicycle-sharing program in Munich demonstrates how having a great program can be worthless if no one is willing to use it. One cannot build infrastructure or promote marketing independently while expecting awareness to increase; both are essential for this to occur (2012).

Interviews conducted by Cody Bird with bike shop employees found that having lockers, showers, and other facilities at the work place would result in more cycling to work (2010). By providing showers, changing rooms and lockers to its employees, the Croydon Council, as Bird's article suggests, could increase the likelihood of cycling for work purposes.

Cycle Culture

The Mayor's Transport Strategy has set a goal to encourage more cycling in London over the next 20 years. According to Transport for London data, in figures 3 & 4, from 1993 to 2010, the number of cyclists in London has remained constant at around 1% of total traffic.

Year	Pedal cycles	Car & Taxis	All motor vehicles	percent of bicycles	percent of cars
1993	260	24800	30,300	0.858%	81.848%
1994	270	25200	30,800	0.877%	81.818%
1995	260	25100	30,800	0.844%	81.494%
1996	290	25300	31,100	0.932%	81.350%
1997	280	25400	31,300	0.895%	81.150%
1998	260	25400	31,300	0.831%	81.150%
1999	260	25800	31,900	0.815%	80.878%
2000	250	25600	31,800	0.786%	80.503%
2001	270	25500	31,700	0.852%	80.442%
2002	260	25200	31,200	0.833%	80.769%
2003	330	24700	31,100	1.061%	79.421%
2004	330	24500	30,800	1.071%	79.545%
2005	400	24500	30,800	1.299%	79.545%
2006	470	24400	31,500	1.492%	77.460%
2007	430	23700	30,800	1.396%	76.948%
2008	440	23300	29,900	1.472%	77.926%
2009	430	23600	29,900	1.438%	78.930%
2010	460	23700	29,900	1.538%	79.264%

Figure 4: Bicycle and car usage in London 1993-2010 (Network Performance Traffic Analysis Centre, 2012)

What is your main mode of transport?			
Country	Bike (%)	Car (%)	Public transport (%)
Netherlands	31.2	48.5	11.0
Hungary	19.1	28.2	35.3
Denmark	19.0	63.4	11.8
Germany	13.1	60.9	14.8
Slovakia	9.5	32.3	30.9
Italy	4.7	54.4	18.2
Ireland	3.2	67.7	14.2
France	2.6	63.7	20.1
UK	2.2	57.6	22.1
Spain	1.6	47.4	30.2
EU27 average	7.4	52.9	21.8

Figure 5: Mode of transport by country (European Commission Future of Transport Report, 2011)

In 2010, the number of cars and taxis was over 50 times higher than bicycles (Network Performance Traffic Analysis Centre, 2012). In addition, the Department for Transport's National Transport Model (NTM) estimated that by 2040, road traffic will increase by 46%, with congestion being about 14% higher than in 2010 (Road Transport Forecasts 2013). These data clearly show the need for increased bicycle use in order to reduce the number of cars on the road. Unfortunately, they also show that increased congestion could make cycling more dangerous, unless proper infrastructure is in place. Compared to London, commuters in Amsterdam use bikes more often. A survey conducted by the European Commission, in Amsterdam, showed that

up to 70% of trips are made by bike and 31% of people said that they used bikes as their primary mode of transport (2011). In order to improve safety for cyclist, Amsterdam built a vast network of cycle lanes, with clear signage and lights along the road. Furthermore, Amsterdam invests almost twice as much funding in cycling transport compared to London. In order to increase cycling usage, London must become a bicycle-friendly city.

2.6 Reducing Cycling Barriers Through Technology

There are new technologies combatting the challenges facing cycling. Two problems addressed are the feasibility of biking longer distances and safety. A new product, called the "Copenhagen Wheel", provides electric power assistance. This product is especially unique because it can modify any current manual bicycle. The Copenhagen Wheel uses a pedal assisting motor to convert any manual bicycle into a hybrid bicycle, using electric power to complement pedaling. The motor, battery, and generator are all stored in a disk that attaches to the back wheel. The image above shows how all elements of the Copenhagen wheel can be attached to any bicycle.

Figure 6: Copenhagen Wheel in red on a bicycle (Gianluca, 2014)

The device works through the use of a smartphone application, where a user sets a maximum speed. This app monitors pedal movements and provides electrical power assistance to maintain the speed setting (Ratti, 2013). This is especially useful when traveling up hills, where the smartphone can sense a rise in elevation and apply electrical power for assistance. In contrast, when going down hills, automatic braking occurs, charging the battery.

Another new technology is called the "Hovding Helmet" (see Figure 7, below). This revolutionary bicycle "helmet" addresses the safety concern that commuting cyclists are not motivated to wear bicycle helmets. The helmet fixes two problems associated with traditional bicycle helmets: comfort and appearance. This invention can be worn as a scarf and uses the same principles found in an air bag, only deploying when an accident occurs. The picture below shows how the "helmet" can be comfortably worn, and still offer protection when needed.

Figure 7: The "Hovding Helmet" before and after crash (SK, 2013)

Using sensitive gyros and an accelerometer, the “scarf” can detect dangerous movements and deploy, protecting the head from impact (Streeter, 2011). At a cost of £245, the product is out of reach for many, though the company plans for expanded production to decrease cost. Although these new technologies are costly and still not at full production, they are still important to consider when addresses the barriers to cycling.

2.7 Bicycle-Sharing Programs: Case Studies

We researched several examples of bicycle-sharing programs to identify the specific aspects that make them work efficiently. We specifically focused on two successful programs in Europe, the “Vélib” system in Paris and the “Bicing” system in Barcelona, as well as The Burke Group’s “bike to work” program in the United States. We identified best practices used by these systems that could apply to the Croydon Council’s program.

Vélib in Paris, France

The Vélib program is operated by JCDecaux, a French based multinational corporation known for its bus-stop advertising systems, billboards, and public bicycle rental systems. In 2007, Vélib had over 20,000 public bicycles and over 1,400 bicycle docking stations, positioned every 300 meters. Paris has a population of over two million, with a density of 53,000-people/sq. miles. In addition, approximately 27 million tourists visit the city every year. More than half of the tourists plan to use bicycles during their stay ("Vélib official website,” 2014). The large amount of bicycles,

Figure 8: Vélib station in Paris (Eurocheapo)

combined with an expansive docking station network, allow for both citizen and tourist use. (Midgley, 2011)

Weather can be a barrier for the adoption of bicycle-sharing systems. Paris' average temperature range in January is 1ºC to 6ºC with an average number of snowy days equal to 4 days per month (Evans, 2013). According to the data provided by the Vélib program, the bikes were used year around except for occasional times of extreme weather. Similar to Paris, small fluctuations in yearly temperatures in Croydon are conducive to cycling ("England 1981–2010 Climate averages," 2008).

The majority of expenses for a bike-sharing system occur during the startup phase. The startup cost for the Vélib program, about €90 million, was paid by the advertising company JCDecaux. An additional €6 million was paid for half of the advertising billboard space on 1,628 sites for one decade (Anderson, 2007). The advantage of using this kind of operation is that the government does not carry any financial risk. However, the downside is that the government loses controlling influence over the project (Curran, 2008).

Vélib has high expenses due to the "overall greening and livability strategy", published by Mayor Delanoë in 2001 (Planning, 2009). The plan involved building 125 miles of new segregated bicycle lanes and widening of sidewalks to improve the quality of pedestrian infrastructure and further encourage the use of bicycles (Bennhold, 2007). After implementation, Paris saw a 70% increase in bicycle use. However, user surveys showed that the increased cycling use did not effectively replace car use; only a mere 7% said they used bicycles instead of cars. Almost 65% of the subscribers stated that they ride bikes instead of using public transportation and 20% instead of walking (Buis, 2008; Curran, 2008; Julie Bachand-Marleau, 2010). Even though the number of people cycling increased, it is important to look at the decrease in car usage, since not all new cyclists switched from driving cars.

"Bicing" in Barcelona

In May 2007, the city of Barcelona implemented the "Bicing" bicycle-sharing program. Initially, there were just 750 bikes along with 50 stations, located close to Metro stops and major parking lots. Today it has expanded to 6000 bikes and 400 stations, but only in the center of the City. With a population of 1.6 million people and density of 41,000 people/sq. mile, the ratio of bicycles to inhabitants is 3.7 bicycles per 1000 inhabitants (Midgley, 2011).

Barcelona's Bicing is funded by local "parking agencies" (on-street parking) and "public transport agencies" (subscription revenues) (Midgley, 2011). The startup costs of €2.2 million and annual operation fees of €4.5 million equal spending of €1,500 per bike annually (Planning, 2009). The government has also built 22 km of new bicycle lanes increasing their total bicycle lane network length to 177 km (Curran, 2008; Midgley, 2009). Unlike Vélib in Paris, Bicing relies on subscription fees instead of private funding. It is also important to consider that only citizens of Barcelona can use the bicycles. Even though the government has control over the system, without private funding it is hard to make bicycles available to everyone.

Figure 9: Bicing station in Barcelona

Bicing stations, in Barcelona, Spain, are made with long metal poles that limit pedestrian flow. This design means users must physically lift the bicycles when returning or borrowing (Planning, 2009). The docking stations also have green and red lights to show users if they have locked the bikes properly. Global positioning system technology is also used to track the bicycles. The use of these technologies has resulted in lower theft rates for the Bicing program. The tracking technology is used with Google maps to help users easily find available bike stations. Figure 10 shows public bicycle availability in Barcelona.

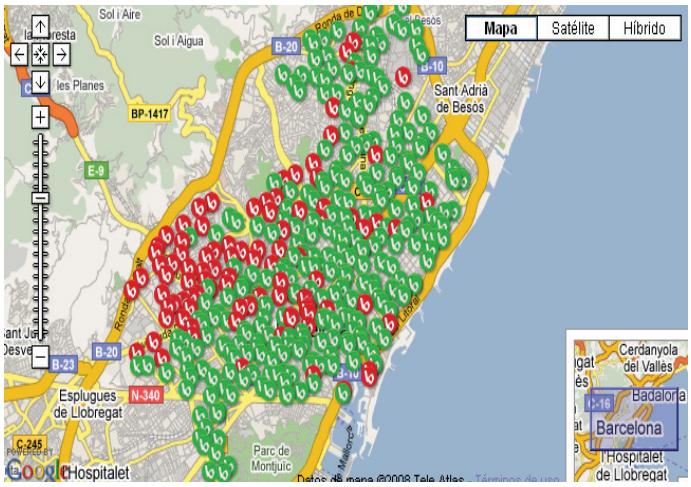

Figure 10: A map showing bicycle availability in Barcelona (New York City Department of City Planning, 2009)

Barcelona faces maintenance issues with their bicycles. "Bicing" users state that every station has at least two bicycles with flat tires (Curran, 2008). The program also encounters challenges regarding the distribution of bikes. Since the center of Barcelona is at a lower elevation compared to its surrounding area, users tend to ride to lower elevations and leave their bicycles, using other modes of transportations to go back uphill. To fix these issues, a fleet of vehicles is used to remove unfit bicycles and equalize bicycle distribution. Though it alleviates problems, it is at additional cost to the system.

The Burke Group – "Bike to Work Program"

In 2006, Christopher B. Burke Engineering, Ltd. started a bike to work program. Since the start of the Burke Group's "bike to work" program, employees have ridden over 211,000 miles. The number of participating employees has steadily risen from six at the start of the program to 68 in 2013. The graph on the left, Figure 11 shows this increase in participation. The company has provided shower/locker facilities, health club passes, and bike accessories and equipment to encourage employee participation. Staff can store their bikes in the office or at outdoor covered bicycle parking. They record the distance traveled by each rider weekly. Results show that since the program started, ridership has increased every year. The company also has a giveaway program where a free bicycle is awarded to the employee who has ridden the most miles in a given year. Proper facilities as well as incentives have contributed to the steady increase in bicycle usage.

Figure 11: Employee participation for each year of the Burke Group bike to work program (The Burke Group, 2013)

2.8 Summary

In order to make informed recommendations and guidelines to the Croydon Council, research is essential to assess the feasibility of a bicycle-sharing program. It is important to understand the needs of the stakeholders in order to guide further research. After reviewing the literature, we discovered many benefits and negative aspects of cycling. We found that future savings reduce large upfront costs of cycling over time. We also learned that cycling benefits such as improved air quality and health must be compared to potential problems including safety and infrastructure. Furthermore, new technologies were discovered that could reduce barriers toward cycling adoption. We then researched examples of best practices to determine how their successful implementation could be mirrored in our bike pool scheme. The way these programs were funded, operated, and maintained was carefully studied.

Chapter 3 Methodology

Our goal for this project was to work with the Croydon Council to create guidelines and recommendations for developing a bike-sharing program for the Council staff. This goal was achieved through completing the following objectives:

- Research best practices in London bike-sharing schemes
- Evaluate the Croydon Council bicycle share potential
- Design innovative and promotional materials bringing attention to the new program

3.1 Research of Best Practices in London Sharing Schemes

Collaborating with our sponsor we identified and contacted bicycle-sharing program directors at other London Borough Councils. We decided to visit the Lewisham and the Ealing Councils, as well as Better Bankside, a local non-profit organization that promotes bicycle sharing through various initiatives. We arranged these visits to observe their facilities, inquire about their programs and evaluate their functionality.

To properly evaluate these three cases, we set up a rubric for evaluation, which included site assessments as well as semi-structured interviews. A site assessment checklist (**Appendix A**) was used to record information provided by each program. A photo checklist within this site assessment provided visual records and illustrated information to use when formulating solutions. We also tallied the number of bicycles and organized them by their type. Other observations were made on the topography of the region, presence of cycling infrastructure and facilities, and the process of the bicycle booking system.

After the site assessment we interviewed the managers and inquired about difficulties facing each site to learn from the mistakes made by other programs, hoping to avoid similar problems in the Croydon Council. Our semi-structured interviews were used to gain information that would not be uncovered with our site assessment checklist. So before our visits, questions were developed and categorized into topics to address unique aspects of each program's functionality. A list of these interview questions can be found in **Appendix B**. The topics included: access to the bicycles and facilities, insurance policies, information about usage rates, funding, savings and expenses, education regarding bicycle ability, and proper use of the

facilities. Since we conducted semi-structured interviews, not every question from the guide was asked, as it depended on the direction of the conversation. Instead, we used these questions to direct our dialogue to areas of our interest such as registration procedure, maintenance, insurance policies and cycling training policies. The paragraphs below go into some detail on each Council and business, and discuss why they were chosen.

Ealing Council

Ms. Joanne Mortensen oversees the bicycle-sharing program at Ealing Council. We approached her to discuss the process by which an employee signs up to use the program, how employees are insured, and to obtain statistics about the program. Her responses were important to determine how their implementation strategies could be applied to Croydon's cycling program.

Lewisham Council

Ms. Carol Crankshaw, Croydon's Senior Transport Planner, recommended we speak to Ms. Liz Brooker, the Road Safety and Sustainable Transport Manager at the Lewisham Council. The Lewisham Council was in the process of reestablishing their bicycle scheme. Because the Croydon Council was also in the process of setting up a bike-sharing program, we believed Ms. Brooker's input could be very beneficial.

Better Bankside

Better Bankside is a non-profit business that has a bike-sharing program for its employees. Since Croydon Council also want to extend this program for business companies in the whole borough if its own scheme would succeed, it was important for our team to observe a functioning bike share outside of London Councils. As we planned to learn more about bike-sharing schemes by investigating different kinds of business bike-sharing programs but not only operated by a local government agency, we interviewed Ms. Sophie Tyler, the Travel Planning Coordinator at Better Bankside, to see how their pool bike scheme functioned. We wondered if there were differences between pool bike programs run by the government and programs run by private business. The knowledge gained at this case study was used to provide more thorough recommendations to the Croydon Council.

3.2 Evaluation of Croydon Council Bicycle Sharing Potential

In order to effectively provide guidelines for bicycle use in the Croydon Council, we conducted a site assessment of our program. We knew that the Council had already purchased bicycles and researched trial bicycle management software. Even with this information, a series of strategies such as insurance policies and infrastructure arrangement was needed to determine the state of the program's infrastructure and planning. This site assessment was conducted during our first week in Croydon. We toured the Council's cycling facilities and infrastructures. This allowed us to see the bicycles first hand, and visually estimate what condition they were in. We visited the changing room facilities, observed the showers and lockers, and evaluated their capacity and cleanliness. During this site assessment we also found some problems need to be solve such as the automatic main gate that was not accessible for cyclists, the manual side gate was inconvenient for pedestrians and cyclists to use, and retrieved information regarding the issues with the key card and gate access. Photographs were taken for our reference.

A requirement for participation in the Council's proposed cycling program is to partake in a cycling training lesson at the Croydon Arena, which certifies employees to a cycling proficiency of Bikeability Level 2 (roadway experience and how to deal with traffic). To evaluate effectiveness and convenience of the training session, our team scheduled and participated in the cycle training lessons and we identified ourselves as average cyclists, who are concerned with safety about riding on the road. This program lasted two days, with about two hours of instruction each day. A competent cyclist can complete the required lesson in two hours, still ensuring the Council of their ability to operate a bicycle safely. By going through the training ourselves, we were able to better understand the knowledge we lacked regarding cycling techniques on the road, as well as recognizing the confidence that this training lessons build.

Finally, we evaluated the Croydon borough's cycling infrastructure and cycle culture by traveling in a car around the borough. Because of legal issues, as well as the size of the borough, both cycling and walking were not options for the infrastructure observed. This strategy was designed to help us understand the cycling infrastructure and topography of Croydon. We looked for the presence of bicycle lanes and Sheffield stands, as well as the condition of the roadway and various hazards among it. These observations helped us determine the level of cycling ease and safety in Croydon. A written description of our observations and photographs, taken during our trip, were compiled to better inform our final recommendations.

Council Staff Interviews

In addition to the site assessment, we arranged interviews with Council Teams, employees grouped by their departments, and other staff to determine the general perception of bicycle-sharing programs. These teams and individuals were selected based on suggestions made by our sponsor as well as through snowball sampling. The suggestions were based upon the potential of these teams and individuals using the bike scheme. These interviews helped us realize the potential of business biking and the barriers impeding it.

Accommodation Manager in the Corporate Services Department

The first person we interviewed was Shelley Williams, the Accommodation Manager in the Corporate Services Department of the Croydon Council. Ms. Williams manages building operations such as key card access to various areas in the building including shower facilities, Council parking, and driveway gate. Cyclists requesting to gain access need to know the process involved. Her insight was needed to determine the best possible way an employee would register for gate and basement access.

Pollution Team

We interviewed Ms. Linda Johnson and Mr. Jason Andrews, who are members of the Pollution Team. This team regulates and enforces pollution control policies, air quality, noise, and other environmental factors around Croydon. Their job involves traveling to various monitoring stations and responding calls from residents. Their input was important to determine how bicycles could be utilized and integrated into their daily travel around the borough.

Highway Team

We interviewed Ms. Sue Ritchie, who is a Senior Engineer with the Highway Team at the Croydon Council. Based upon the highway team's business travel frequency, they were suggested as potential business biking users. Like the Pollution Team, our interview focused on the potential of bicycle use by Highway Team members. We also asked Ms. Ritchie her opinions on the debate between optional and mandatory helmet use and cycling instructions.

3.3 Design of Creative Material Bringing Attention to Business Biking Program

Our final objective was to design innovative and promotional material bringing attention to the new biking program. This objective was accomplished by combining solutions to barriers to cycling discovered during our observations of the Council's bike-sharing capacity, and the knowledge gained from our study of the best practices in London. To present the data, our team constructed an organized list of all the barriers preventing the Croydon Council from implementing a bicycle-sharing program. We also disclosed potential barriers that could arise based upon visits to other boroughs. Along with each barrier, suggested actions were recommended based upon our research. The recommendations made will be considered by the Council to begin their Business Biking Program.

Along with instructions for implementing the program, our team designed a set of detailed guidelines towards using the potential bike-sharing program. In order for the program to succeed, the staff needs a clear set of instructions to be able to participate. Our team wanted the sign up process to be as simple as possible and believed a user manual was the best answer. This manual is described how to register for the scheme as well as how to participate. In addition to this manual, our team also published the information on the Council's intranet. Both a physical brochure and online resource would attract/ensure more potential users. In the bicycle usage registration section, the instructions focused on how a staff member would sign up for the program. Steps included participating in a cycling training session, signing of liability waivers, and gaining access to cycling facilities. We designed the registration form and Bikeability assessment form, which could be filled in online. Each staff member would only have to complete the registration process once. The pre, during, and post cycling sections of the manual focus on the process of using a pool bike. These sections include instructions on signing out a bicycle, what to do in an emergency, and how to properly store a bike when finished. In order to facilitate staff to participate this program, we also contacted with the intranet manager and tried to create a new webpage. In this webpage, staff could not only register the pool bike program online easily, but could also find all information about cycling, such as pool bike scheme, tax free bicycles, cycle training lessons and bike to work, which would attract more staff who loved to cycle visit this webpage and increase the potential of participating this bike-sharing program. With these deliverables to the Croydon Council, our team was able to accomplish our goal of

creating guidelines and recommendations for developing a bike-sharing program for the council staff.

World Environmental Day

On Thursday June 5th, the Council had displays for World Environmental Day. Along with other presentations on energy saving methods, our team presented our new business biking scheme. The goal this day was to spread awareness of the new pool bike scheme and gauge interest of the staff.

Chapter 4 Results and Discussion

The chapter contains the findings of our research from evaluating best practice bicycle haring programs and Croydon's cycling infrastructure. The results and corresponding discussion below were used to formulate our final recommendations.

4.1 Results

Objective 1. Research best practice in London bike share schemes

In order to fully understand the logistics of a pool bike scheme, our team visited some bicycle-sharing programs in London to evaluate how they functioned and what factors led to their success. These best practice examples were determined through snowball sampling, and our independent research. We visited Ealing and Lewisham Council, as well as Better Bankside, a non-profit organization. For the Ealing and Lewisham Councils, we organized the information into three tables: general information, user experience, and liability & safety. We also noted unique aspects of each program that cannot be categorized in the tables below such as the loan process, promoting cycling, and problems that have occurred. The Better Bankside assessment cannot be categorized with the Ealing and Lewisham bicycle sharing schemes because it does not have a bike-sharing program, but instead it supports local businesses with bicycles to be used amongst their respective staff. The information in Tables 3, 4, 5 below was gained from interviews with the Ealing and Lewisham councils as well as with our site assessment of Croydon.

General Information

Table 3 displays general background information on each Borough we visited.

Table 3: Comparison of boroughs by size, cycling prevalance, bicycles, and upfront program costs
(*Compared to England's national average 2011/2012)

	Ealing	**Lewisham**	**Croydon**
Size	21.44 sq mi	13.57 sq mi	33.59 sq miles
*Cycling prevalence**	Above Average	Average	Below Average
Bicycles	9 (folding)	16 (full size manual, both male and female bikes)	8 (4 manual, 3 electric throttle & 1 electric assist)
Upfront expense	~£6,500	~£5,000	~£10,500

User Experience

The table below shows different aspects of the participant's user experience for the two Boroughs. It includes the processes for the user from the point of registering for the bike-share scheme, checking out a bicycle, and then returning it.

Table 4: Comparison of visited boroughs user experience

	Ealing	**Lewisham**
Booking system	Outlook resource scheduler	Not yet determined but is considering booking software
Bicycle apportioning	Available to all employees	Distributed amongst Council teams
Storage location	Near front entrance (**Appendix D**)	Basement garage (**Appendix E**)
Bicycle takeaway and return	The main entrance for pedestrian traffic (**Appendix D**)	Automatic pedestrian/cyclists door in garage, Level -1 (**Appendix E**)
Bike lock managing	Overseer administers key upon reservation	Front desk security holds all keys
Equipment	• Helmet and high-visibility vest per bike • Four luggage that attaches to bicycle • High visibility are/ankle bands	One backpack per bike containing helmet, high-visibility vest and tool kit
Shower/Locker facilities	• Three showers per gender • One locker per bike containing equipment	• One shower per gender • One locker per bike containing equipment
Drying room	One per gender	None

Liability and Safety

The table below shows the methods each council uses to ensure proper safety and insurance coverage.

Table 5: Comparison of visited borougs liability and safety

	Ealing	**Lewisham**
Helmet rules	Recommended	Required
High-visibility vest rules	Recommended	Recommended
Bikeability training	Recommended	Up to Level 2 required
Maintenance routine	Superficial check on all bikes every quarter at a cost of £800 per year In-depth check on all bikes annually at a cost of £540 per year	In-depth check on all bikes every two months performed by a designated council employee
Breakdown procedures	Fold bicycle and take public transit. (Call Ealing Council)	None. (Call Lewisham Council)
Emergency procedures	None. Call 999	None. Call 999
Insurance coverage	Full (Regardless if helmet or high visibility vest is worn)	Only when wearing safety equipment
Reimbursement for loss of bike	Borrower or borrower's team may be charged	Council covers entire cost

Best Practices: Pool Bike Loan Process

Through our research and visits to other Councils, we have determined common features shared amongst best practice pool bike schemes. The following are necessary features each pool bike scheme had in order to properly function:

- Simple registration process
- All insurance and safety information sheets located in the same place.
- Intuitive way to book bicycles.
- Centrally located area for storing keys.
- Routine maintenance on pool bikes to ensure roadworthiness.
- Protocol for accidents and breakdowns while riding pool bikes.
- Accountability for damaged bicycles, system for reporting accidents.
- Proper system to return pool bikes, ensuring on-time return.

Best Practices: Lessons Learned

The Ealing Council has observed underutilization of their pool bike scheme, forty employees have registered for the program but only ten use the nine bikes regularly. According to Ms. Mortensen, the pool bike scheme is underutilized and she would have gotten six bikes instead of nine if she were to do it over. There are also issues with the bikes that are being used, where participants who start using the bikes have trouble folding them and eventually become frustrated, leading to improper storage, potential damage to the bikes, and reduction in user base. Figure 12 shows Ms. Mortensen demonstrating the correct folding/unfolding procedure. Additionally, because Brompton bikes can be carried, and have a high resale value, they are a frequent target of theft. Though the Council has not had any occurrence of theft, it is still a problem to consider.

Figure 12: Ealing Council cycle administrator demonstrating correct folding/unfolding of the Brompton bicycle

Participants who use the pool bikes can cause a situation, where a minority of cyclists use the majority of bicycles; resulting in limited availability. Ms. Brooker from Lewisham Council suggested dividing the pool bikes amongst specific teams. When it comes to reporting problems with the bicycles, some participants don't report them because they feel that they may be penalized for them. It is also important to have a designated area to store the pool bicycles (Figure 13).

Figure 13: Lewisham Council's large poster to identify the pool bike area

The Lewisham Council has clear signage designating the pool bike area preventing other cyclists from parking their personal bikes there. It also helps with the functionality of the program as it shows new users where the pool bikes are located.

Best Practices: Promoting Cycling

Ms. Brooker also told us of Lewisham Council's participation in the Urban Cycle Loan Scheme. This scheme was designed by The London Cycling Campaign (LCC) to encourage more people to cycle during their daily lives. The main idea of this program is to change the transportation behavior, by focusing on the cost saving and health benefits of cycling. Several boroughs such as Lewisham, Greenwich, Enfield, and Lambeth participated in this cycle loan program (London Cycling Projects, 2014). The program in Lewisham council consisted of bicycle rentals for £10 a month to anyone working, studying or living in the borough. To sign up one must simply go online and insert their information to ensure they qualify for the program.

At the end of the month, users have the option to buy the rented bicycle for a 20% reduced price. They can also continue to rent this bicycle, or another bicycle if they are not

satisfied. According to statistics from the Lewisham Scheme, approximately six hundred people have used this service over the span of a year. Among those people 87% agreed that they found cycling enjoyable, 89% said they would cycle more in the future, 99% said that they would recommend the scheme. At the end of the month around 50% of the people bought the bikes and 27% had friends or family who had now started cycling (London Cycling Projects, 2014). The system allows people to get used to cycling and then can decide whether they want to purchase a bicycle. It is a great way to promote cycling since people who want to start out might buy a cheap heavy bike, which will make them have a negative experience and thus decide that cycling is not for them. Furthermore, it has been shown that 48% of participants who use bikes, three or more times per week, had shifted from car or public transport to bike. This has cut down the transportation expense almost £15-£20 per week (London cycling projects, 2014). The majority of people who were adopting bikes were the ones who were using public transportation. London's Cycling Campaign manages the online and telephone booking system, which evaluates participant data and promotes this program.

Best Practices: Business Cycling Encouragement

Better Bankside is a non-profit organization that provides services for local businesses in return for a yearly fee. They started running a bicycle-sharing scheme in 2009 called "Brompton Hire". The program offers pink Brompton bikes to Better Bankside staff members to use during the workday. In addition the bikes can be also loaned free of charge to a business for a six-month period. These services are provided so that people can become familiar with using Brompton bikes without having to spend money right away.

Their approach is rather hands-off, because it is the responsibility of the business that has received the bicycle to manage it. Therefore, it cannot be placed into the same category as Ealing and Lewisham's bicycle sharing schemes. Given this information, we were still able to takeaway measures they used to facilitate cycling such as the Brompton Two-Week Trial program and bicycle-supporting infrastructure.

Brompton Two-Week Trial

Better Bankside also offers free bicycles for a two-week trial period. To support this free two-week trial, Better Bankside owns 14 Brompton folding bikes (Figure 14).

Figure 14: Better Bankside Brompton bike alongside free to public bicycle maintenance stand

It is required that participants take part in a free introductory session with a cycle trainer to ensure that they are ready to cycle on the road. This program has turned out to be quite successful, with many free trial participants eventually purchasing Brompton bicycles themselves.

Bicycle Supporting Infrastructure

An additional cycling benefit that Better Bankside offers is a Pit stop service (Figure 14). It was the UK's first free on street 24/7 pit stop for bicycles, and it is located near one of London's busiest Cycle Superhighways. It provides cyclists with eight types of repair tools and an air pump. Additionally it is equipped with a stable repair stand, which aid users working on their bike. Users can also have their bikes inspected and repaired for free at Dr. Bike mechanics, which have a free on-call service. The service inspects the overall status of the bike and specifically focuses on brake pads, cables, gears, wheel alignment, tires, and inner tube status. If a serious problem is found, an explanation of how to repair it and a recommendation on how to prevent it in the future will be provided to the participant. Better Bankside also offers free cycle maintenance courses for business and their employees. The session lasts two hours and they are advertised in the Better Bankside's monthly debrief.

Better Bankside's official website has a page about "travel tool", (Figure 15) for checking

travel options on the go. It has information about real time updates on availability of: Barclays Cycle Hire (bikes and parking spaces), on-street cycle parking locations, electric vehicle charging points, live traffic disruption updates and bus stops service locations. However, this information is restricted to the area serviced by Better Bankside.

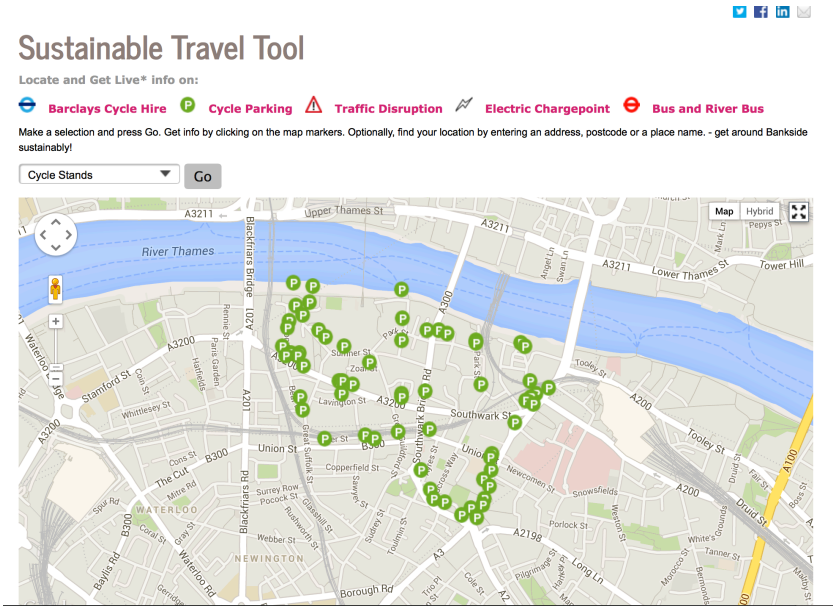

Figure 15: Better Bankside's Sustainable Travel Tool to help cyclists find cycle parking

Objective 2. Evaluate the capacity at Croydon for a bicycle sharing program

In order to determine the possibility of the Croydon Council to have a properly functioning bicycle-sharing program we investigated the Council's facilities, the topography and infrastructure of the borough as well as the cycling training lessons. Furthermore we interviewed three potential users of the pool bike scheme; these Council employees helped us understand possible concerns with the scheme and possible suggestions as well. Finally we analyzed the results of previous staff travel surveys, which helped us gain more information about the potential of having a pool bike scheme.

Council Tour

We conducted a site assessment of the Croydon Council by touring the facilities with Peter McDonald, the Croydon Council's Travel & Transport Planning Officer. This assessment was essential to understand the current conditions of the pool bicycles and the potential to have a functioning bicycle-sharing program. We used our compilation of best practices to identify what to look for in the Council. Features of present or missing at the Council were organized into two categories: assessment of bicycles and assessment of facilities.

Below is an inventory of all the components needed for a bicycle-sharing scheme that we have observed and assessed for quality and condition. All the bicycles and their features and equipment were new and recently purchased.

Assessment of Bicycles

- 3 Electric throttle (Figure 16)
- 1 Electric assist, "hybrid" (low cross-bar for women) (Figure 17)
- 2 Manual (high cross-bar for men) (Figure 18)
- 2 Manual (low cross-bar for women) (Figure 18)

Figure 16: Electric Croydon Council pool bicycle

Figure 17:Hybrid Croydon Council pool bicycle

Figure 18: Manual Croydon Council pool bicycle

Assessment of Bicycle Equipment

- 4 helmets & high-visibility vests (Figure 19)
- 4 Electric chargers (one per bike) (Figure 20)
- 8 Locks (one per bike)
- Absence of bicycle pump

Figure 19: High-visibility vest provided to each pool bike user

Figure 20: Electric bicycle charger

Assessment of Bicycle Features

- Bells to alert pedestrians
- Reflectors to increase visibility
- Front and real lights to maintain visibility in dark conditions
- Mudguard fenders to shield cyclist in wet conditions
- Chain guard to prevent clothing entanglement
- Panniers to store belongings during travel
- Twist-style gear shifters to accommodate topography
- Tire internally coated with slime to mitigate puncture
- Kickstand to park bicycles upright

- Bicycle batteries (2 batteries concurrently per electric throttle, 1 for electric assist bike)
- Front and rear brakes (disk brakes for electric throttle bike only)
- Rear-view mirror (electric throttle bike only)
- Electrical system control (electric bikes only)

Assessment of Facilities

Table 6: Assessment of the Croydon Council facilities

Feature of Best Practice	Present Situation at Council
Employee access	Staff normally don't have, but can gain access to all basement facilities and pedestrian gate by submitting a request to the Building Operation Manager.
Showers (Figure 21)	Four showers per gender present with proper locker and drying rooms. Clean, modern, well equipped and maintained daily.
Lockers (Figure 22)	130 lockers in use at a cost to employees of £10 per month and, due to limited availability, there is a waitlist to acquire one.
Gate	Automatic automobile only gate with an adjacent manual pedestrian gate that cyclist are now restricted to use due to previous misconduct.
Proper bike storage	Numerous efficiently organized Sheffield stands and locks for each pool bicycle.
Bike equipment storage	The Council will provide a helmet and high-visibility vests to each pool bike user. There are four helmets and four vests, but no lockers to store them near the pool bikes.

Figure 21: Croydon Council shower

Figure 22: Croydon Council lockers

Croydon Cycling Infrastructure

In order to determine the ease of cycling in Croydon, we accompanied our sponsor on a local trip around the Borough. During this trip, we made observations on the cycling infrastructure and the topography of the borough. We were not able to do our assessment of the Borough by using the council's bicycles due to lack of insurance coverage.

We knew from prior research that Croydon was hilly, but actually driving up such hills gave us a more accurate depiction. Areas especially in the southern end of Croydon have steep grades where it would be difficult to travel by manual bicycle

Figure 23: Parked car obstructing bicycle lane

Although Croydon Council had implemented almost 45 miles of new bicycle lanes in the Borough currently, many roads in Croydon had poor cycling lanes or no lanes at all (Croydon Council, 2014). To make the matter worse, many cars park on the cycle lanes, which push cyclists into moving traffic (Figure 23). Furthermore, we noticed that some buses and cars occupied part of the cycling lane while driving. Many roads had bicycle symbols in place of bicycle lanes, notifying drivers that there are cyclists on the road. This signage has associated safety risks as bicycle symbols are not a proper alternative to segregated bicycle lanes. Not all roads around Croydon are as smooth as the ones in central Croydon, with numerous potholes and fading bicycle symbols, as can be seen in Figures 24. A recurring theme was that bicycle lanes would only last a block or two before becoming a traffic lane (Figure 25).

Figure 24: Fading bicycle symbol

Figure 25: Bicycle lane ends as road narrows

Potential for Pool Bike Usage

We analyzed the results of the 2012 staff travel survey and the 2013-2014 zipcar usage data to gain a better understanding of the potential for pool bike usage within the Council. According to the Staff Travel Survey, out of the 802 employees who responded, almost 30% needed to travel daily and 14% travel more than once a week for work purposes. The survey also provided us with the data in Figure 26 that displays which method of transportation staff use while on work visits.

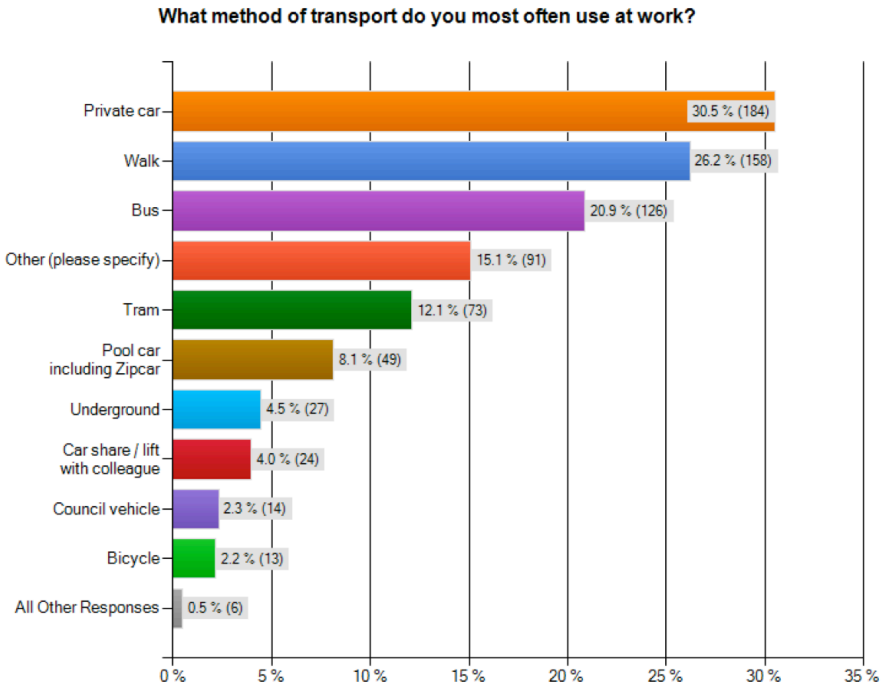

Figure 26: Staff Travel Survey responses to "What method of transport do you most often use at work?" (2012, Council survey)

Almost 30% of staff used private cars during their work journeys, 26% walk, 8.1% used pool cars and only 2.2% used bicycles. However, compared with the 2010 survey the private car usage was reduced by 7%, Zipcar usage increased by 6% and bicycle usage increased by 2%.

In addition to this, the 2012 survey also informed us that if there were a pool bike scheme, 86 employees said that they would be interested in

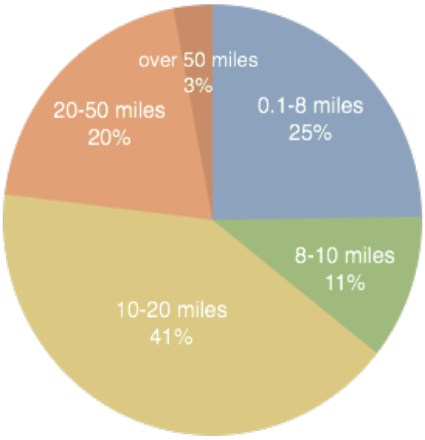

Figure 27: Percentage of Zipcar trips by mileage traveled

using this pool bikes for work purposes.

Based upon the given data, we were able to determine the potential for decreased Zipcar usage based on driving distance. The pie chart shown (Figure 27) displays the length of a round trip in a Zipcar in Croydon Council. According to the Council, 25% of trips were under 8 miles round trip. Since Croydon Council has electric pool bikes, these trips could be done by bicycle.

Concerns of Staff

To further examine the potential in a pool bike scheme, our team interviewed three members of the Croydon Council, Ms. Johnson and Mr. Andrews from the pollution team and Ms. Ritchie from the highway team. We asked questions regarding travel habits to determine the practicality of applying pool bikes to their daily routine. The discussion also brought to light their concerns, and issues impeding them from cycling. Table 7 describes various concerns of the Council Staff toward participating in a pool bike scheme.

Table 7: Concerns of staff members at the Croydon Council

Concern	**Reason**
Safety	• Lack roadway cycling confidence. • Absence of cycling lanes. • Dominant car culture • Motorists are inconsiderate toward cyclists.
Travel distance & duration	• Respond quickly to multiple destinations. • More effort compared to other forms of transportation
Mandatory safety equipment	• Dislike wearing bicycle helmets. • Unfashionable
Mandatory bikeability training	• Already feel confident cycling on the road. • Believe it is unnecessary.
Hilly topography	• Difficult with manual bicycle

Addressing Safety Concerns: Cycling Confidence Training

One of the biggest concerns of staff members was safety. To improve safety, the Croydon Council requires staff to take cycling training lessons up to Bikeability Level 2 before they can participate in the pool bike scheme; our team took the lessons ourselves to obtain firsthand information about the training, and see if it built our cycling confidence. We followed the steps provided online to book and then participate in two of the bicycle training lessons required by the staff to use the pool bikes (Figure 28). The first one informed us of the basic skills needed to ride a bicycle while the second taught us proper procedures at roadway junctions. After completing training for Bikeability Levels 1 and 2, our confidence had definitely grown. Our ability to safely travel on roads by bicycle also increased with our knowledge of proper bicycle procedures. The three Bikeability Levels, as described by Department for Transport are listed in Table 8.

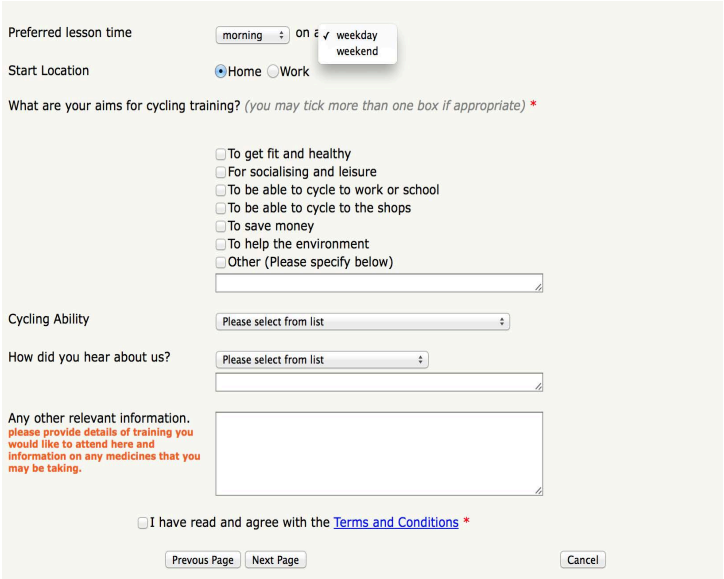

Figure 28: Screenshot of cycle training registration webpage

Table 8: Desired skill outcomes for each Bikeability level

Bikeability Level 1	Bikeability Level 2	Bikeability Level 3
• Fit your own helmet • Carry out a simple bike check • Get on your bike, start cycling, then stop and get off • Ride your bike using the gears • Make your bike go where you want it to, including moving around objects safely • Control the bike with one hand • Stop quickly if you need to	• Start and finish a journey by road, including passing parked or slower moving vehicles and side roads • Make a u-turn • Identify and react to hazards in the road • Signal your intentions to other road users when someone needs to know what you're doing • Understand where to ride on the road • Use junctions, including turning left and right into major and minor roads	• Make a trip to school, work or elsewhere on any roads • Use complex junctions and road features such as roundabouts, multi-lane roads and traffic lights • Understand driver blind spots • Know how (and when) to pass queuing traffic • Identify and react to hazardous road surfaces • Plan your route • Interpret road signs

• Look all around you when you're riding, including behind, without wobbling	• Decide whether a cycle lane will help your journey • Use the Highway Code, particularly when it comes to understanding road signs	

After the completion of Bikeability Levels 1 and 2, staff must also learn how to ride an electric bike. This process takes more then 30 minutes and ensures cyclist know how to operate this type of bicycle safely and comfortably.

Objective 3. Design innovative promotional materials

We accomplished objective three by creating a brochure and a poster with information regarding the pool bicycle scheme. This information was displayed in the Council to create awareness about the upcoming program during "world environmental day", an event to promote environmentally friendly behaviors. Our team also went to the "Hackney Cycling conference" to learn more about infrastructure constraints and improvements related to cycling in the city of London. Finally, we created registration forms that will be posted on the intranet. These forms will be used to register a staff member for the pool bike scheme and inform them of the schemes insurance coverage and liability. The brochure and posters (Figure 29) can be seen in Appendices F and G.

Figure 29: One of many posters created for World Environmental Day

4.2 Discussion

Our study revealed the complexity in promoting a bike share program that is safe, accessible, and easy to use. From our analysis of the results, we discovered how best practice pool bike schemes functioned. The methods used are divided into three sections: user experience, liability, awareness, and facilities. We begin our discussion with the cycle user experience.

User Experience

The participant user experience consists of how participants interact with the program starting from the registration process.

Booking Method

There are numerous options available for the pool bikes reservation system. At Ealing Council, Outlook is used to reserve bicycles in the same way a conference room would be reserved. Meanwhile, Lewisham Council is proposing using outside software to handle the reservation duties. The benefit of using Outlook is that it is prepaid, because the Council has a contract, and employees are already familiar with the system. A potential downside, mentioned by Ms. Brooker, is that Lewisham's Council has had problems with use of Outlook, and those problems could translate into issues with the pool bikes. Our group has personally experienced some trouble with conference rooms when council members have overstayed their booking times. If this problem was to correspond to the pool bicycle program, there could be issues with returning bicycle on time. If pool bikes were booked consecutively, other staff members could be late to their meetings.

Type of Bicycle

Ealing and Better Bankside had only Brompton bikes while Lewisham had regular manual bikes. The Croydon Council has manual, electric assist and electric throttle bikes. Each bicycle has its own strengths and weaknesses depending on the supporting infrastructure and cyclists' Bikeability skills.

Brompton folding bicycles are very practical because they are able to fold into a compact storage form. This allows more bicycles to fit into the same footprint compared to full size bicycles. Additionally, they can be easily transported in vehicles to areas where workers would transition from car to bicycle use. In the event of a breakdown, these can be folded and carried to the nearest public transportation service so one can continue their journey. While these bikes are

allowed aboard public transport services, their full size counterparts are not. Though the Brompton folding bikes face a high theft threat due to their high resale value, folding the bike and carrying it to your destination can mitigate this threat. Another downside is that the pool bikes are solely manual bicycles, with no electric assistance or throttle available. This means that participants will usually ride them to nearby destinations and areas where the topography is appropriate for manual cycling. Folding electric bicycles are available, and though they are heavier, they can still be carried on buses and trains like regular Brompton bikes. Some cyclists are discouraged by folding bicycles because of their small size and are perceived as being shoddy. Folding bicycles have small wheels and frame, while the handlebars and seat are set high and seem disproportionate to traditional full size bicycles. Because of this, some individuals do not adopt folding bicycles unless they have a need for the benefits of being able to fold, carry on public transport and store it in space limited areas.

Figure 30: Folded Brompton bicycle

Full size bicycles come in three types: manual, electric assist, and electric throttle. These bicycles consume more space compared to their folding counterparts and cannot be taken onto public transportation. They do have a more traditional look and feel that some cyclists prefer. Full size hybrid and electric bicycles can be used to travel a wider range with more comfort. However, they are heavier compared to folding electrical bikes because of their batteries and motor. The weight is not as great of a concern as these bikes are meant to be rolled instead of being carried.

Incentives

Incentives were discussed during our visits to best practice bike schemes as well as in our interviews with Council staff. One thing mentioned by Sue Ritchie, who participates in the Council's bike to work scheme, was that incentives were not the reason she bikes. She stated that the effort it takes to record her biked miles and the small cash reward offered resulted in her non-participation in the incentive program. If an incentive program is used to promote a pool bike scheme, it must be easy to participate in.

Other incentives discussed include giving free helmets and high-visibility vests to early adopters of the pool bike scheme. Not only would this get new cyclists to try out the program,

but would also increase safety. To get this incentive one must simply sign up to use the pool bikes.

Liability

After our evaluations of the other two Council pool bike schemes, we took note of different approaches to safety equipment policies. It is important to note that both Council's had helmets and high-visibility gear available to all pool bike users.

Ealing, in conjunction with their laissez-faire approach to pool bike regulations, does not make wearing such equipment mandatory. In case of an accident, they provide insurance coverage to all cyclists, no matter what equipment is worn. On the other hand, Lewisham Council requires that all cyclist wear helmets if they are to be covered by insurance. Even though there is a requirement for insurance, Ms. Brooker stated that people will still not wear helmets and because it is a hard rule to enforce. Even though our group believes that helmets should not be required, in preliminary talks with the Croydon Council insurance team, they suggest making helmet use required.

As with safety equipment, there has been much debate over whether cycling training should be mandatory or not. At the Ealing Council, Ms. Mortensen expressed concern over staff members who knew how to cycle not wanting to participate in confidence training, as they already feel fully confident in their cycling ability. Mandatory cycling training adds additional barriers toward pool bike adoption. In our interview with highway team member Sue Ritchie, she said that even though she was an experienced cyclist, she would not mind partaking in further cycling training. After experiencing the training ourselves, we also have mixed opinions. Even though we learned the proper ways of cycling, team members who were more confident in cycling felt bored. Our biggest concern is that experienced cyclists will not want to participate in the pool bike scheme if the training is mandatory.

Even with improved safety, there will still be risks associated with a pool bike scheme to Council staff and equipment. Both Lewisham and Ealing have registration forms that include terms and liability. At Ealing, if a Brompton bike is stolen, and there is reason to believe the user did not follow proper bike protocol, their team may be charged for the loss. For this reason, a budget holder from the Council's team must sign the liability form. Though you would want the registration process to be as simple as possible, legal issues such as who takes responsibility for a stolen bike must be addressed. Even if legal forms were signed there would still be

discrepancies. If the cyclist properly locks up the pool bike and it is stolen, it must be determined if he/she is held liable. Another factor to consider is who decides if proper lock up procedures were use.

Program Awareness

In order to have a successful program, Council staff must be made aware of the benefits of pool bikes. Both Lewisham and Ealing Council's had ways to advertise their pool bike schemes. Lewisham Council used The Lewisham weekly magazine to display the bicycle loan scheme and the bicycle lessons. They also plan on using social media such as Facebook and Twitter to spread awareness and creating post cards and pamphlets to publicize the bike loan program. During the process of signing up for a bike lesson or to reserve a bike, the website will have information about the pool bike scheme.

At the Ealing Council, there were only ten employees consistently using the Brompton Bikes. Ms. Mortensen stated that she held demonstrations on folding and unfolding Brompton bikes to raise awareness. There is also a poster hanging next to the bicycle storage lockers and an advertisement in the weekly newsletter sent to the Council employees.

When participating in World Environment Day, our team was able to spread awareness of the new pool bike scheme. We were able to get 26 signatures of staff who were interested in the program, and 3 employees who wanted to participate in the trial bike pool system. Even this initial interest, additional promotion of our pool bike scheme would be needed to ensure program success.

There are many different aspects of a pool bike scheme. In order to fully understand how to establish a functioning bike pool for the Council, a discussion on the results was needed. After reviewing and analyzing the results from the best practice pool bike schemes in London as well as the capacity for cycling in the Croydon Council, we were able to make our recommendations.

Chapter 5 Recommendations and Conclusion

Based on the findings discussed in Chapter 4 and the research presented in the literature review, our team developed recommendations for the establishment of a business biking scheme for use by the Croydon Council staff. The recommendations are divided into two categories, short-term and long-term, with additional specifications.

Short-Term Recommendations:

- User Experience
- Safety and Liability
- Awareness and Promotions

Long-Term Recommendations:

- Croydon Cycling Culture
- Bicycle Options
- Cycling Facilities

It is important to consider the obstacles our team faced when making recommendations. There was varying interest in the pool bike scheme and many barriers that need to be overcome in order to implement a new program. Cycling should not be forced upon employees, but rather encouragement should be used to get more users cycling even though it is not a part of their job description. It is also important to note that we faced some challenges, such as the selection of an administrator for the pool bike program. However, we are confident it will be overcome in the coming weeks.

5.1 Short-Term Recommendations

Our short-term recommendations include the steps required to implement a pool bike scheme. We are confident that our suggestions can work as a guide towards its establishment.

The User Experience

Our recommendations to ensure a satisfactory user experience of the proposed bicycle program consist of registration, facility access, key management, bicycle booking, and signage. Table 9 below outlines each recommendation.

Table 9: Recommended actions to ensure satisfactory user experience

Category	Recommended Actions
Registration	• Make all forms available on the Council Intranet and capable of being filled out online
Facility Access	• Design the registration system so that it automatically sends an email to the Building's Operation Manager when a registration is complete • Have automobile gate open halfway for cyclists
Booking System	• Utilize Outlook resource scheduler to book bicycles in a similar way to conference rooms
Key Management	• Designate the 1st floor concierge as a holder of the bicycle keys
Informative Posters	• Display instructions on wall by pool bikes. Includes: electric bike plug in/out, pre-ride safety check, reminder to return keys

Intranet Registration

We have created a Pool Bike Procedure, which can be found on the intranet, for staff to gain information and explanations about the scheme. To register and join the program, employees can sign the terms and conditions, understand the liability involved, and fill out personal information (Figure 31). This procedure is completed when an employee joins the scheme. Afterwards staff will undergo the free cycling training lessons with both the manual and electric bike. If a manual bike is ridden for the confidence training, a brief instruction on operation of an electric bike is to be given. The instructor, at the end of the training, needs to sign an assessment form to certify that the participant has successfully accomplished the training lesson. The forms are provided in Appendices H and I.

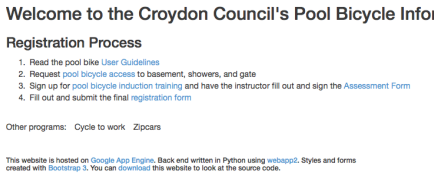

Figure 31: Mockup webpage displaying registration process

Facility Access

We were informed that to gain access to the basement, shower facilities, and pedestrian gate, a request in the form of an email would normally be sent to Ms. Williams, the Building's Operation Manager. We believe that this process can be simplified, by having an email

automatically sent to Ms. Williams upon completion of the online intranet registration (Figure 32).

Another potential hindrance to the pool bike scheme is the gate separating the Council driveway and the street. Currently, the large gate will only open for cars that have access to the basement. If a cyclist has access to this gate, it will be much easier to exit and enter the basement garage; however there could be potential for abuse, cars tailgating the cyclist to gain basement access. Also, a vehicle may turn quickly around the corner to make it through the gate and cause an accident with a cyclist. A functioning and cycle-friendly gate will enable participants to exit and re-enter the building without undue effort. Our recommendation to have the main gate swing open half way or only have one side of the gate open will allow cyclists to enter or exit, while still preventing unwanted cars from entering.

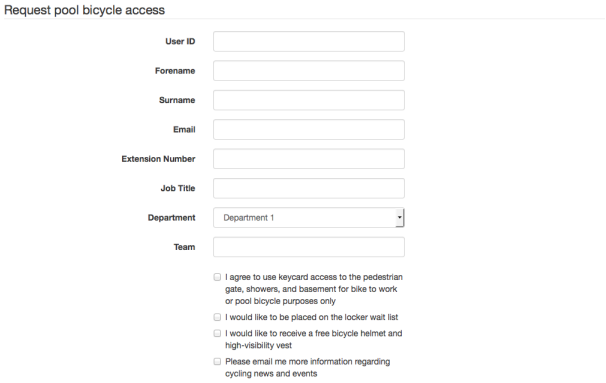

Figure 32: Mockup web form to request pool bicycle access

Booking System

To use a pool bike a staff member must first make a reservation. Using Microsoft Outlook for this process is both cost effective and easy to use. By avoiding other booking methods such as Bike Rental Manager, there will be no additional cost to the Council since the pool bicycles will be added as a resource, much like a conference room (Figure 33). Outlook is also convenient since Council members already know how to use the system to book conference rooms. By having bicycles under the same system as conference rooms, they will be easy to find and sign out, reducing the barrier of signing out a bicycle.

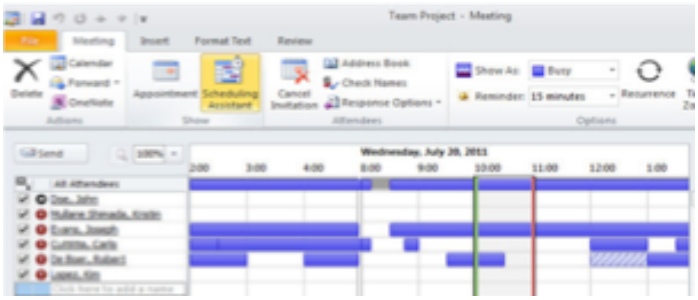
Figure 33: Example of booking a resource in Outlook

Key Management

When signing out a bicycle, keys are to be obtained to unlock it. After reviewing the key system at the Ealing and Lewisham Councils, we thought it was best to have the keys kept at the concierge desk. Since there is always someone there during business hours, the keys would

always be available. It would also be a good place because it is a central location that everyone can access.

Information Posters

In order for the pool bikes to be used properly, especially the electric and hybrid bikes, appropriate signage could be displayed in the basement. The signs would inform and remind users of tasks that should be done to use the bikes properly. Below is a list of instructions that could be displayed to ensure proper use of pool bicycles.

- A checklist of aspects to assess regarding the bike's functionality, before departure, in order to ride safely (ABC checklist learned in bicycle training lesson that includes a check of: Air pressure, Brakes, and Chain)
- How to lock and unlock bicycles properly
- Detailed explanation on how to appropriately plug in the electric bike batteries after usage. Specifying the location of battery A and battery B on the electric bike
- Reminder to return the bicycle keys on time
- Reminder of where to return equipment

Safety & Liability

Here we outline the recommendations regarding the safety and liability of the pool bike program. The table below provides the necessary elements to ensure a safe and functioning program, which include recommendations on safety equipment, maintenance, emergency plan, liability forms, and cycling training.

Table 10: Safety and liability recommendations

Category	Recommendation
Safety Equipment	Recommend but do not require helmet and high-visibility jacket to be worn
Maintenance	Use year-long pre-paid maintenance with Bike Shop (currently, Cycling Made Easy)
Emergency Plan	Provide every pool bike user with a card containing the number of an outside service such as SOS Motorcycle Recovery
Liability Forms	Require registration and cycling assessment forms be signed, indicating the user has read user guidelines and is a competent cyclist
Cycling Training	Mandate free cycling training to Bikeability Level 2 including an electric cycling lesson

To further explain our recommendations on user experience of our pool bike scheme, the topics are discussed in more detail.

Safety Equipment

Due to insurance coverage, helmets and high-visibility vests are required to be worn by pool bike users. The Council will ideally provide helmets and high-visibility vests for each staff member in the scheme. In addition, communal helmets and vests should be provided in case a staff member forgets his or her equipment. It must be noted that the Council needs to provide different size helmets for the different needs of the staff. By reading and signing the registration form, participants are notified that they may not be covered if they sustain an injury when not wearing safety equipment.

Our team, however, recommends that the Croydon council provides staff with helmets and high visibility vests and strongly suggests cyclists use them without making it a requirement. The reason we suggest that the helmets and vests not be mandatory is the fact that UK law does not mandate cyclists to wear them. Our concern is that mandating helmet use in the pool bike program might discourage employees from participating.

Maintenance Recommendations

After our site visit with Cycling Made Easy, we found they provide maintenance for one year, which is included in the price of the bikes. This maintenance consists of inspecting the bikes to check for problems every three months, meaning four inspections per year. It does not however cover problems such as accidents on the road, which the Council will have to pay an additional cost for. After the first year, the Council may choose to renew this service or find different maintenance methods. Another option, which is used by the Lewisham Council, is to have a member of the staff in charge of maintenance of the pool bikes. We recommend that the Council reassess the quality of the included maintenance after one year.

Emergency Strategy

An emergency contact must be provided to pool bike users. We recommend that the Council use an outside company like SOS Motorcycle Recovery Specialist, which provides a bicycle roadside repair service 24 hours a day 7 days a week. In the event of an emergency situation such as a collision or a broken bike, a pool bike user could call the number and request

assistance. The number for such a service must be available on the intranet and also attached to the bikes themselves. A main advantage of this type of emergency plan is that there are no membership fees, and only a cost if assistance is needed. The Council could also have a member of the staff, preferably the administrator of the pool bike scheme, respond to and help staff in case of an emergency.

Forms

We recommend that the Croydon Council require employees to sign a safety travel form and participate in cycle lessons in order to participate in the scheme. The safety travel forms include the Registration Form and the Pool Bike User Cycling Assessment Form (**Appendix I**). The registration forms (**Appendix H**), which consist of information about safety, Highway Code and guidance, could be provided on the Council's intranet.

Cycling Training

To ensure overall safety and cycling ability, training lessons should be mandatory. Furthermore, we recommend that the Bikeability Level 2 (see section 4.1) training lesson also incorporate experience on fully electric bicycles. For a competent cyclist, the training should last no more than one hour. Instructors would need to sign a form after the training lesson which states that the staff member completed the training successfully.

Awareness & Promotion

There is a need for staff members to be aware of the pool bike scheme. The following recommendations aim to create awareness of the program and explanation on how it works in order to aid its adoption. Furthermore we focus on methods on how to encourage people to use the pool bike scheme.

Brochure

Our team designed a tri-fold brochure, which briefly describes the overall program and how it works. It also provides a link to the intranet web page that has more information about the pool bikes. We suggest that our brochure be placed near others in the lobby level of the Council building, since all employees go through the lobby to enter the building. This brochure can be seen in **Appendix F**.

Posters

Along with the brochure, we created a series of posters using A4 and A5 size paper. We recommend these posters (**Appendix G**) to be displayed throughout the Council in stairwells and bathrooms in designated glass displays. In addition, we recommend these posters to be digitally displayed on the council's TV screens. The posters will create awareness as well as direct staff members to the Intranet website and cycle training lesson website.

Intranet

The Intranet will be the main hub of information regarding the pool bike scheme. We recommend that it contain all the information about this pool bike scheme, as well as web links to bicycle related subjects, such as training lessons, the London cycling campaign, the bike to work program and the please cycle phone application. This will help attract more interest toward the pool bike scheme.

The website also have a designated area to leave comments, which would help the Council to simply achieve user feedback and suggestions for improvements. Furthermore, this webpage could also have information on road traffic information and weather forecasting, which will help staff decide whether to cycle in the current condition.

5.2 Long Term Recommendations

Below we outline our ideas and improvements that could be implemented, after the program has started, to make the program work more efficiently and to increase the cycling culture in Croydon.

Improving Cycling Culture in Croydon

There are opportunities to improve cycling culture in Croydon that are not in use. A cycle loan scheme to allow residents to try bicycles before they buy, mobile phone applications to help find cycle friendly routes, cycling competitions, and infrastructure improvements.

Cycle Loan Scheme

There are other means to create a cycling culture other than a pool bike scheme. Our team believes that having a cycle loan program is an effective way to increase cycling not only in the Council, but the borough as a whole. Our visit to the Lewisham Council and discussion of their successful cycle loan scheme can be found in the results section (section 4.1).

Cycle Hackney Mobile Phone Application

In the long-term, Croydon Council could cooperate with other councils and develop a cycle mobile phone application that automatically uploads users' data to the Council's database. With this app, users could easily use GPS to route their way and locate roads with proper bicycle infrastructure (Figure 34). Furthermore, with this app the Croydon Council will be able to know which roads should be preferred and which should be avoided. Afterwards this information could be used to decide where to invest to improve the bicycle infrastructure. There could also be an extension on the application that allows users to report problems that they encounter, such as insufficient bicycle parking, poor bike lanes or potholes. This app could also consider health statistics, such as the speed, distance and calories burned.

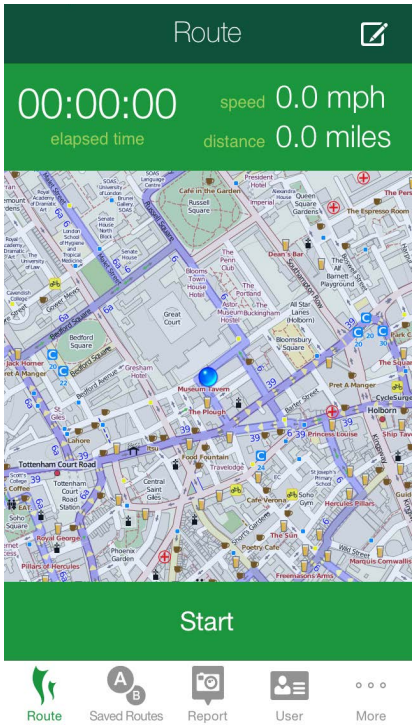

Figure 34: Cycle Hackney mobile phone application

Other Applications

Competition is always a good way to stimulate people's enthusiasm to participate in a program. The staff could be categorized by different department or team and use a phone application to track cycling mileage. Successively, the Council can have a one-month or quarter competition, in which the groups redeem their cycling mileage through the app and the ones with the higher redeemed mileage receive awards. This competition will most certainly encourage and motivate staff to participate in cycling. One thing need to mention is that the Croydon Council has a subscription on Please Cycle, but they are trying to find a free alternative. There are some free cycling related apps that the Croydon council can use (Figure 35). All of the apps record personal mileage and several also display health metrics and a GPS route.

Figure 35: Free cycling mobile phone applications

Cycling Infrastructure Improvements

In order to improve cycling infrastructure in the Borough, the Croydon Council could support the construction of more bike lanes to improve cycling safety. Transport for London (TfL) recommends 11 different types of bicycle lanes. After considering Croydon's current infrastructure, and the present car culture, mandatory cycle lanes should be the best option (Figure 36). These cycle lanes are much like what Croydon already has, only the yellow double line on the sides of the street would be painted red, prohibiting cars from parking in the cycle lanes. Another option would be to add semi-segregated lanes, a specific type of bicycle lane composed of planting or armadillos, which offer separation between cars and bicycles but allow pedestrians to walk between. Figure 37 shows the bicycle lanes and close-ups of armadillos.

Figure 36: Double red line bicycle lane preventing cars from parking in it

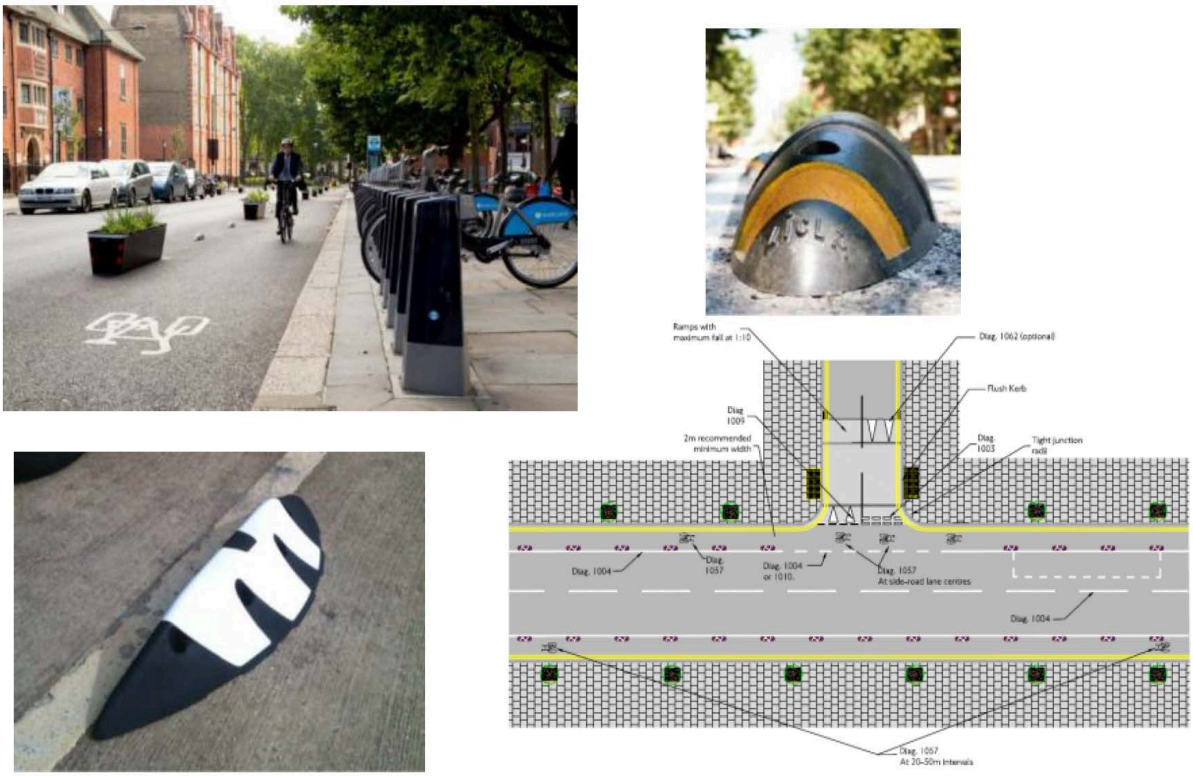

Figure 37: Armadillos themselves and showing their usage in a semi segregated bicycle lane (Hackney Cycling Conference, 2014)

Bicycle Options

After visiting Ealing Council and Better Backside we learned that they solely use Brompton folding bikes. They informed us that the users greatly appreciated using this type of bikes. The specific aspect that was most prized was the practicality of folding the bike and being able to easily put it in a car or on public transportation. By having this ability, users were able to use different means of transportation along with cycling to improve their pool bike experience. Given the benefits of this kind of bike, the Croydon Council could acquire Brompton bikes for their pool scheme, once the program has gained popularity and more bicycles are needed.

GPS Tracking

Due to the high cost of the electric and hybrid bicycles, it is important to protect them from theft. We recommend having a Spybike TopCap Tracker, which includes an advanced early warning movement sensor and a state of the art GPS Tracker in one integrated self-contained unit (Figure 38). The device can be used to track the bike's movements in case of theft. If the

bike is stolen the vibration sensor device will detect a significant movement, activate tracking and it will send an SMS message notifying its owner. To address users that may be concerned with their privacy, it is important to note the GPS tracker only records the position of the bike after it is locked (Figure 39). While riding the bicycle there is no GPS tracking.

Figure38: Spybike GPS Tracker

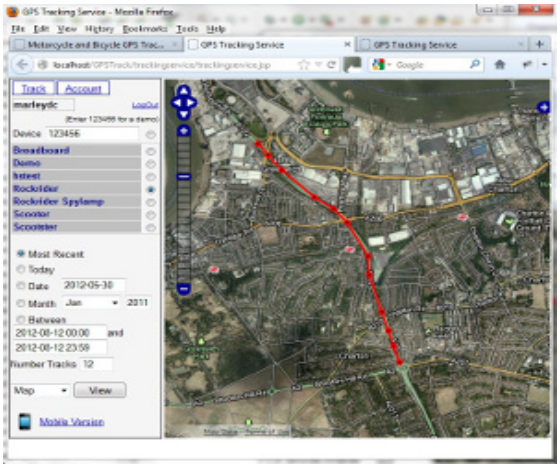

Figure 39: Map showing path of stolen bicycle

Facility improvements

We believe that it is important to ensure that the participants feel safe while using the Council's pool bike scheme. Upon our assessment of the basement and thanks to our interview outcomes, we have concluded that since both cars and bicycles use the basement garage, the safety of this garage could be improved. Many vehicle drivers might not be consciously aware that cyclists use the basement as well, therefore they might drive carelessly. We recommend that signs remind drivers as well as cyclists, to move around slowly and go around corners cautiously since they are sharing the space. Furthermore there are many blind spots and sharp corners, especially where the gate to the outside is, hence, so we advise installing convex mirrors to enable seeing around corners so that safety can be increased.

To insure that the bicycles function properly, maintenance should be performed periodically. However we feel that it could be of great use having tools and an air pump near by the bicycles, so that if an employee finds a simple problem with the bike before departure he or she can quickly repair it. We recommend providing additional electric chargers in the event that both the batteries on an electric bicycle need to be charged at the same time. We also recommend having more lockers available for the users of the bikes because we feel that it would be very

useful to have a place to store one's belongings before departure. As of now, there are lockers but the number is limited and there is a waiting list to receive one.

5.3 Conclusion

The benefits of cycling are clear. Improving health while decreasing transport costs is the main factor that influences people to utilize to the bicycle as a main method of transport. However, that does not mean cycling is free of challenges; safety, upfront costs, and cycling practicality are barriers impeding widespread adoption. The potential of cycling as a popular mode of transportation has led TfL to promote a series of initiatives. The "Mayor's Transport Strategy" has called for an increase in cycling in London's outer Boroughs. Croydon, being one such outer Borough, is a prime example of an area that should increase its cycling capacity.

Building on the Mayor's Transport Plan, the Croydon Council has sought to establish a pool bike scheme for use by the Council staff. This scheme would serve the purpose of increasing cycling among the Borough while reducing Council trips taken by polluting transport such as Zipcars. The development of this program required considerable planning and preparation. To aid in this effort, our team created guidelines and recommendations for the development of the program. We researched best practices at other London bike share schemes, evaluated the Council's bicycle sharing potential, and designed innovative promotional materials. Our recommendations on how to proceed in the short-term for establishing a pool bike scheme include management strategies in relation to user experience, safety and liability, and awareness through promotional materials. They also include long-term recommendations on cycling culture in Croydon, different bicycle options, and the improvement of Council facilities. After all of these steps we accomplished our goal of working with the Croydon Council to create guidelines and recommendations for developing a bike-sharing program for the Council staff.

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Appendix A: Site Assessment

Terrain

Hilly	Flat	Bike Lane	Map	Smooth	Rough

Picture checklist

	Bike Access Road/Gate
	Bike Administration Room
	Signage
	Safety Information/Forms
	Bicycle Types
	Shower/Locker
	Accessories(helmet, lock)
	Docking Station
	Booking System

Type of Bikes

Electric Bikes	
Hybrid Bikes	
Standard Bikes	
Brompton Bikes	

Comments

_____

_____

_____

_____

_____

Details

Quality of infrastructure

_____

_____

_____

_____

_____

Notification

_____

_____

_____

_____

_____

Booking System

_____

_____

_____

_____

_____

Safety Information/forms

_____

_____

_____

_____

_____

Disadvantage

_____

_____

_____

Appendix B: Council Interview Questions

Access to the bicycles and facilities

1. Is your booking software system integrated into Outlook?
2. Where does your staff need to go to retrieve the bikes? What kind of security access method do you use? Do you use any type of card access?
3. Can all staff members use the pool bikes? Or does one have to register beforehand?
4. Are emergency contacts provided in the event of an emergency during travel?
5. What types of bikes are offered? Are there any electric or hybrid bicycles? Folding bikes? Do men and women receive different bicycles? Unisex bicycles?
6. Is the staff provided with locker rooms and showers? Are locks, for the lockers and bikes, provided by the Council or are they bought by individual users? Is soap provided in the showers?
7. Are accessories provided such as: helmets, tool kits, high visibility vests, luggage holders that attach to bicycles, ankle straps? Do staff members agree to share bike helmets or do they prefer having their own?
8. Is there a penalty or a potential charge in the event of a lost, stolen or late returned bicycle?
9. Is the Council's website, used for booking training lessons or reserving a certain bike easy to find, comprehend and use? How are employees notified of the existence of the cycling scheme?

Information about usage

10. Do you have any information on usage rates?
11. Do you have any statistics regarding improved staff health, Council savings and positive effect on the work environment? Do you have any statistics regarding any disadvantages of using the scheme?

Insurance policies

12. Does the Council insure cyclists? What are the requirements the staff needs to abide by in order to be insured while cycling? For example, are they required to wear helmets? Do they need to wear a high visibility vest?
13. Is the staff required to sign a safety agreement form before they start using the scheme?

Education regarding biking ability, awareness of the program and cycling benefits

14. Are there any locations that lack informative signs regarding the cycling scheme?
15. Is there any event to educate and encourage staff to cycle? Also, are the employees informed of the benefits of cycling?
16. Does the Council provide bicycle-training lessons for their staff? Is it free? Is it required? Is a pamphlet with safety information provided to all the staff members?

Funding, expenses and incentives

17. How much was the bicycle sharing scheme's initial startup cost? What and how much are the ongoing maintenance expenses?
18. What and how much are the savings induced by the bike-sharing scheme?
19. Do you provide any sort of incentives to cycle, since there are induced savings from reduced Zipcar usage?

Further recommendations

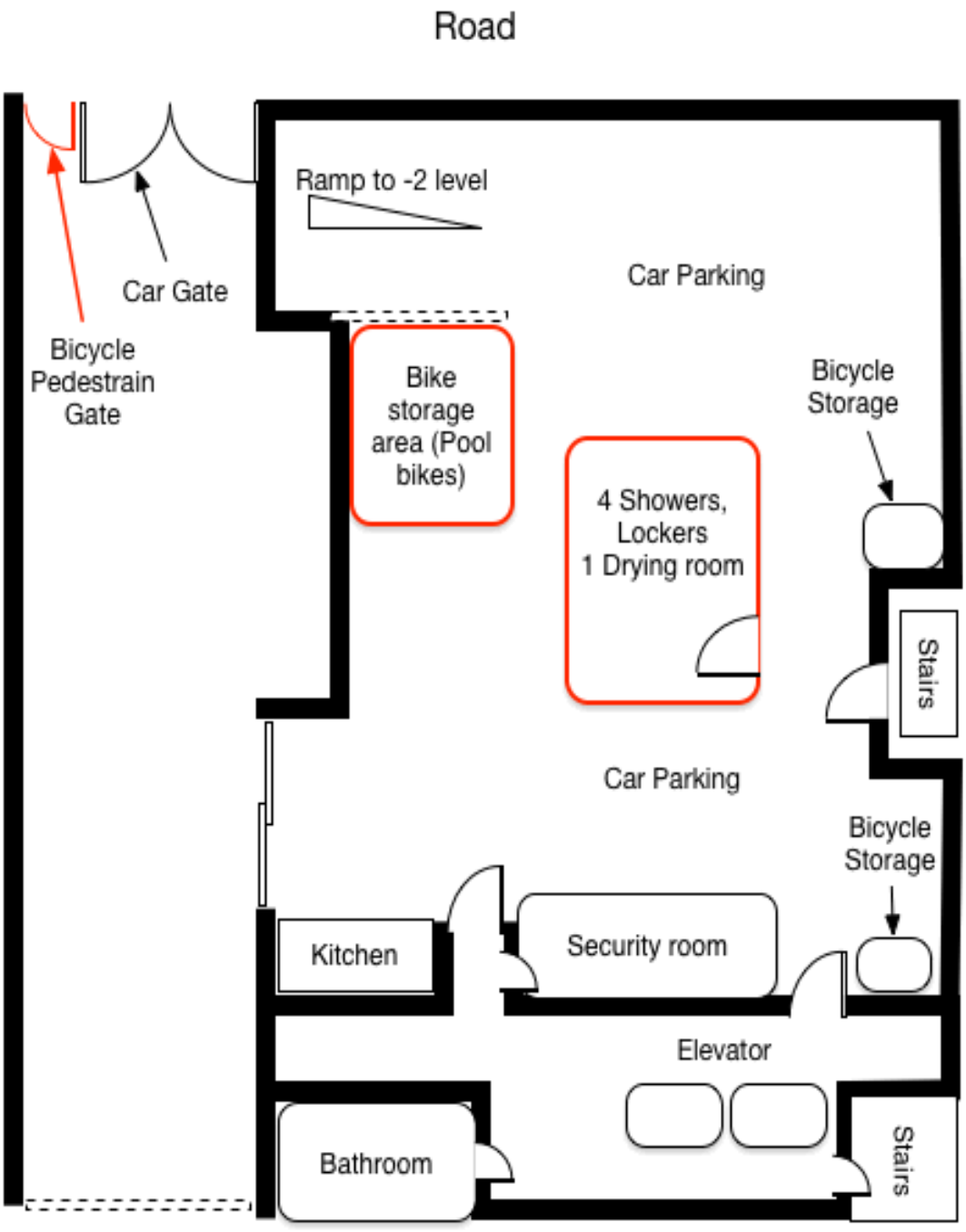
20. Do you have anything you would suggest to improve the pool bike scheme?
21. Would you think that expanding the bicycle-sharing scheme to the whole borough is a good idea?
22. Do you think that investment in bicycle infrastructure improvements in the surrounding area is a good idea?

More information

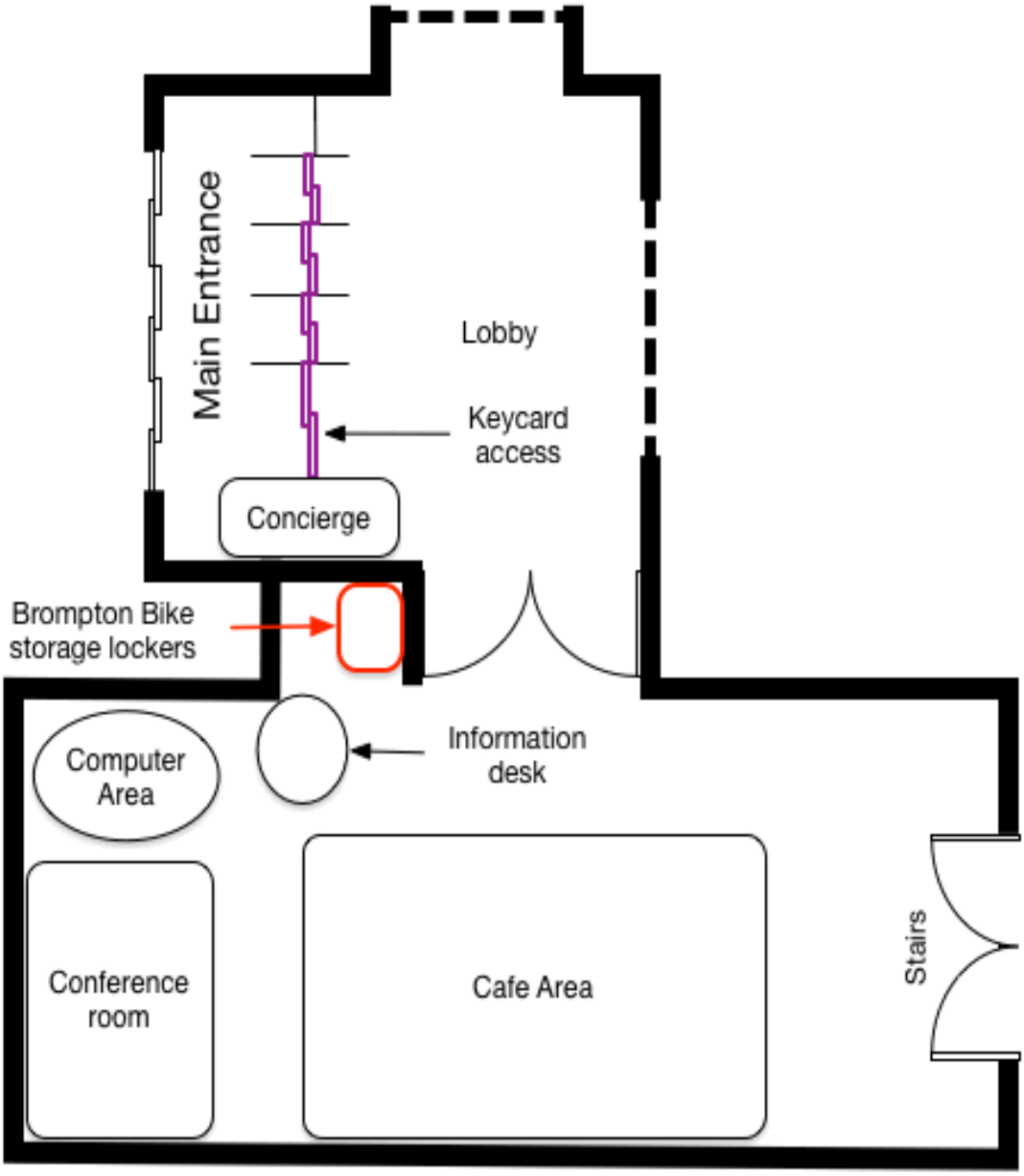
23. What obstacles do you think are preventing the staff from using the pool bikes?
24. Are there any individuals or organizations that you would suggest we contact for more information?

Note: Questions 2,6,7,9,12,13,16 were created to address problems faced by the Croydon Council.

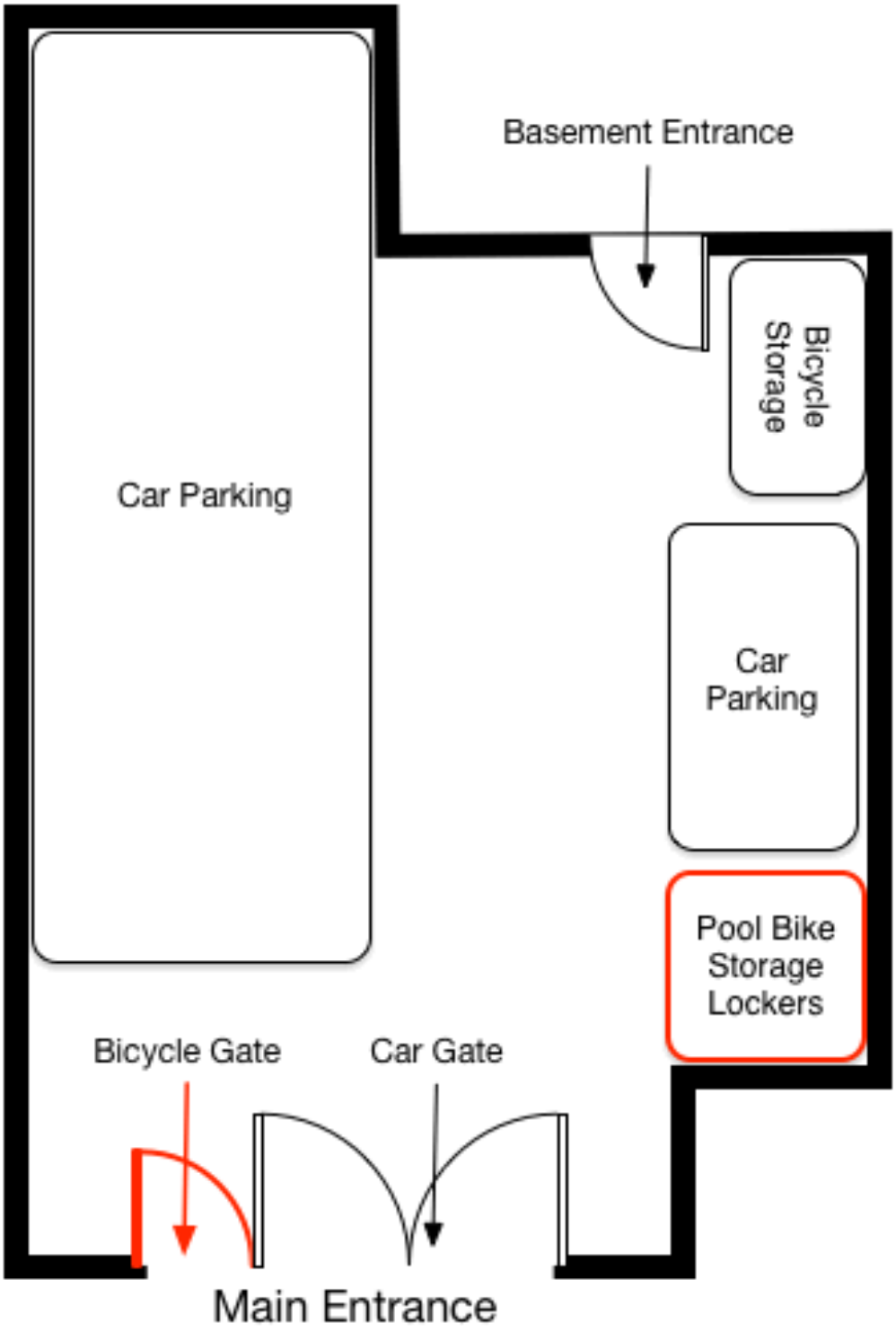
Appendix C: Croydon Council Bicycle Storage and Garage Access



Appendix D: Ealing Council Bicycle Storage and Entryway



Appendix E: Lewisham Council Garage Bicycle Storage and Gate Access



Appendix F: Brochure

REGISTRATION

1. Register Online
   1.1. Send E-mails to peter.mcdonald@croydon.gov.uk
   1.2. Obtain keycard access from Shelley Williams
2. Read and abide by the User Guide
3. Take the cycling induction session
   3.1. Get a FREE one-to-one, cycling confidence training
   3.2. Lesson available 7 days a week starting from your home, office or other convenient place
   3.3. Includes training on both electric and manual bicycles

   Book online www.cyclinginstructor.com
   Or call 0845 652 0421 Instructor
4. Have instructor sign Cycling Assessment Form
5. Sign the final Registration Form

CROYDON COUNCIL
contact Peter McDonald
020 8726 6000 x 62765
peter.mcdonald@croydon.gov.uk

WHY CYCLE?

CONVENIENT!

HEALTHY!

BIKE-SHARING SCHEME

Croydon Council freely provides 4 manual, 1 hybrid, and 3 electric bikes for use during work by council staff

CROYDON COUNCIL
www.croydon.gov.uk

Appendix F: Brochure

Three types of bikes

- Electric Bikes
  - 40 mile range
  - Two large panniers

- Hybrid Bike
  - Control the amount of electrical assistance

- Manual Bikes
  - 2 low crossbar bikes
  - 2 high crossbar bikes

PROCEDURES FOR USING THE POOL BIKES

Registration process
Free cycle training lessons

BEFORE:

- Book pool bikes through Outlook
- Pick up key at the concierge desk
- Check bicycle and equipment to ensure roadworthiness
- Plan your route
- Wear proper clothing

Check Air, Brakes, Chain, And Dress Before You Go

Fit The Helmet Properly

DURING:

- Abide by the Highway Code
- Lock the bicycle properly to prevent theft

Note:If a user is negligent and a bicycle is lost or stolen, the borrower or borrower's team may be charged

Make Sure Bike Is Locked Properly

Follow The Traffic Rules

AFTER :

- Lock the bicycle
- Plug in electric bicycle
- Report any incidents
- Return key

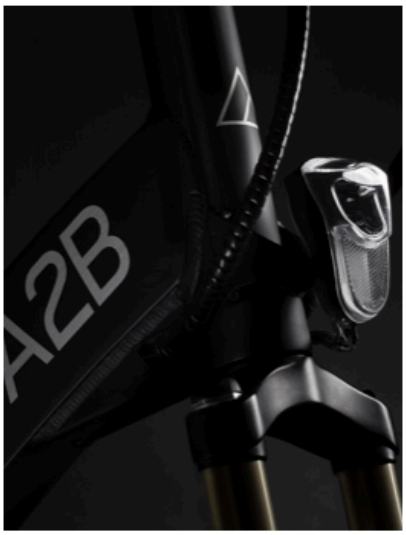
Note: **Please avoid late returns. Your team will be charged** for any bicycle returned late without notice. You must contact the Administrator if you are unable to return the bicycle at the scheduled time.

Return Keys On Time

Plug In Electric Bikes After Use

Appendix G: Posters

ELECTRIC BICYCLES



- Fast
- Convenient
- Easy to use
- Travel long distance
- Environmentally Friendly

Appendix G: Posters

Appendix G: Posters

Pool Bike Scheme
Coming Soon!

Free for Council staff use

Electric, hybrid, and manual bikes

Lockers, showers, drying rooms

Free cycling confidence lessons

Contact Peter McDonald at Peter.McDonald@croydon.gov.uk

Appendix G: Posters

Appendix H: Registration Form

Registration Form

Croydon Pool Bicycle Scheme

Name:	
JobTitle:	
Department:	
E-mail Address:	

Cycle Questions

How often do you cycle using the public highway?	Everyday ☐	Once a week ☐	Once a month ☐	Once a year ☐	Never ☐
Have you reviewed the **Pool Bike Procedure** document?				☐ Yes	☐ No
Have you requested **pool bike facility access**?				☐ Yes	☐ No
Have you completed the **bicycle training course** and received signed **Cycling Assessment Form**?				☐ Yes	☐ No
Have you reviewed the **Highway Code** (Rules for cyclists) and agree to abide by it?				☐ Yes	☐ No
Do you agree to take all necessary precaution to ensure the bicycle is **protected from theft** as described in the pool bike procedure?				☐ Yes	☐ No
Do you agree to use a **helmet and high-visibility vest** while cycling?				☐ Yes	☐ No
Do you agree that your team's Budget Holder has been informed of potential **charges** resulting from damage, theft or late return of the bicycle?				☐ Yes	☐ No

I am aware that I may not be covered by Council insurance if I sustain injury when not wearing a helmet and high-visibility vest.

Signed: _____ Date: _____

Please print and sign this form, along with your cycling assessment form then bring them to the pool bike administrator.

Any information given will be treated in confidence and will only be used to administer the pool bicycle scheme.

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Appendix I: Cycling Assessment Form

Pool Bike User Cycling Assessment Form

The purpose of this assessment is to demonstrate the competency of the cyclist in the following criteria as set out in the CSTB (cycle training standards board) Cycling National Standards.

Level 1 (You must be able to demonstrate all the skills listed in level 1)

1. Properly fit your helmet
2. Carry out a simple bike check
3. Get on your bike, start cycling, then stop and get off
4. Use gears while cycling
5. Make your bike go where you want it to, safely moving around objects
6. Control the bike with one hand
7. Stop quickly if necessary
8. Look all around when riding, including behind, without wobbling

Level 2 (You must be able to demonstrate all the skills listed in level 2)

1. Start and finish a journey by road, including passing parked or slower moving vehicles and side roads
2. Make a u-turn
3. Identify and react to hazards in the road
4. Signal your intentions to other road users when someone needs to know what you're doing
5. Understand where to ride on the road
6. Use junctions, including turning left and right into major and minor roads
7. Decide whether a cycle lane will help your journey
8. Use the Highway Code, particularly when it comes to understanding road signs

Electric Bicycle

1. Be able to properly use an electric bicycle
2. Have full control of the electric bike
3. Carry out a simple electric bike check

The trainee has demonstrated on the day of the assessment competency in the above cycling skills

Instructor comments: _____

_____

Name: _____ Signature: _____

Date: _____ Instructor Signature: _____

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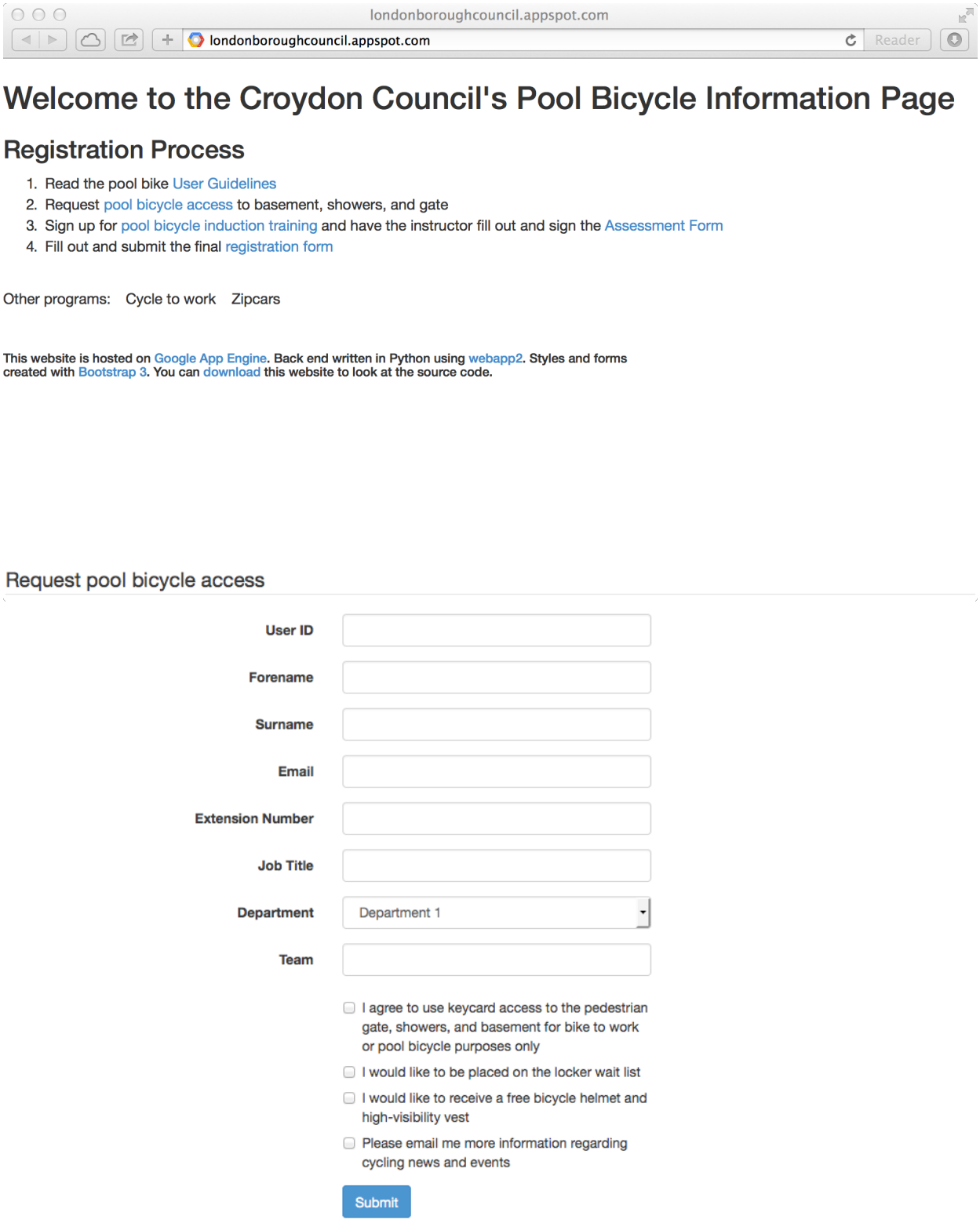
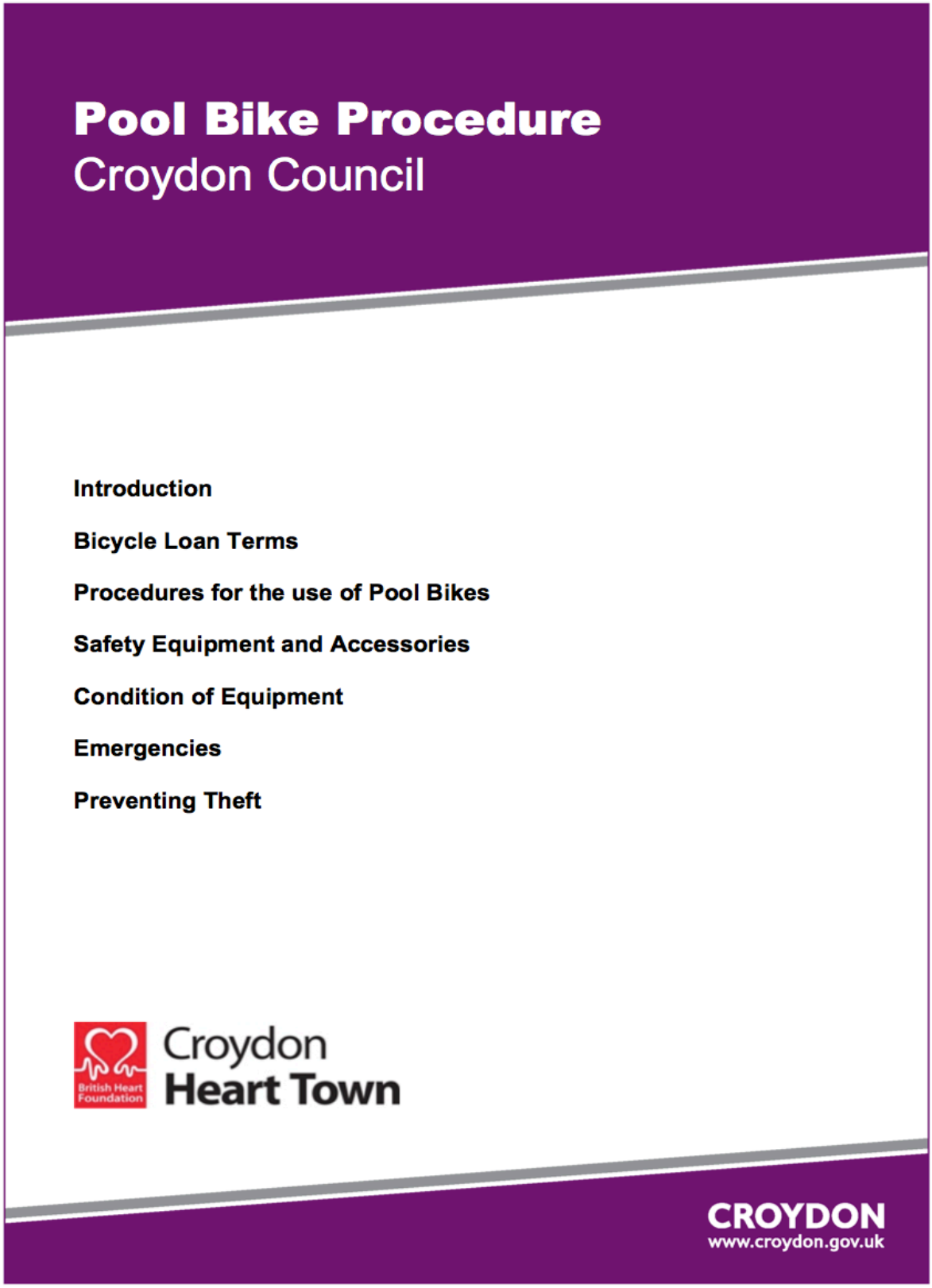
www.croydon.gov.uk

Appendix J: Prototype Cycling Information Webpage



Appendix K: Pool bike procedure



Pool Bike Procedure
Croydon Council

Introduction

Bicycle Loan Terms

Procedures for the use of Pool Bikes

Safety Equipment and Accessories

Condition of Equipment

Emergencies

Preventing Theft

British Heart Foundation
Croydon
Heart Town

CROYDON
www.croydon.gov.uk

Appendix K: Pool bike procedure

Croydon Council
Pool Bike Procedure

Introduction

Croydon Council is providing four manual, one hybrid, and three electric bicycles for use by staff for journeys on council business. The different options of bicycles offer more flexibility when travelling:

- provide assistance when travelling up hills
- decrease travel time with a maintained speed
- reduce exertion when travelling

Guidelines and advice on the use of these pool bikes are given below.

Simple Booking
The bikes are located in the basement (Level -1) of the Croydon Council. Book them using Outlook by making an appointment with Manual Bike 1-4, Hybrid Bike, or Electric Bike 1-3.

Free
While there is no charge for the use of a bicycle, a late return may incur a penalty.

Bicycle Loan Terms

- The Bicycle Pool is only available to Croydon Council employees who have completed cycling training of at least Bikeability Level 2.
- The Bicycle Pool is to be used for work journeys
- At this time, employees cannot use the bicycle pool for daily commuting purposes.
- Typically, bicycles may be booked for a maximum of 10 hours and are primarily for use during business hours unless special arrangements have been agreed.
- Please return bicycles on time – in the event you are running late, contact the Concierge desk and give notice of your delay.
- Borrowers must obey the Highway Code while riding a pool bicycle and user must review **Highway Code** to increase cycle safety.
- Prior to the first booking, Borrowers must sign a Pool Bicycle User Agreement. This is an acknowledgement that a charge may occur in the instance of neglect resulting in theft or penalty for late returns.

CROYDON
www.croydon.gov.uk

Appendix K: Pool bike procedure

Procedures for the use of Pool Bikes

1) Book a Bicycle Online & Arrange Pick Up
Use Outlook to make an appointment with Manual Bike 1-4, Hybrid Bike, or Electric Bike 1-3.

2) Collect Bicycle Key
Please allow 15 minutes for your first booking to ensure you have time to review guidance and sign forms. After your first booking, collection should only take a few minutes.

Checkout

1. Borrower completes Registration Form (first time only)
2. Borrower shows staff ID card as proof of employment
3. Borrower collects keys from Concierge on 1st floor
4. Borrower retrieves bicycle and accessories from Basement (Level -1)
5. Borrower conducts pre-journey check
    - If damage is present, please return the keys and notify the Concierge desk

Pool Bicycle Registration Form must be signed and returned to Administrator before bicycle can be borrowed.

3) Secure Equipment & Return Keys

Returns

- Borrower locks the bicycle then places helmet and other equipment in the correct storage locker
- Borrower returns keys to Concierge desk
- **Late Returns** – Please avoid late returns: a charge may be applied if the bicycle is returned late without warning
- For returns after work hours, please arrange a time for return with Concierge

Safety Equipment and Accessories

Employees using the Pool Bicycles are expected to use safety equipment during their journeys. **Borrowers must read the Highway Code before their first journey, which includes safety information and tips for riding a bicycle.**

Borrowers may choose from the following safety equipment and accessories:

- Helmet
- High-visibility vest

Condition of Equipment

Appendix K: Pool bike procedure

The cycles are considered work equipment and therefore subject to the Provision of Use of Work Equipment Regulations.

Croydon Council will ensure cycles are:

- Suitable for use, and for the purpose and conditions in which it is used;
- Maintained in a safe condition for use so that people's health and safety is not at risk;
- Inspected to ensure that it is, and continues to be, safe for use;
- Used only by people who have received adequate information, instruction and training;
- Accompanied by suitable safety measures

Emergencies

If the Borrower experiences any mechanical breakdown while using the bicycle that results in unsafe riding conditions or inability to ride, please call SOS Motorcycle Recovery Specialists. Do not try to continue riding a bicycle when it is in an unsafe condition, or if severe weather makes it unsafe to continue.

Preventing Theft

Every Croydon Council Pool Bicycle is accompanied with a lock. When leaving your bicycle, use these guidelines for an appropriate spot to leave the bicycle.

- Park in well-lit areas
- Park in a prominent place where lots of people are coming and going, rather than tucked away in a corner
- Use cycle parking stands, where available, and choose those that allow you to lock both your frame and one or ideally both wheels to the stand
- Where no suitable stands are available, use secure, immovable street furniture, but make sure your bike can't be lifted off it
- If you have to use stands designed to hold the bike by one wheel only, position your bike so that you can lock the frame as well
- Always ensure your bike isn't causing an obstruction

If a bicycle is lost or stolen, the Borrower or Borrower's Team may be charged for the expense.

Enjoy the freedom of cycling