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Identifying and Evaluating the Impacts of the 2012 Olympics: London Borough of Hounslow

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Identifying and Evaluating the Impacts of the 2012 Olympics: London Borough of Hounslow

An Interactive Qualifying Project submitted to the faculty of Worcester Polytechnic Institute in partial fulfillment of the requirements for the Degree of Bachelor of Science

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Abstract

The purpose of this project was to assist the London Borough of Hounslow Contingency Planning Unit in identifying and evaluating the impacts of the 2012 Olympic Games. We gathered and derived data to present a quantitative representation of the borough with possible impacts. Analysis shows significant impacts, as Hounslow could see a 15% increase in population, a 37% increase in rail ridership, and an additional 2000 cars per day traveling through the borough.

Authorship

All authors listed on the cover of this report contributed equally to its content and revision.

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Executive Summary

On July 6, 2005 the International Olympic Committee (IOC) awarded London the rights to host the Games of the XXX Olympiad in 2012. The 2012 Olympic Games in London will bring close to a million visitors into the city for a little more than two weeks. Planning for the Olympics is one of the largest logistical problems a city can undertake. The increase in population will cause strain on transportation infrastructure and impede many boroughs' ability to provide services. The boroughs of Greater London need to know the extent and severity of these impacts.

Our project was to assist the London Borough of Hounslow Contingency Planning Unit in their investigations of the impacts of the 2012 Olympics. In order to adequately plan, the Hounslow Council needs to know what the quantitative impacts on the borough will be during the Olympics, and our goal was to provide them with those impacts. This entailed dividing potential impacts into categories, and then trying to quantify as many as possible. The end goal of our research was to develop sets of information on impacts, both qualitative and quantitative, that could assist the Borough of Hounslow as it prepares for the 2012 Olympics.

The first step of generating our quantitative representation of the borough was to create a mind map of possible impacts of the Olympics on Hounslow. We divided the possible impacts into five categories: residents, visitors, businesses, infrastructure, and transport. Each of these major categories was divided into sub-categories. For example, residents was divided into disabled and elderly, healthy adults, children, and ethnic concentrations. For each of these sub-categories, we developed estimates for how they could be impacted during the Olympics. We used a variety of research methods to collect our data. Our research involved a small portion of primary data collection, but it mostly involved manipulation of existing data to establish estimates for Hounslow. An example of our primary data collection was our research into hotel capacities. Since the Hounslow Council had very little existing information on hotels in the borough, we identified hotels in and around the borough and contacted them regarding their maximum occupancy. Most of our other estimates were made by applying existing data from previous Olympics to Hounslow. The Sydney 2000 Olympics provided a wealth of existing data, as most aspects of the Games were well documented and Sydney was also the most

similar host city to London in terms of existing infrastructure and cultural setting. The remainder of our estimates were taken from other organizations working on planning for the 2012 Olympics such as the Olympic Delivery Authority and the Department for Transport. We collected baseline data on Hounslow from multiple sources including the 2001 Census, the Department for Transport, and Transport for London. Then, we could apply the estimates to the current baseline data to determine the impact on that sub-category.

Our research and analysis indicates that the 2012 Olympics will have a significant impact on some aspects of the London Borough of Hounslow. The first major impact is that the population will increase by up to 15%. Secondly, there will be an additional 37% of people traveling on the Tube through Hounslow. In order to ensure the borough runs smoothly during the Olympics, it is important that the Hounslow Council is aware of the magnitude of these impacts.

The two major sources of population change in the borough will be people staying at hotels and private housing through informal letting. We determined the likely population increases due to hotels and informal letting will be 5,244 and 27,270 respectively in a worst-case scenario. This is a combined population increase of 32,514 people across the borough, representing a 15% increase in the total number of people staying in the borough. The Hounslow Council will need to determine if this increase is significant enough to impact local businesses' ability to meet demand.

In addition to population increases, there will be a large increase in the number of people traveling through the borough. Most of this increase will be due to people traveling from Heathrow Airport into central and eastern London. We estimated that there will be a 37% increase in Tube and National Rail traffic in the borough. There will also be up to an additional 2,000 cars per day on the M4 and there will be an additional 219,000 people arriving at London Heathrow Airport during the Olympics. The Hounslow Council will need to take these numbers and assess the level of impact on the borough.

The Borough is particularly interested in the reliability of our estimates. Our population estimates are considered worst-case scenario estimates, meaning that they will most likely be higher than the actual number. The informal letting portion of this number is based on 2001

census data. However, even though the population of the borough has increased somewhat in the past ten years, we do not believe this will significantly impact our estimates. This is because there has not been a significant number of new housing developments in Hounslow during this time, meaning that any additional people living in the borough will be living in the open rooms already accounted for in our estimates. All of our other estimates are based on information published by credible institutions like the Olympic Delivery Authority or the Department for Transport. The range of variation in our estimates is caused mainly by the lack of detailed borough-specific information.

The Borough of Hounslow should look over our estimations and determine how the borough can prepare for them. We recommend that special attention be paid to the following impacts: a 15% increase in population, a 37% increase in rail ridership, and a 12.5% increase in Heathrow departures. In addition, we believe that the Borough of Hounslow needs to make local businesses aware of these changes, as 60% of businesses are making no preparations for the Olympics. Finally, we recommend that the Contingency Planning Unit reviews the emergency plan based on our updated version of the Community Risk Register. Certain hazards have had their casualty and fatality figures increased, and will likely need more resources to deal with. We believe that if the London Borough of Hounslow follows these recommendations, they will be better prepared for the London 2012 Olympics.

1 Introduction

The modern Summer Olympic Games are the largest sporting event in the world, drawing more than 10,000 athletes from all corners of the world to compete. The Olympics attract a massive influx of people to the host city and therefore have a significant impact on most areas of the city. The London 2012 Games are expected to attract as many as 900,000 visitors to the city between July 27th and August 12th, 2012. As the city prepares, many borough councils are anxious about the preparations and potential impacts caused by the Games. The Hounslow Council is attempting to assess the potential impacts of the 2012 Olympic Games on the borough's infrastructure to make appropriate preparations in advance. This infrastructure includes, but is not limited to transportation, shelters, and emergency response services. A particular area of concern is emergency preparedness and risk assessment.

While the London Borough of Hounslow is not hosting any venues or events, two major traffic routes run from Heathrow Airport through Hounslow to central London: the Olympic Route Network and the Piccadilly Underground Line. The District Line also runs through a small section of Hounslow and is likely to see traffic increases. The Olympic Torch Relay will also travel directly through Hounslow for 7.4 miles. With the increased influx of visitors during the Games, potential hazards may affect more people, and emergency services will need to be prepared to handle the increased load.

In order to determine how the Olympics are going to impact the Borough of Hounslow, the government needs to gather data on the local infrastructure, how visitors during the Olympics affect the host city, and the projected changes in population and transportation across the borough during the Olympics. The International Olympic Committee (IOC) already provides some statistics on past Olympics, and the Olympic Delivery Authority (ODA) has published a comprehensive document depicting traffic predictions for the greater London area during the Olympics (ODA, 2009). Unfortunately, these London-wide predictions are not easily localized to a single borough since the infrastructure varies for each borough and the impacts change according to the proximity of the borough to the venues. The impacts for a borough like Hounslow are likely to be much different than that of the central London boroughs. This is due

to a difference in proximity to venues, number of tube stops, population density, and a number of other factors.

The purpose of this project was to generate a quantitative representation of what Hounslow could look like during the 2012 Olympics Games. This required identifying potential impacts on residents, visitors, businesses, infrastructure, and transportation. Once we had identified the impacts, we attempted to quantify as many of them as possible. The end goal of this information was to highlight significant changes that could occur during the Olympics in order to assist the London Borough of Hounslow's planning efforts.

We generated our quantitative representation of the borough by drawing a mind map of all the potential aspects of the borough that could be affected during the 2012 Olympics. For each area we identified, we drew up a number of potential impacts. We attempted to quantify each of these impacts. In many cases this was a matter of finding data published by reputable sources like the Olympic Delivery Authority, and adjusting them for Hounslow. However, some data, like population increases, required some primary data collection from local hotels.

Our results highlighted a couple of key areas that will be heavily impacted by the Olympics. First, we determined that there could be up to a 15% increase in the population of the borough. Secondly, we found that there will most likely be a 37% increase in rail ridership through the borough. We also found that there could be a 5% increase in accident and emergency (emergency room) visits during the games period. Lastly, we determined that there could be an additional 2,000 cars per day on the M4 Motorway through Hounslow. Using our resulting data, the London Borough of Hounslow will better be able to plan for the 2012 Olympic Games.

2 Background

On July 6, 2005 the International Olympic Committee (IOC) awarded London the rights to host the Games of the XXX Olympiad in 2012, winning over Paris in the final round of voting 54 to 50 (London Wins the Race for the Rings, 2004). The London Games are scheduled for July 27 through August 12. These dates were chosen to maximize attendance and minimize the stress on London's facilities.

2.1 Past Olympics

Each Olympic host city uses the Olympics as a catalyst to update and renovate infrastructure throughout the city. The last two host cities, Beijing in 2008 and Athens in 2004, improved their infrastructure and subsequently improved their quality of life and reduced air pollution. Sydney promoted the 2000 Olympics as the *Green Games*. The Sydney Organizing Committee for the Olympic Games put a lot of funding into making the Olympic Park and other aspects of the Games environmentally friendly. Sydney also promoted the Aboriginal population to improve their chances of winning a bid for the Olympics over Beijing. Barcelona 1992 & Tokyo 1964 used the Olympic Games as a catalyst for urban regeneration and renewal. Tokyo used the construction to renew the city and reintroduce it to the world after the Second World War. Barcelona used the Olympics to perform decades worth of infrastructure regeneration in the six or seven years prior to the Opening Ceremony. The sporting events were far out-shadowed by the massive infrastructure projects taking place to bring the city international recognition. Since then, Barcelona has become the model for cities using the Games to initiate costly urban development (Gold & Gold, 2007). London will be taking a similar approach by using the 2012 Olympics to improve the eastern boroughs of London.

There is some common ground between how all host cities prepare for the Olympics. First, a new stadium for Opening and Closing Ceremonies must be constructed for the Games. Second, almost every host city has had to either improve an airport, or build a new one. London may end up being the exception, since Heathrow is already a major international airport capable of handling the increased load. Despite this, measures will need to be taken in order to accommodate the sudden increase of visitors. This brings up a third issue that every host city

must address: transportation. The Olympics can cause severe strain on the transportation infrastructure of a city. Lastly, since September 11, 2001, every host city has increased security measures for the Games.

2.1.1 Transportation

The Olympics causes millions of additional people to use the transportation in the host city. Beijing expected an additional 4 million people to travel on the subway system a day (Reuters, 2008). Those visitors are concentrated along predictable routes between stadiums and residential housing areas. During the Athens Olympics the Athens 2004 Committee modeled pedestrian movements using three different software tools (Frantzeskakis & Frantzeskakis, 2006). These tools were EMME2, SATURN, and a specific tool developed for Athens. This special application software generated traffic flow based on event schedules, venue capacities, accommodation zones, and arrival and departure patterns. These models revealed problem areas in the transportation system, and they were able to develop a plan to prepare for the increase in number of people during the events. They overhauled public transportation in specific problem areas. They also posted signs to direct visitors along specific routes that were determined to be capable of handling the increased loads. The models identified problematic intersections, and new traffic lights were added along with new traffic control centers. One of the biggest improvements was the addition of Olympic lanes. These were special lanes that could only be used by athletes, officials, and buses headed to the Olympics. This allowed important people, and the Olympic Family, to reach their destinations on time. Athens also strictly controlled parking near the venues. Parking was reserved only for athletes and officials. This made it very impractical for visitors to drive to the venues, encouraging them to use public transportation. All of these changes played a role in creating a successful traffic control system in during the 2004 Olympics.

Sydney had about 1.5 million additional passengers per day riding its railway system during the Olympics compared to non-Olympic times. The railway system carried 80% of Olympic traffic during the Sydney Olympics (Jiang, 2008). London could easily have many more passengers, due to the fact that almost twice as many tickets were sold for 2012 (see Figure 2). Beijing wanted to take full advantage of its subway system to address the increased

transportation demand, so they increased the number of trains on many of the lines (Jiang, 2008). The maximum interval between trains on many lines was around two or three minutes during peak hours and five or six minutes during normal hours. Two of the lines serviced over 30,000 passengers per hour during peak hours. The workday passenger flow (WPF) and holiday passenger flow (HPF) was recorded during the Beijing Olympics and in the months leading up to the Games. WPF is the passenger flow during weekdays excluding holidays and HPF is the passenger flow during weekends and holidays. The total volume of the HPF is usually about 80% of the total volume of the WPF in Beijing. During the Olympics, WPF was 123% of what it was during non-Olympic weekdays. The lines leading to venues increased by over 25%, however many lines which did not lead to venues had almost no change in WPF. Some lines had lower WPF than normal, which was probably due to the reduced civil work during the Games. Holiday Passenger Flow was significantly affected by the Games. It increased by 42% overall during the Olympics and many Olympic lines had passenger flows greater than 160% the normal amount on weekends (Jiang, 2008). These numbers from Beijing and Sydney suggest that the London Underground will need to be prepared to handle over 1.5 million more passengers per day on lines passing near venues.

Past Olympics highlight potential risks that the London Olympics will face. First, weekends are a bigger concern than weekdays, since the Beijing Olympics suggest that there is going to be more traffic around the venues. This is most likely because local residents need to work on the weekdays, so they can only attend venue events on the weekends or holidays (Jiang, 2008). Second, the city center and tourist locations are not visited significantly more than before the Olympics; however, Olympic hotspots such as stadiums do affect traffic patterns during the Olympics (Jiang, 2008). This is especially true on weekends, where Beijing recorded over 60% more traffic on lines leading to venues during an Olympic weekend than on non-Olympic weekends. This concentrated stress will cause the most impact on the lines and could increase some potential risk due to the increase impact it would have.

2.1.2 Security

Addressing Traffic issues are not the only concern for the host city when preparing for the Olympics. Due to the increased number of people at the Olympics, security becomes a top priority. Since the attacks on September 11, security spending at the Games has increased by a factor of ten (Gold & Gold, 2007) (see Figure 1). According to Ford's *Olympic Security* report, the United States was heavily incorporated into the development and implementation of security plans for the Athens 2004 Games (Ford, 2008). Following the terrorist attack in 2001, many governments and organizations believed the Olympics would be a probable target for future attacks. To protect against these threats, Greece asked for assistance from many countries, including Australia, France, and the United Kingdom (Ford, 2008). With this assistance, the remaining security gaps were resolved, however, this cost Greece an additional billion US dollars (Ford, 2008). Working to increase transportation and security are just a couple of the many factors a host city must do to place a successful bid.

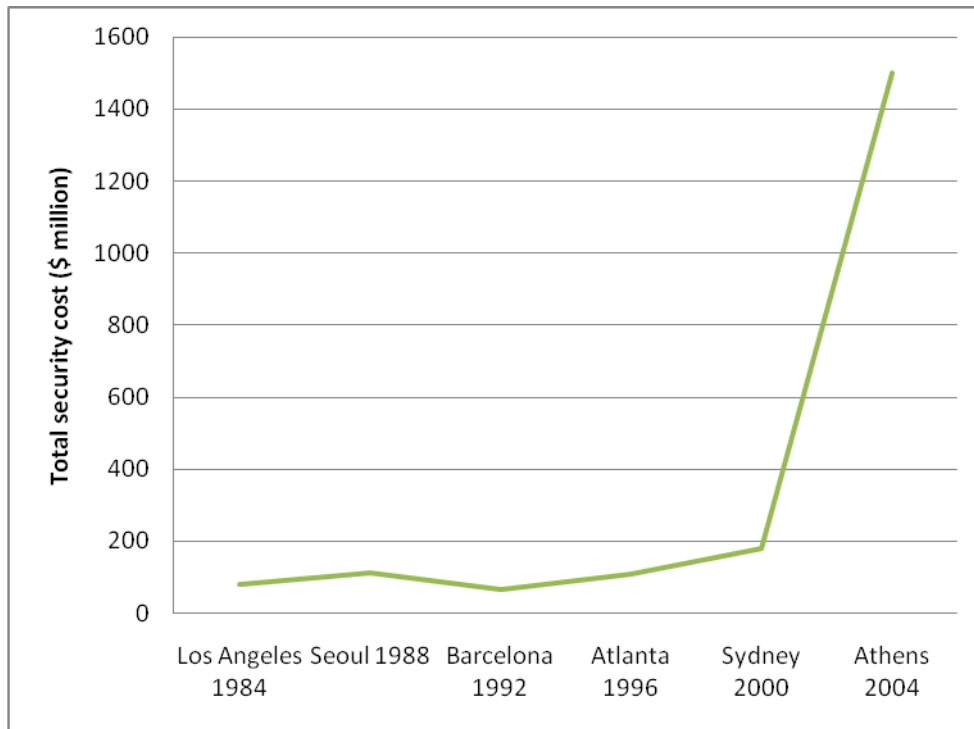


Figure 1: Security costs of Olympic Games, 1984-2004 (Data from: Gold & Gold p.146)

2.1.3 Housing

The Olympic Games usually require more housing than the host city can provide, causing new hotels to be built to meet the expected increase in demand. For the Beijing Olympics, the city built 100 new hotels and performed renovations on hundreds of other hotels. This would be an increase from 109,000 hotel rooms in 2006 to 130,000 rooms by the Olympics in 2008 (Xinhuanet, 2006). These improvements handled the Olympic visitors, but during the depression in the years after the Olympics, tourism went down. The hotels were forced to lower their prices to attract business (The Great Wall Adventure Club, 2006 & Drescher, 2009). In contrast, the Athens Olympics caused tourism to increase; however, the hotel rates are still low. This means Athens is not getting as much tourism income as it could (Ikkos, 2008). Therefore, the price of hotels in London after the Olympics will probably be lower compared to current prices if the city is performing construction similar to Beijing and Athens.

2.1.4 Attendance

By looking at past Summer Olympics ticket sales and the increased number of reporters attending the Olympics, we can see that the popularity of the Olympics is increasing. Figure 2 shows the ticket sales for the last four Summer Olympics. The number of tickets available directly correlates to effects on hotels, transportation and other infrastructure through the host city. With 2 million more tickets being sold for the 2012 Olympics London can expect a much larger increase in visitors than the previous 2008 Beijing Olympics.

Ticket sales and volunteer numbers from past Olympics provide a useful index for judging the scale of the impact. The Sydney Olympics sold 6.7 million tickets and attracted approximately 47,000 volunteers, while the Athens Olympics sold 5.3 million tickets and attracted approximately 45,000 volunteers and the Beijing Olympics sold 7 million tickets and needed 70,000 volunteers to be able to run The Games (International Olympic Committee 2009, Bernhardt, 2006 & China Daily, 2006). Figure 2 provides a visual comparison of the projected size of the 2012 Games to past Summer Olympics. Based on these numbers, it would make sense that the London Olympics will be slightly larger than the past few, since London is planning to sell over 9 million tickets and has about twice as many reporters as Beijing (International Olympic Committee, 2009).

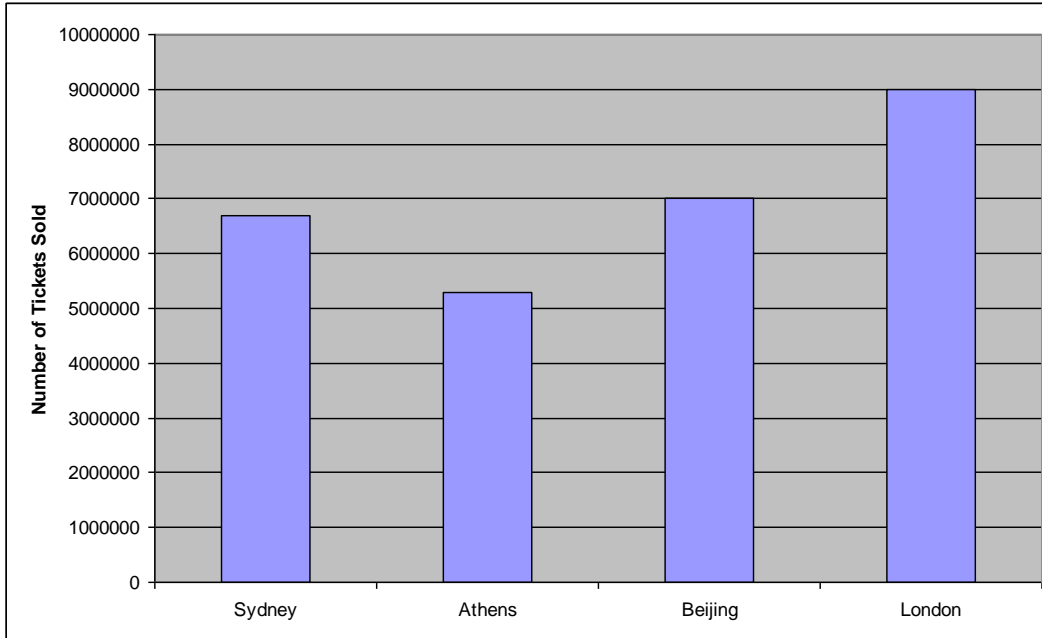


Figure 2: Sizes of Summer Olympics 2000 - 2012

2.2 London's Preparation

Beijing held the most expensive Summer Olympics to date, costing over \$60 billion. The original budget put forth in the London bid was less than £3 billion (about \$4.86 billion). In the same budget, they projected large profits from hosting the Olympics (see Figure 3). The original budget projection seemed low at the time compared to previous Olympic Games (see Figure 4). In 2007, the original budget was re-

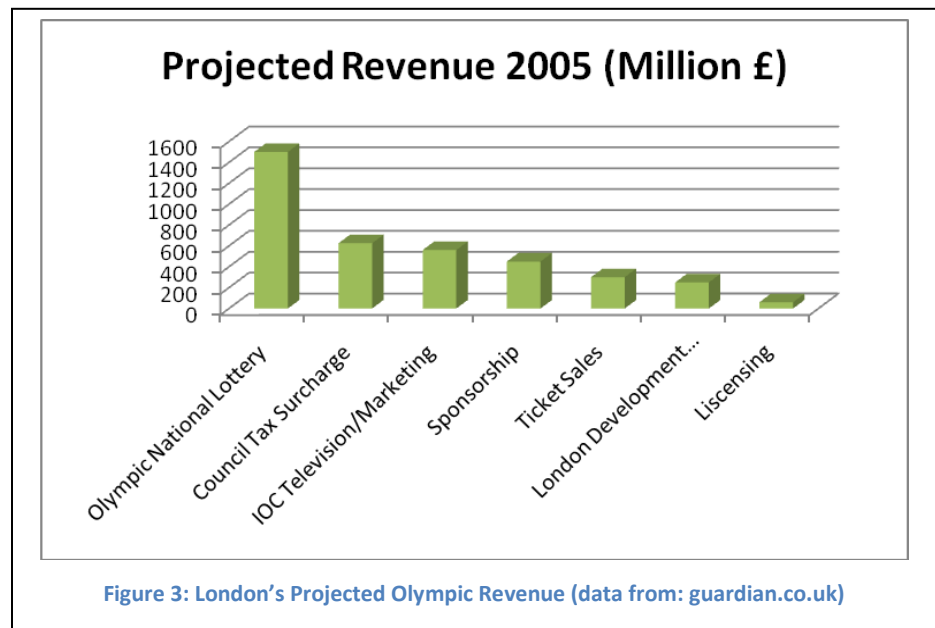
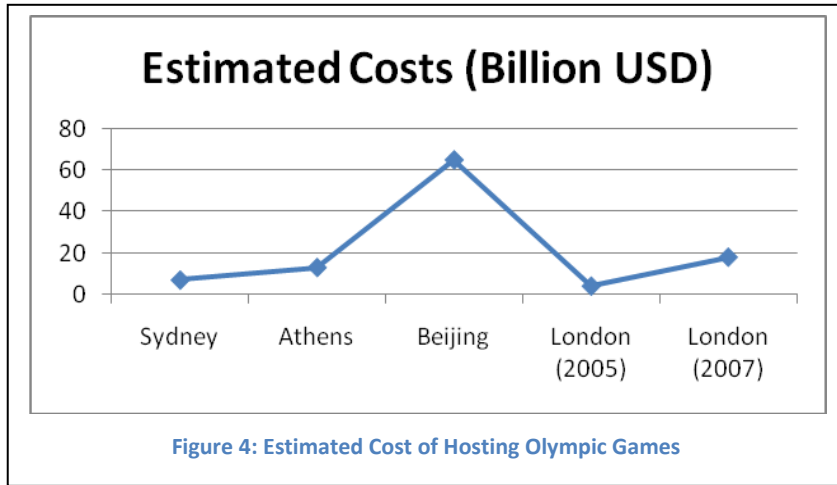


Figure 3: London's Projected Olympic Revenue (data from: guardian.co.uk)

analyzed and discovered to be a quarter of what was necessary to run the Olympics. As of February 2011, the budget remains at £9.3 billion (about \$15.06 billion) with an expected final cost of £7.3 billion (2012 London Olympics 'still on budget', 2011).

London's host candidacy bid included a venue layout plan for the Games. There will be 33 competition venues, and 15 of them already exist. The London Bid proposed that the large majority of events would be held in one of three main zones: the Olympic Park, the Central Cluster, and the River Cluster (see Figure 5) (London Wins the Race for the Rings, 2004). The



Olympic Park is projected to be the most popular area due to the number of venues located there. It is the home of the Olympic Stadium, where the Opening and Closing Ceremonies of the Games will be held. The Olympic Park zone will also

hold venues for 13 different sporting events along with the Olympic Village (London Wins the Race for the Rings, 2004). The Australian construction company Lend Lease Corp LTD is building the £5.3 billion (about \$8.56 billion) Olympic Village. It consists of 4,200 residential buildings, which will provide beds to over 17,000 athletes and officials who are part of the 'Olympic Family'. The Olympic Village provides most athletes with the convenience of being within fifteen minutes of their respective venues (Cummins, 2007).

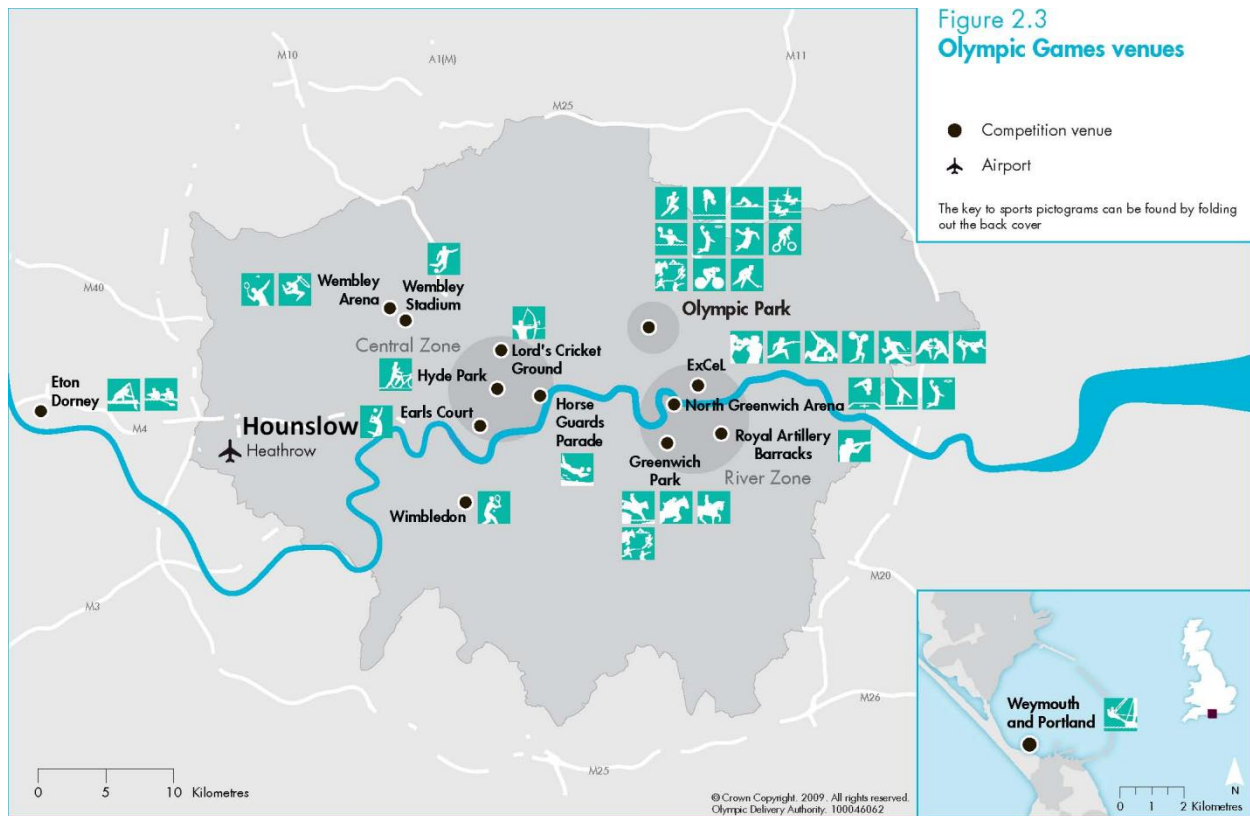


Figure 5: Map of Olympic Venues (london2012.com)

2.3 Construction

In preparation for the Olympic Games, the city of London will have to construct a large number of infrastructure improvements and sporting arenas to host all of the Olympic events, as well as house, feed, transport and protect members of the Olympic Family, which include athletes, coaches, media, and officials. The Government Olympic Executive (GOE) has listed 10 major ‘milestones’ which will give an accurate guideline of the progress that needs to take place in order for the Olympic Games to proceed on schedule. These milestones consist of constructing the Olympic Stadium, Aquatic Centre, Velodrome, International Broadcast Centre/Main Press Centre (IBC/MPC), Handball and Basketball arenas, Lee Valley White Water Centre, Eton Manor and Royal Artillery Barracks, Olympic Village, and all permanent bridges (GOE, 2011, p. 7-12). There will also be weekly closures on the London Underground to renovate lines to ensure safety and increased efficiency to and from event venues. At this point, most of these milestones have been met. Almost all construction in London is focused on the Olympics. Even construction on London Heathrow Airport, which was scheduled before the

Olympic Bid took place, has stopped to allocate more effort into improving infrastructure more directly related to the Olympics including but not limited to event venues and athlete housing during the Games.

2.4 Transportation

The 2012 Olympic Games will bring many people into the Inner City of London, and it is up to London and its boroughs to give proper access to the people who wish to come and enjoy the games. It is estimated by the Olympic Delivery Authority that “33% [of spectators] are expected to come from the Greater London,” (ODA, 2009, p. 49). This would mean that about 67% of people would be traveling from outside the inner city of London, and “It is proposed that comprehensive train services for the majority of spectators from these London, suburban and outer suburban areas will be provided,” (ODA, 2009, p.49). Needless to say transportation is a major concern for London and its respective boroughs, as well as surrounding towns.

2.4.1 Rail Services

Rail services will be leading the transportation movement to prepare for the 2012 Games. Transport for London, which runs both The London Underground and Docklands Light Railway (DLR), will be mostly responsible for the rail services during the 2012 Olympic Games. Since 2004 all train operation companies (TOC’s) with franchise agreements are expected to cooperate with Service Delivery Plans for the Olympic Games, (ODA, 2009, p.52). To collaborate with the Service Delivery Plans for the Olympics Games, the LU and the DLR had to abide by the rules and prices reductions set out by London (ODA, 2009, p.53).

Many boroughs have already started planning with the ODA for the 2012 Olympics, by increasing the amount of trains that pass during any given hour on key lines during peak operating hours, by doing this they can better compensate for the increased pedestrian traffic to places like Olympic Park, River Zone, and Central Zone (ODA, 2009, p. 56). The pedestrian traffic to these specific areas is predicted to reach near a million visitors in a single day, see Figure 6 (ODA, 2009, p. 41).

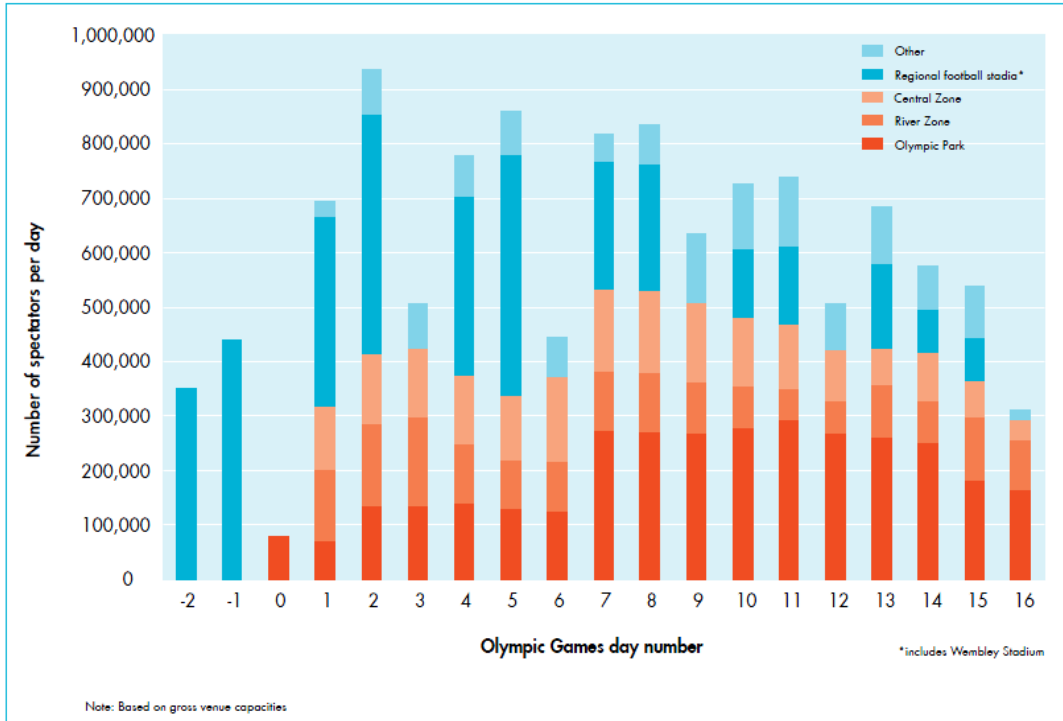


Figure 6: Estimated Spectators per day (ODA, 2009, p. 41)

Using this information the ODA has been able to calculate what capacity the rail systems need to be able to accommodate for when the Olympics begin. For example on day 7 of the Olympic Games there will be approximately 250,000 people who travel in and out of Olympic Park as shown in Figure 7 (ODA, 2009, p.41). To accommodate for this mass amount of people all four main rail systems, DLR, LU, Javelin, and National Rail have increased their train frequency. This will allow for more trains both in and out of Olympic Park to keep pedestrian traffic moving, and keep waiting times down (ODA, 2009, p.65).

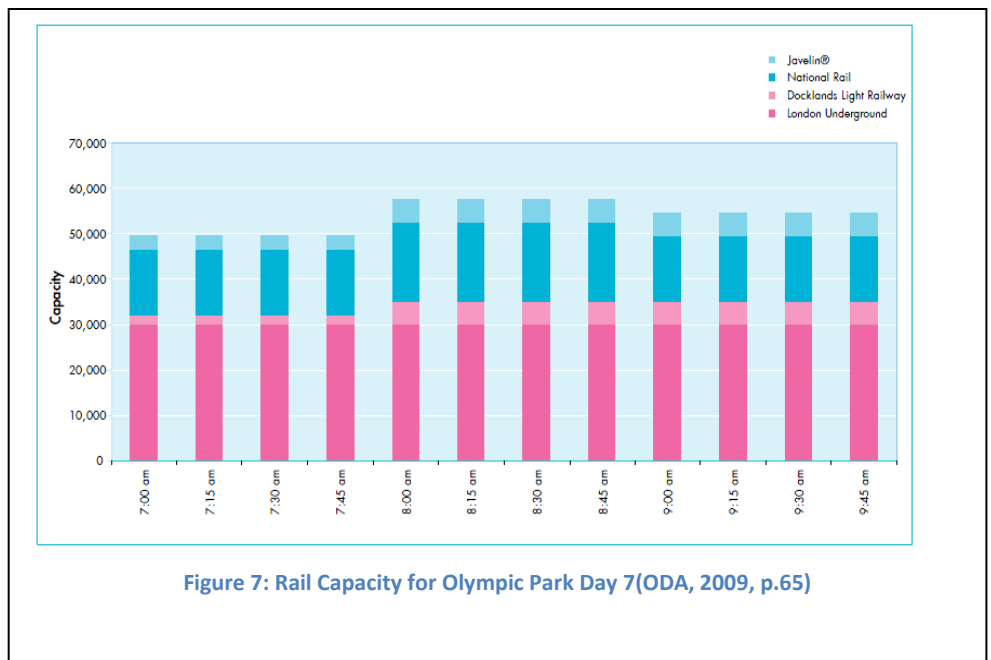


Figure 7: Rail Capacity for Olympic Park Day 7 (ODA, 2009, p.65)

2.4.2 Road

Transportation by road will also be a key factor that the ODA must acknowledge. To do this, the ODA will have to create a successful Olympic Route Network (ORN) to transport the Olympic Family around London (ODA, 2009, p. 36). Having a well organized ORN will also allow for the local bus network, taxi service, and pedestrian traffic to run smoothly. This will ensure a minimal amount of disturbance to the citizens of London as they go about their everyday routine. To keep many of the citizens happy and to minimize impact on London streets the ODA has already started to implement measures such as creating signage for what will be on the ORN, improving certain junctions, creating 'Games Lanes', and improving traffic signal technology to improve the flow of traffic on all streets.

The local bus network will also need to be enhanced to accommodate the increased pedestrian traffic flow to and from the games (ODA, 2009, p.71). There will be times when public transportation will not meet the needs of the public. To counteract this, Taxis and privately licensed vehicles will be able to provide the level of service required. "London has a pool of 25,000 licensed taxi drivers, and 22,000 licensed taxis, all of which are wheelchair accessible. London also has around 47,000 private hire vehicles and drivers. Some 161 million trips are made by either taxi or private hire vehicles in London per year," (ODA, 2009, p.71).

Even though Hounslow is not a major contributor to the traffic to the Olympic Games, it does service a major route to most of the Olympic Zones, and has a major road that services other events outside of the Greater London Area. The ODA has already planned a route and an alternative route to get to and from the Olympic events in the case of an emergency or a major traffic delay As Figure 8 shows, one of the main Olympic routes, the M4 Motorway, goes from London Heathrow Airport through Hounslow and into the inner city of London. The purple roads are the Olympic Route Network, and the red roads are the Alternative Olympic Route Network. With the addition of 'Olympic Lanes' and smarter traffic lights, we can see that the ODA is well prepared for the crowds ahead.

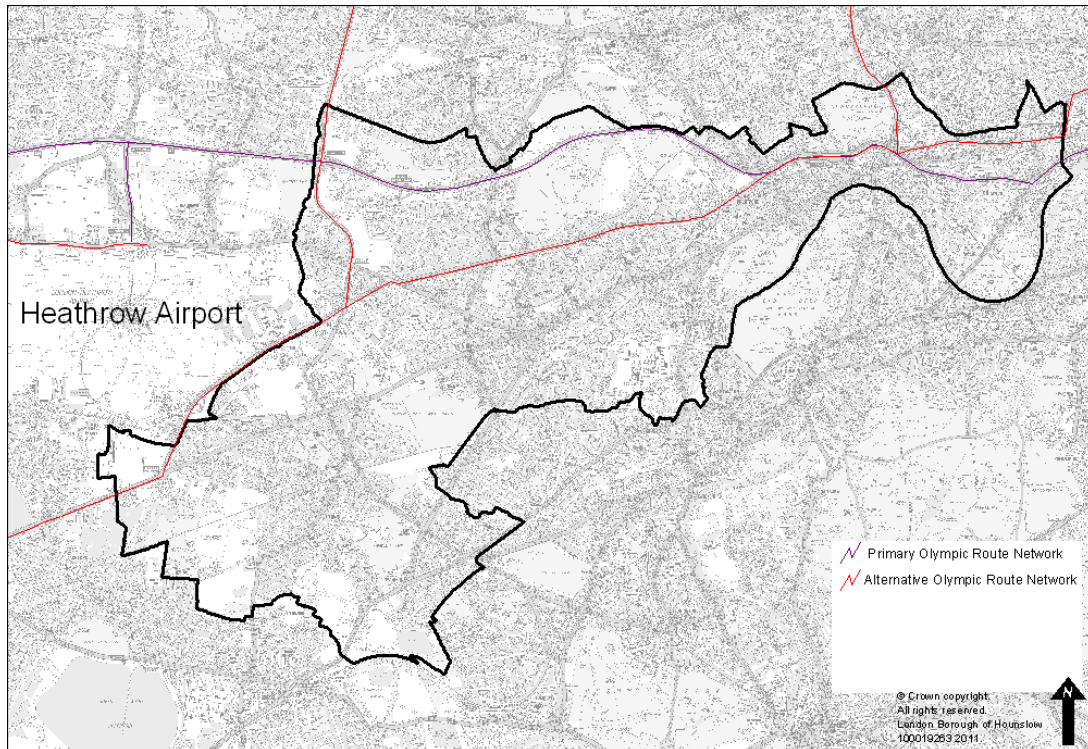


Figure 8: The Olympic Route Network

2.4.3 Transportation in Hounslow

Transportation in Hounslow is very different from the inner London boroughs. In the Greater London, roughly 36% of people drive to work by car, while in Hounslow about 54% drive to work by car (London Borough of Hounslow, 2006). A very small percentage of people living in Hounslow use the Underground or other rail systems to get to work. Of the roughly 163,000 people who commute to work in the Hounslow Borough, only about 6,200 uses the Underground, light rail, tram, or metro, and about 9,750 take the bus. The Borough of Hounslow has been working with its citizens to create better transportation for the borough, not just for the 2012 Olympics, but for everyday use as well. As seen in the Hounslow Council's *Local Implementation Plan*, the borough is working to decrease wait times for buses and the Underground, and assess other concerns as well. "The Council is keen to ensure that all residents are able to get around the borough easily by their chosen method of transport, whilst also helping make sure we address our environmental commitments," says Cllr Corinna Smart, lead member of environment for the Hounslow Council (London Borough of Hounslow, 2011).

Although the Borough of Hounslow is not a host borough, it has a role to play during the Olympics. The large number of people traveling through Hounslow will dramatically change current estimates for contingency planning. Contingency planning is essential to ensuring that the borough runs smoothly. The Olympics introduce a large variable into the assessment. Understanding exactly what the Olympics will bring and how it will affect contingency plans is a major goal of the borough over the next year.

2.5 Boroughs Hosting Events

There are five boroughs hosting venues for the Olympics. These five host boroughs are: Greenwich, Hackney, Newham, Tower Hamlets, and Waltham Forest (London 2012.). Each of these boroughs has laid out an extensive plan detailing how they intend to prepare for and benefit from the 2012 Olympic Games in London. The Olympic Delivery Authority (ODA) is overseeing the infrastructure being implemented in each borough. The ODA is responsible for venue construction as well as new roads and bridges to accommodate the influx of people during the 2012 Games (ODA, 2009). This takes the burden off the host boroughs, leaving them free to concentrate on different kinds of preparation. Many of the boroughs are concentrating on how they can benefit from the Olympics. For example, most boroughs are implementing programs to help their residents receive employment in either construction or the running of the Games. Some boroughs are using the Games as a catalyst to promote development of poverty-stricken neighborhoods. Each of the five host boroughs has a specific plan in place to ensure they receive the most benefit from the Olympic Games in 2012. The detail of each borough's preparation for the 2012 Olympics is outlined in Table 1.

Borough	Incentive programs for citizens to get involved.	Revamping public transportation.	Recruitment center to help citizens find employment in the Olympics.	Skills training for citizens seeking jobs.	Notes:
Greenwich	X				Formed Greenwich Olympic and Paralympic Unit to coordinate efforts.
Hackney		X	X	X	Overhauling North London line of the Underground
Newham	X		X		Inspiring People program to ensure maximum cultural impact.
Tower Hamlets			X	X	High Street 2012 program to overhaul High Street for the Olympic marathon route.
Waltham Forest	X		X	X	Olympic Neighborhood Initiative to allow residents to rent out housing to Olympic visitors.

Table 1: London Boroughs' Preparation
 (Data from: greenwich.gov.uk, hackney.gov.uk,
newham.gov.uk, walthamforest.gov.uk/, towerhamlets.gov.uk)

2.6 Risk Assessment

The influx of millions of people into London will drastically change the impact of many potential incidents. The Hounslow Council is unsure which incidents will be most affected by the increase in visitors. In order to analyze how the risk will change, it is important to perform a risk assessment. Risk assessment is the determination of the qualitative and quantitative impacts of any identifiable risk. Risk is generally assessed on two dimensions: magnitude of loss and probability of occurrence. One way of characterizing information related to risk assessment is through a risk matrix. Magnitude of loss is plotted on one dimension, and probability of occurrence is plotted on the other. Magnitude of loss can generally range from negligible to catastrophic. Likewise, probability of occurrence can range from rare to certain. Different hazards can then be placed in each of the boxes based on data collected and previous

analysis. Once all of the hazards have been accounted for, they are assigned risk based on which box they were placed in. For example, something placed in the box corresponding to catastrophic loss and very likely occurrence would be labeled as a critical risk. Similarly, something in the box corresponding to negligible loss and rare likelihood of occurrence would be a very low risk. These assessments of risk are generally color-coded and correspond to a value on a risk index. (McTerman, Johnson, Staniewska, 2007) The risk index quantifies the results and allows them to be more easily analyzed. The risk matrix used by the London Borough of Hounslow can be seen in Figure 9. For example HL9 correlates to an aviation accident which is said to cause up to 50 fatalities and 250 casualties. HL9 has a medium to low likelihood and a moderate impact, therefore there is a high risk assigned to it.

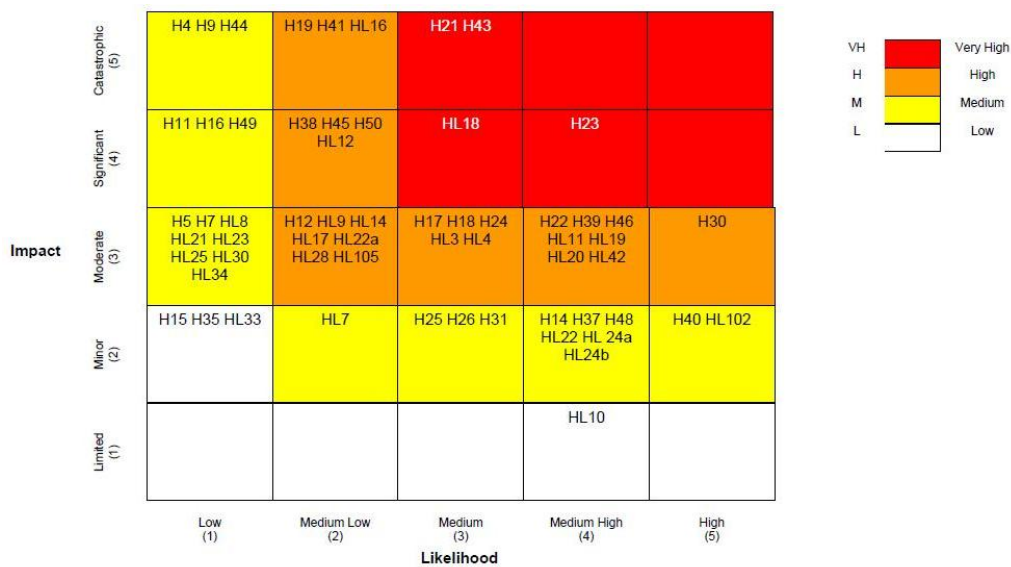


Figure 9: Risk matrix used by the Borough of Hounslow. Each code represents a hazard.

Once the risk has been identified and assessed, a risk management plan is drawn up describing what action must be taken in case the incident takes place. There are four main categories of action to be taken to deal with each identified risk. The first action is to simply accept the risk. This means that no action will be taken concerning the risk. This is generally done when the hazard was determined to be fairly low risk index, and is not worth the additional expenditure to deal with it. The second main category of action is to reduce the likelihood of the event happening. This is generally ideal, but it is not always viable or apparent how to reduce the likelihood of an event occurring. The third category is to mitigate the risk.

This means that steps will be undertaken to minimize the impact of the event should it occur. Mitigation is generally chosen when it is not possible to reduce the likelihood of an event. The final category is transference of risk. This involves passing the risk management or mitigation on to third parties which lessens the load on Local Authorities. It is possible that any hazard may have multiple categories of action applied to them. It is likely that a very large risk may have steps undertaken to both avoid and mitigate the risk. The actions for each identified hazard are drawn up into a risk management plan along with risk matrices and an explanation of how each action will be carried out.

3 Methodology

Our approach to data collection and analysis can be divided into three main sections. First, we developed projections of increase in population and transportation during the Olympics. Analyzing the borough on a number of social and economic issues, we determined how the new appearance of the borough would affect the council's ability to perform its services. Lastly, once we had completed our analysis, we created visual representations of our analysis. It was essential that our information was clear both to the London Borough of Hounslow and any other boroughs that may be interested in replicating our efforts.

Throughout this section we refer to many of the estimates we made in terms of *expected* and *worst-case* numbers. For most of our numbers we tried to use expected estimates that portray what will most likely be the case during the Olympics. However, in some situations it was difficult or impossible to develop an expected number. In these situations, we estimated the worst-case number. It is likely that the actual numbers will be much lower, but a better estimate was not possible. The worst-case scenario estimate is still useful for planners who want to make sure they are prepared for a potential situation. Although there would ideally be expected and worst-case scenario numbers for each of our estimates, this was not possible given the availability of data.

3.1 Hounslow During the Olympics

The London Borough of Hounslow is particularly interested in how the borough will change during the 2012 Olympic Games. We focused our research on how the population will change and how transportation traffic will increase. We focused on these two areas because we believed population increase and transportation will have the greatest impact on Hounslow during the Olympics. For population change, we estimated the increase of people staying in hotels and residents informally letting out their homes. The sources of additional traffic were due to the Olympic Route Network passing through Hounslow, increased London Underground traffic, and additional flights at Heathrow airport. By determining a number for all of these increases, we are able to create geographical representations of Hounslow during the 2012 Olympic Games.

3.1.1 Representation of the Borough

Many aspects of the borough of Hounslow will be impacted during the Olympics. In order to plan for the impact, we created a list with five major categories: infrastructure, transportation, visitors, residents, and business. For example, we categorized residents into disabled and elderly, children, healthy adults, and ethnic concentrations. We broke down the largest areas, such as residents and public health, to make them easier to work with. We then made a mind map of the borough. For each end point, we listed all of the potential impacts for that area. For a complete breakdown of each point and the potential impacts see Appendix H: Mind Map Completed Categories. We did not attempt to quantify the impacts at this stage but simply identified all of the problems that could arise in that area. For example, workers in Hounslow have four potential impacts: a slower commute, restrictions from human resources, problems finding parking, and a possible change in work hours. We used the problems that we had identified to guide our future research on how each area would be affected during the Olympics. Our research will include answering the following four questions:

- What is the base line?
- What are the problems?
- What is the background of the problems?
- How can we quantify the problem?

3.1.2 Lodgings

A major source of population increase in Hounslow during the Olympics will be due to people staying in hotels. For this project we refer to lodgings as hotels, bed and breakfasts, and guest houses. The first step was to identify all of the lodgings in Hounslow and in the area immediately surrounding Heathrow Airport. Google Maps allowed us to build a list of all lodgings in the area. We then used our list to search on Google.com and Booking.com to find addresses, contact information, and the number of rooms in each lodging.

According to our research, there are approximately 50 lodgings in Hounslow and the Heathrow area. Parallel to the assumption made by the London Resilience Team (London Resilience Team, 2010)(see section 3.2.1), we assumed that all lodgings will be filled. By

determining the maximum occupancy of each lodging, we were able to find the number of people who could be staying in lodgings in Hounslow and surrounding Heathrow Airport. Next, using our list of contact information, we emailed each lodging and asked how many guests they were able to accommodate. We also called hotels that did not provide email addresses or did not respond to our emails.

Because some lodgings did not respond to our emails or phone calls, we estimated the occupancy of the other lodgings using the responses we received. Using the data from the lodgings who had responded, we estimated the number of guests per room at each lodging with the following equation:

$$\textit{Guests per Room} = \frac{\textit{Maximum Occupancy}}{\textit{Number of Rooms}}$$

We then split all the information that we collected into 3 groups: B&Bs and guest houses, small hotels, and large hotels. We classified B&Bs and guest houses as lodgings with a maximum occupancy under fifty people, small hotels between fifty and two hundred fifty, and large hotels with a maximum occupancy of over two hundred fifty people. Using the responses we received from all three respective groups, we averaged the number of guests per room for each individual category. For example, small hotels could have an average of 2.3 guests per room and large hotels could have an average of 2.5 guests per room. We used these numbers to calculate the occupancy of the remaining lodgings using the number of rooms for each lodging we had online.

3.1.3 London Heathrow Airport

One of the largest effects on traffic through and into Hounslow will be the increase in passenger arrivals at London Heathrow International Airport (LHR). Since Heathrow is near maximum runway capacity the number of planes landing at Heathrow cannot increase, but the size and passenger capacity of planes can increase. Heathrow's proximity to Hounslow (see Figure 10) makes it a likely source of population increase and transportation increase both on the Tube and the M4.

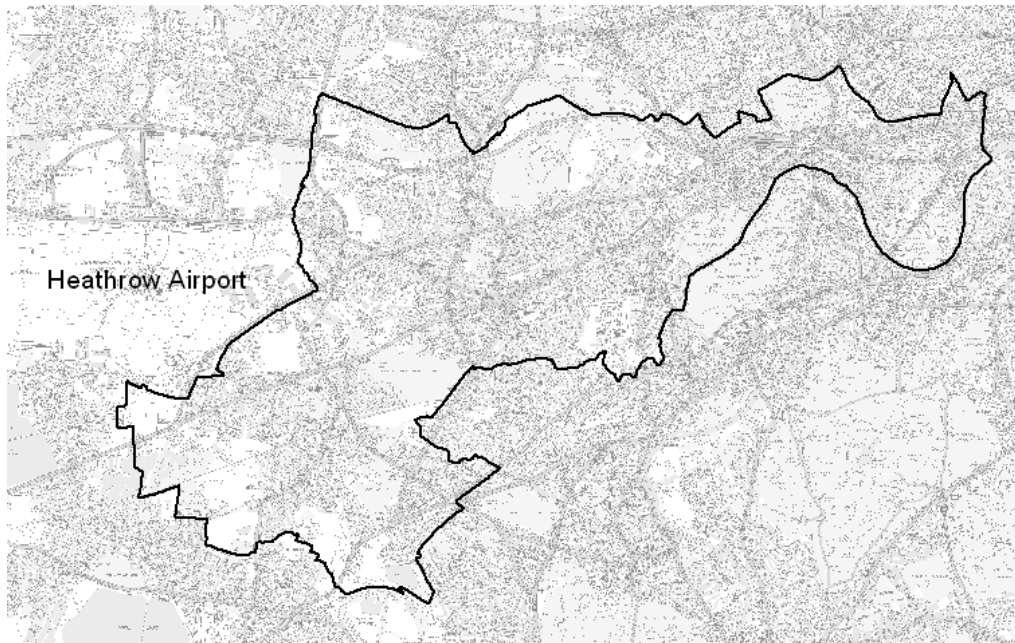


Figure 10: Map of Hounslow in relation to Heathrow Airport

The Department for Transport has published an article giving a prediction on the increase in passengers that will be traveling into Heathrow for each day during the Olympics (Department for Transport, 2010). Using this information, we calculated the number of additional people that will be traveling through and staying in the borough. We subtracted the number of passengers expected to arrive/depart on a given date not associated with the Olympics and this gave us the increase in people traveling into LHR for each day during the Olympics. At this point there is not data regarding the expected impact Heathrow will have so we estimated the worst-case scenario and assumed that all the additional people that land in Heathrow will be traveling through Hounslow. This gave us an increase in traffic on the M4 and the London Underground.

3.1.4 Informal Letting

Another major source of population increase during the 2012 Olympics will be due to people letting out the extra rooms in their residences. Much of this letting that occurs is illegal or not reported. This type of letting is not officially recorded in any way, but could potentially contribute to the population increase.

Initial research found few properties listed online. People may have taken down listings that have already been filled, and there may be many that have yet to be posted. As a result,

the techniques we used for hotels could not be applied to informal lettings. Data from past events is also unavailable, so we were unable to use that approach. We looked for existing housing data to give us a worst-case scenario number.

The 2001 Census is a significant source of housing data, including the occupancy rating of households in Hounslow (see Table 2). The occupancy rating depicts how close a household is to its capacity. The Office for National Statistics determines how many rooms are needed to support a certain number of people and the occupancy depicts how many excess rooms it has. The number of rooms and number of occupants is counted for each household. For example, a household with two excess rooms would receive a score of 2, and a household that requires one more room would receive a score of -1. We added these numbers across the borough, and the resulting number indicates approximately how many open rooms are in Hounslow. We used this number to determine the maximum number of people that could be staying in the excess rooms in people’s homes during the 2012 Olympics.

Number of household with residents	83,994
Overcrowding Indicator	13,635
Table 2: 2001 Census housing data (statistics.gov.uk)	

3.1.5 Rail

Three major rail routes through Hounslow are the Piccadilly Line, the District Line, and the National Rail. All three lines provide residents and tourists with easy access London. The District Line only intersects a small portion of Hounslow, and will not account for a significant portion of tube traffic through the borough. Of particular interest to the Borough of Hounslow is the Piccadilly Line, which connects Heathrow Airport to Central London and runs directly through Hounslow (see Figure 11). The Piccadilly Line has four stops in Hounslow: Hounslow West, Hounslow Central, Hounslow East and Osterley, shown from left to right. The Piccadilly Line is one of the busiest lines in the Tube network, and will be a significant source of increased traffic during the 2012 Olympic Games.

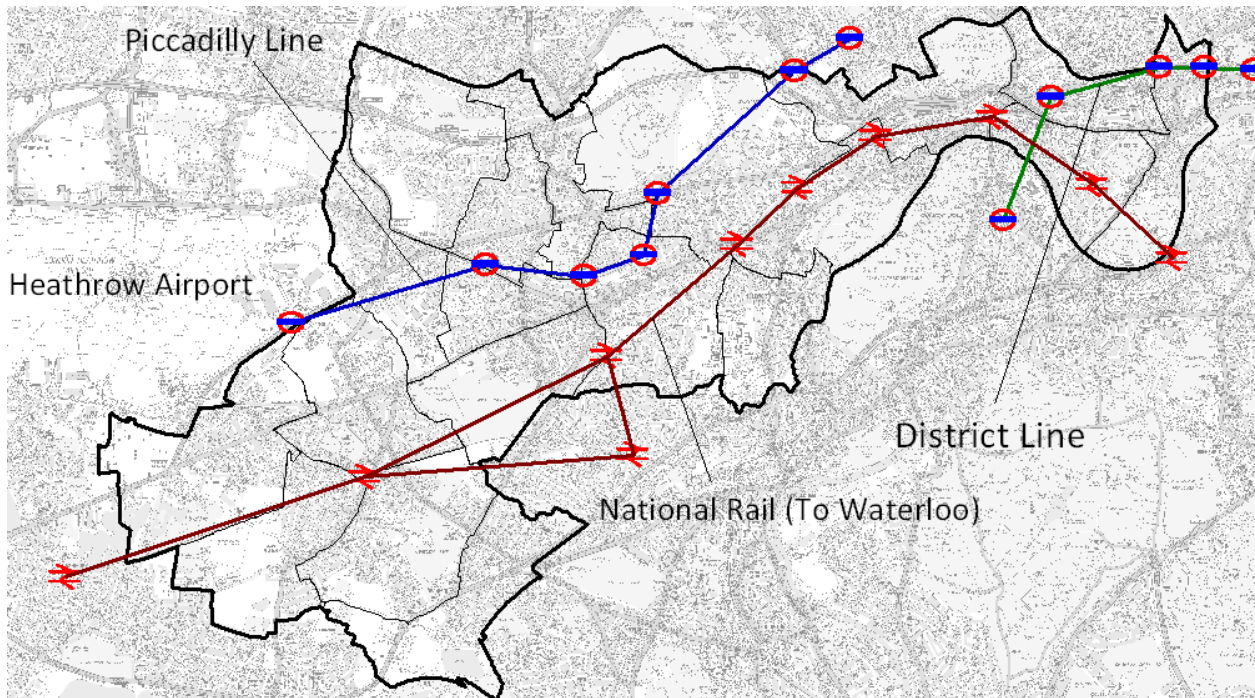


Figure 11: Tube and National Rail stops in and around Hounslow

Transport for London (TfL) is the government body responsible for managing the London Underground and collects large quantities of data about the entire transportation network. TfL has done a significant amount of research into the Olympics and how it will affect the London Underground; however, this data is not publicly available. TfL was unresponsive to our requests for these data, and we were required to make our own estimates based on currently available data.

Hounslow Central			
Annual entry and exit frequencies			
Entry weekday total:	6375	Exit weekday total:	6081
Entry weekday early:	587	Exit weekday early:	61
Entry weekday A.M. peak:	2332	Exit weekday A.M. peak:	999
Entry weekday inter peak:	1832	Exit weekday inter peak:	1443
Entry weekday P.M. peak:	1184	Exit weekday P.M. peak:	1784
Entry weekday evening:	440	Exit weekday evening:	1794
Entry Saturday total:	4162	Exit Saturday total:	3982
Entry Sunday total:	3187	Exit Sunday total:	3003
Total annual entry + exit (in millions) = 3.94			

Figure 12: TfL annual entry and exit tallies.

Transport for London publishes annual summary performance statistics online. Among these data are entry and exit tallies (EET) for each station in the Tube network (see Figure 12). Using data from the Olympic Delivery Authority concerning additional journeys on the Tube during the Olympics, we were able to scale up the number by calculating the percent of people

that take National Rail and the London Underground. Using this we were able to estimate how many additional people are expected at each station.

3.1.6 M4 Motorway and the Olympic Route Network

The M4 Motorway is a major road that connects Heathrow Airport to Central London. This road runs straight through Hounslow and the traffic increase along it will be a cause for concern to the Borough during the 2012 Olympics. Unfortunately the Department for Transport’s (DfT) estimates into possible increases during the 2012 Olympic Games on the M4 are not publicly available. Instead, we were required to use publicly available information. The Department for Transport maintains accurate traffic flow information for all major roads in the UK, including the M4 Motorway, in the form of Annual Average Daily Flow (AADF) (see Figure 13).

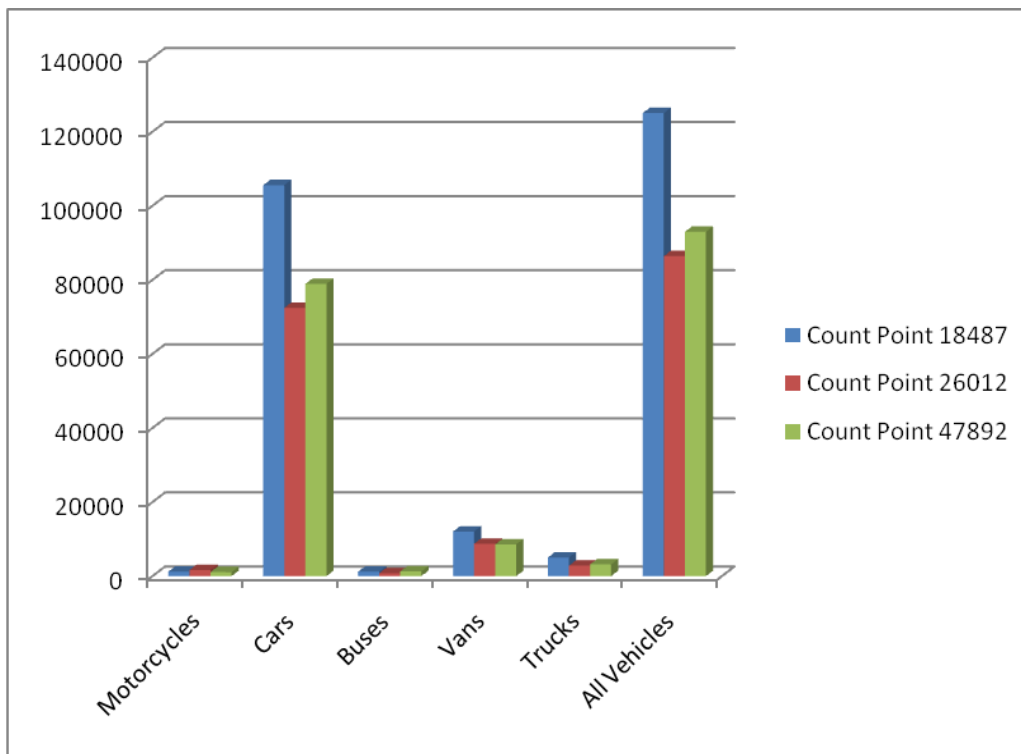


Figure 13: Annual Average Daily Flow of Traffic on M4 in Hounslow (dft.gov.uk/matrix)

All of this information is current traffic data and needed to be adjusted for the 2012 Olympics. We adjusted these numbers based off the projected Olympic Family passenger numbers during the Olympics. We used August 13th, the busiest day for air travel, to estimate

approximately how many people would be traveling from the airport into central London. We were unable to calculate the impact of spectators on the M4 Motorway arriving/departing at Heathrow due to a lack of data.

3.1.7 Other Impacts on Hounslow

There are many secondary impacts caused by the two primary impacts of an increased population and increased transportation. We used the mind map to guide our analysis of the minor impacts on the borough. We created a list of qualitative impacts that would impact each sub-category during the Olympics. We proceeded to quantify the impacts which would be relevant for emergency planners. Each sub-category was researched to determine what relevant data was available in each field. The 2001 Census proved to be a good resource for collecting detailed baseline data in some otherwise overlooked areas. We often found estimates for all of Greater London which had been performed by the Olympic Delivery Authority. We used the baseline data from the 2001 Census in conjunction with the estimates for all of greater London in order to create estimates for just Hounslow. When quantitative data for London 2012 was scarce, we used data from past Olympics and adjust it to fit London. We then localized those estimates to Hounslow using the technique above. Using these techniques, we were able to quantify many of the impacts that appear in the mind map. Some impacts were impossible to quantify using the data currently available, so we left the qualitative impact.

3.2 Impact on Hazards and Services

The London Borough of Hounslow provides a number of services during emergencies, many of which will be affected during the 2012 Olympic Games. Using planning assumptions from the London Resilience Team, as well as our collected data, we determined how the Olympic Games will affect the services that Hounslow provides. We also determined how the assumptions and data would affect the impact of hazards in the Community Risk Register.

3.2.1 Olympic Planning Assumptions

The London Resilience Team published a document with Olympic planning assumptions for Local Authorities in London (London Resilience, 2010). This is a restricted document and

cannot be directly quoted in this report for security reasons. However, the general theme of the document as well as its usefulness to our project can be discussed.

The document begins with a number of general planning assumptions about the Olympic Games. An example of this kind of assumption is that all hotels in the greater London area will be fully booked. We found this assumption especially helpful when performing our population estimates for the London Borough of Hounslow. The second part of the document is organized into specific hazards that could occur during the Olympic Games. For each hazard, certain assumptions are made outlining how many casualties could occur, and how emergency response could become more difficult during the Games. In addition to our collected transportation and population data, these planning assumptions were applied to Hounslow's emergency services and risk register to determine how emergency response might be affected during the Games.

3.2.2 The Major Emergency Plan

The London Borough of Hounslow Major Emergency Plan is a document outlining the roles of the borough during a major emergency. Each department has a set of roles and responsibilities. Some examples include: long term shelter for displaced people, social work and outreach programs for victims, distribution of critical information, and evacuation planning. Over one hundred different roles are listed in the Hounslow Major Emergency Plan. In order to determine how the Olympics will affect Hounslow's ability to provide services, we set up a system to cross-reference effects of the Olympics with the services that Hounslow provides. We called this system the assumptions versus services matrix.

3.2.3 The Community Risk Register

The West London Community Risk Register is a document published by the London Fire Brigade containing risk ratings for the most likely hazards to affect western London. The London Borough of Hounslow Contingency Planning Unit uses this document to plan for any hazards to the borough. An example hazard from this document can be seen in Figure 14. Much of the data and mapping being performed is for the purpose of determining how the Olympics will affect the hazards in this document. The Contingency Planning Unit is making the

assumption that the likelihood of each hazard will not significantly change, or will not change at all. However, they believe that in some cases the impact will significantly change. For each hazard, we modified the outcome descriptor to account for the estimated impacts. Many hazards have an estimated number of casualties, fatalities, and other affected people in the outcome descriptor. We modified that number of affected people based on how it would change due to the increases we found.

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
<i>INDUSTRIAL ACCIDENTS AND ENVIRONMENTAL POLLUTION</i>							
HL25	Industrial Accident & Environmental Pollution	Fire or explosion at a flammable gas terminal including LPG/LNG storage sites.	<p>Outcome Description Up to 1km around site, causing up to 50 fatalities and 150 casualties.</p> <p>Variation & Further Information Gas terminal event likely to be of short duration once feed lines are isolated, event at a storage site could last for days if the explosion damaged control equipments. Impact on environment, including widespread impact on air quality.</p>	Low (1)	Moderate (3)	Medium	LFB

Figure 14: Example entry from the West London Community Risk Register
(<http://www.london-fire.gov.uk>)

3.3 Presentation of Results

The final goal of our project is to convey our results to the Borough of Hounslow and the London Resilience Team. Using Geographic Information System software, we have been able to analyze our data and communicate it visually. We took our results and organized them so as to allow the Borough of Hounslow to understand the impacts of the Olympics. Finally, we generalized our methods to allow other boroughs to perform a similar analysis.

3.3.1 Geographic Information System

We used Geographic Information System (GIS) software to assist in analyzing and communicating our data. GIS can be used to layer spatial data over a map. An example of our use of GIS software is mapping of our lodging data. First, we used the map coordinates we gathered for each lodging and layered them on a map of Hounslow. Using our finalized occupancy data, we divided the lodgings into three categories and placed a corresponding colored dot on each location. This visually communicated which lodgings were small, medium, and large. Next, we added a map layer depicting Heathrow airport and local Tube stops. Using this map, we determined which Tube stop each lodging is closest to, giving us a number for

approximately how many additional people would be using each stop due to lodgings. We determined the additional population in each ward in Hounslow. Using the ward boundaries layer provided by the borough, we queried the total occupancy available in each ward and identified potential problem areas. Our resulting maps not only provide location-based analysis vital to our project, but also provide an illustration of our collected data.

3.3.2 Recommendations to the Borough of Hounslow

Our recommendations to the Borough of Hounslow needed to be specific and easy to convey. Our assumptions versus services matrix contains thousands of comparisons. While it contains a large amount of information, it difficult to read and much of it is irrelevant to each individual department. To facilitate communication, we divided the matrix by department.

The Contingency Planning Unit requires the most in-depth information, given their central role in emergency planning. We provided all of our raw data regarding population and traffic changes during the Olympics, as well as visual representations of the data in the form of graphs and maps. This provides potential for the Contingency Planning Unit to use our data for future planning, and continue any further analysis beyond the scope of our project.

3.3.3 Toolkit for Other Boroughs

In order to ensure that other London boroughs are able to perform thorough risk assessment and resilience planning for the 2012 Olympic Games, we generalized our data collection methods in the form of a toolkit that other boroughs can use for their assessments. It provides detailed instructions advising the user on how to collect and calculate data they can use to evaluate the risks the Olympics can have on them. The toolkit includes many of the spreadsheets and calculations we used to determine population and traffic estimates for Hounslow.

4 Results and Analysis

This chapter contains the results and analysis of our research and data collection. Sections 4.1 and 4.2 deal with population increase due to hotels and informal letting respectively. Section 4.4 describes the results of our research into passenger movements during the Olympics at London Heathrow International Airport. Next, we discuss traffic increases on the M4 and local rail in sections 4.5 and 4.6 respectively. The results of our analysis of which boroughs emergency services will be affected is described in Section 4.7. Next, we adjusted the West London Community Risk Register based on our estimates, and outlined the results in Section 4.8. Finally, our resulting urban planning mind map is discussed in Section 4.9.

4.1 Lodgings

We found that there are a total of fifty lodgings, which we defined as hotels, guest houses, and Bed and Breakfasts, in Hounslow and surrounding London Heathrow Airport. For each establishment, we found the number of rooms and the number of guests it could hold. Then we gathered the coordinates for each location based on Google Maps and the Great Britain Ordnance Survey (GBOS) coordinates system. The relative maximum occupancy for each hotel is displayed on Figure 15. Each circle represents a lodging where the Tube signs represent Tube stops. The darker the color represents a higher maximum occupancy. According to our estimates (see section 3.1.2), lodgings in Hounslow and near Heathrow should be able to accommodate 20,271 people. Table 3 shows four line of the data we collected as an example.

For each lodging we gathered how many rooms the establishment had as seen in the column titled 'Number of Rooms'. We then calculated the maximum capacity in the titled

Name	Number of Rooms	Max Occupancy
Channins Hounslow Hotel	50	102
Osterley Park Hotel	61	131
Best Western Chiswick Hotel	64	138
Travelodge Heathrow M4 Eastbound	66	142

Table 3: Example of Lodging Table

column 'Max Occupancy'. Most of these guests are concentrated around Heathrow Airport, with 79% of them located within a mile of the airport (see Appendix B). There are lodgings around the rest of the borough, but they are usually guest houses and B&Bs which we define as having

20 or fewer rooms. These smaller lodgings make up 26% of the establishments we looked at, but only account for 1.6% of the rooms.

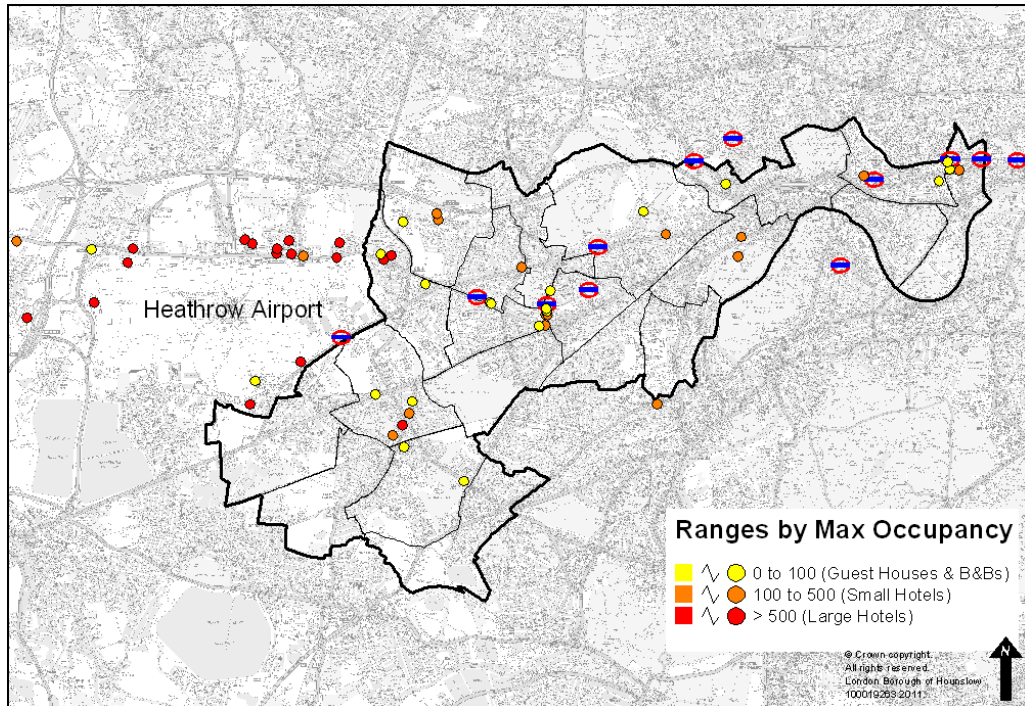


Figure 15: Geographical Distribution of Hotels, Guest Houses, and B&B's by Size

Summing the maximum occupancy of each lodging located in the Borough of Hounslow gave us a population increase of 5,244 people. This represents a 2% increase in the population of the borough over the population of 212,341 from the 2001 Census (2001 Census, 2006). The wards of Cranford and Feltham North will see the largest increase in population, with an 11% increase. In addition to Feltham North and Cranford, eight other wards are significantly impacted by guests staying in lodgings: Chiswick Homefields, Turnham Green, Osterley and Spring Grove, Hounslow Central, Hounslow West, Syon, Heston West, and Heston Central (see Appendix C). All of the listed wards will have at least a 1% increase in population from full lodgings.

4.2 Informal Lettings

The 2001 Census states that Hounslow has an overcrowding indicator total of 13,635. This corresponds to the number of open rooms in the borough. Based on the Office for National

Statistics' definitions, there would be up to two people staying in each room. Therefore, to get a worst-case scenario estimate, we assumed that every open room in the borough would have two people staying in it. The total population increase due to informal lettings is 27,270 or 12.84% over the population of Hounslow as given by the 2001 Census. We distributed this across the wards using information provided by the 2001 Census, displayed in Figure 16 and Figure 17. Figure 16 shows the population of Hounslow broken up by ward in the 2001 Census, and Figure 17 shows the increase in population due to potential informal subletting space available in the borough as reported in the 2001 Census.

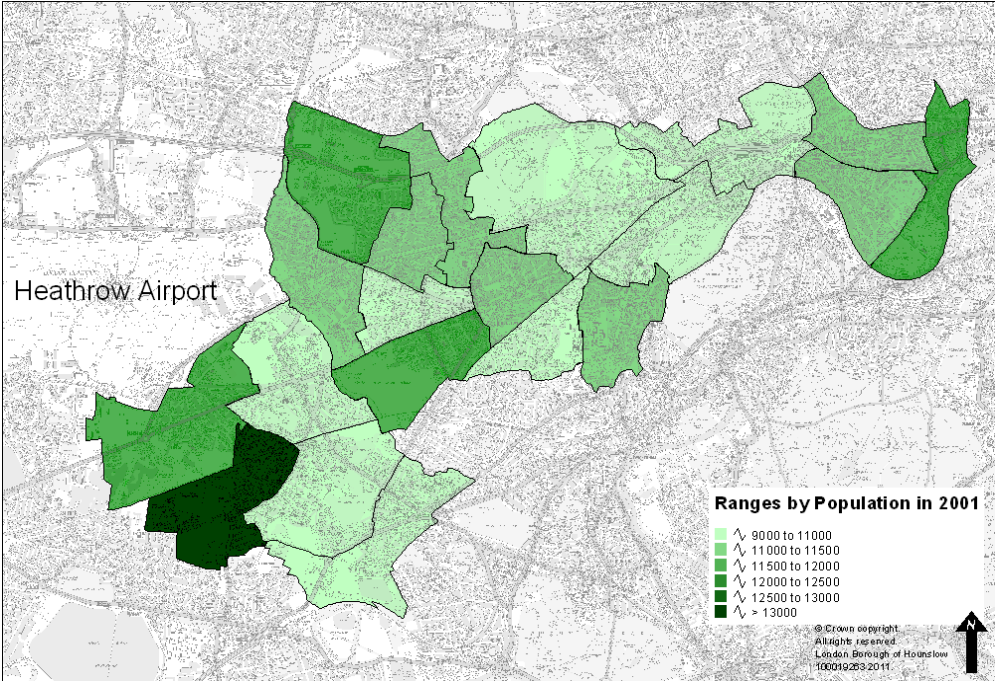


Figure 16: Ward Population from 2001 (Census 2001)

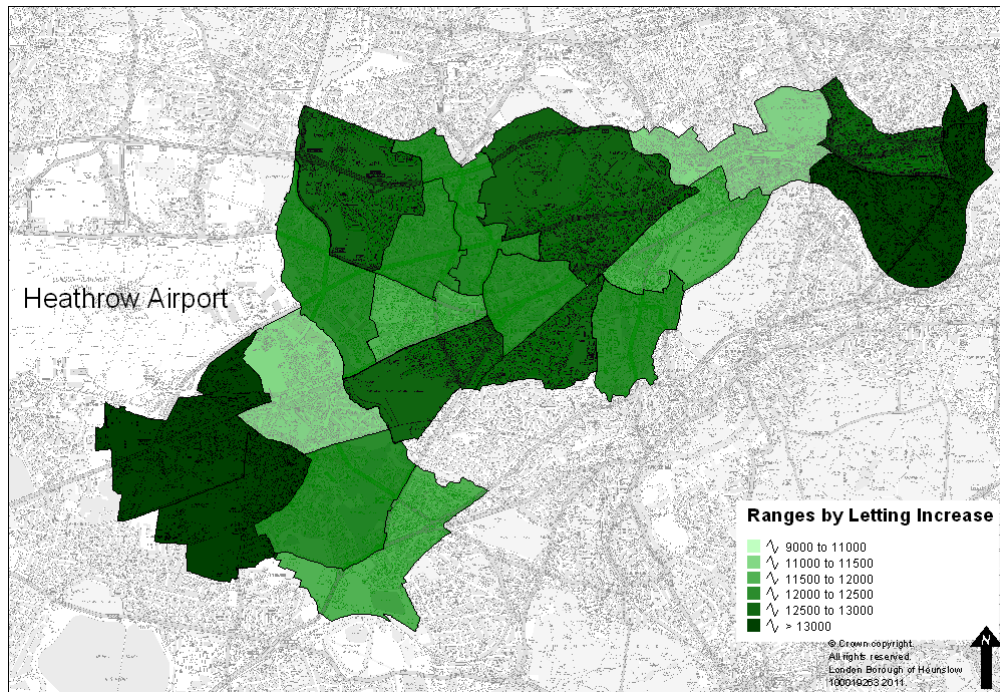


Figure 17: Ward Population including increases due to Informal Letting

These maps show that all of the wards are affected by lodgings being at max capacity and people letting out their homes. On average there is a 5% population increase per ward (see Appendix G: Informal letting breakdown). Although depending on the density of residential buildings we can see that there is an increase spread from 2%-8% across wards.

4.3 Overall Population Increase

The results from our Lodgings and Informal Lettings sections can be combined into a total population increase for the London Borough of Hounslow during the 2012 Olympics. Briefly restating our findings, we calculated that there is room for 5,244 people staying at lodgings in the borough, which is about a 2.5% increase over the population recorded in the 2001 Census. As for Informal Lettings we found that there is room for 27,270 visitors to stay in residences in the borough which averages an increase of over 12%. We calculated that there is space for 32,514 visitors in the Borough of Hounslow which in total is a 15.31% increase over the 2001 Census. We were able to create a map of the borough showing the population of the borough by wards according to our projections for Olympic visitors (see Figure 18)

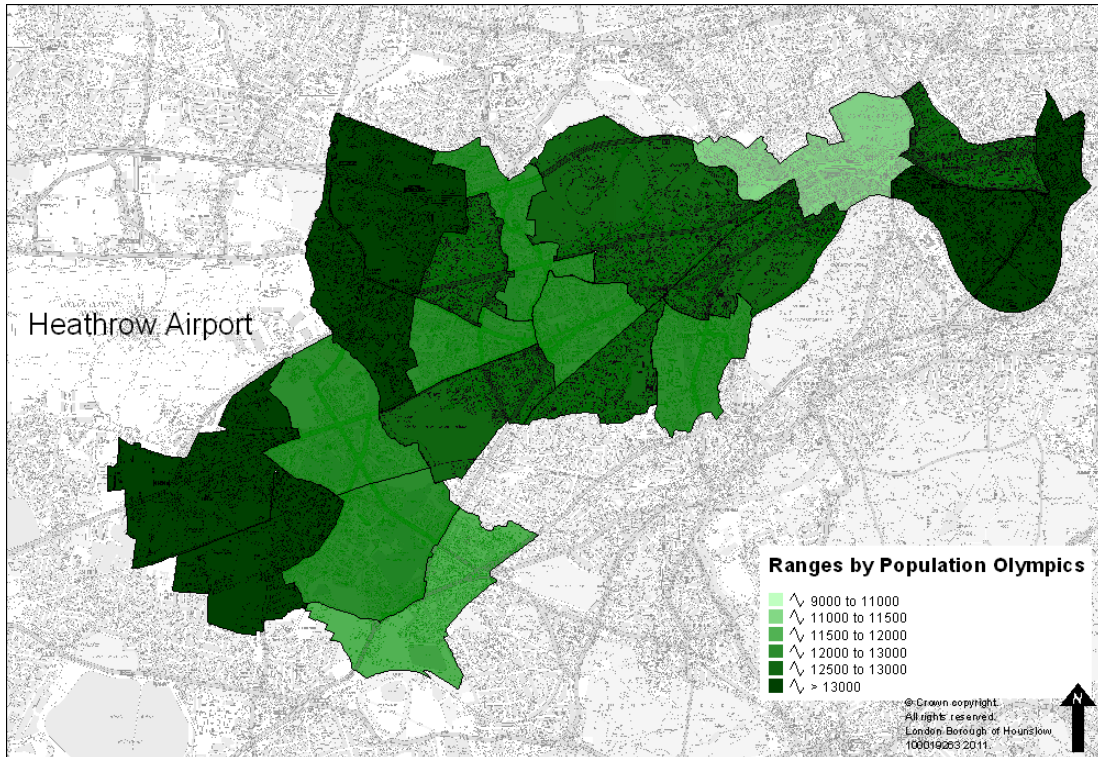


Figure 18: Ward Population due to 2012 Olympics

4.4 Heathrow International Airport

Heathrow Airport (LHR) is a major source of traffic through the borough. Because of the vast number of people arriving in Heathrow, there will be many people traveling through Hounslow. Some examples of transportation from Heathrow are the Tube, Heathrow express, taxis, buses, and the M4 Motorway. Heathrow is of great importance to us because it lets us estimate how many people will be traveling on the M4 during the Games. We looked at Heathrow Airport because it allowed us to estimate the number of cars traveling through Hounslow on the M4 (see section 4.5). We needed to find the number of additional flights entering Heathrow Airport, the additional number of passengers, and how many of these are Olympic related. Using the *Air Traffic Review and Airport Capacity Assessment associated with the London 2012 Olympics and Paralympics* document published by the Department for Transport, we found two important types of information that directly help our research concerning the Olympic Games in London 2012. The first set of information is a basic outline of annual Heathrow incoming and outgoing flights from 2007 through 2009 and projected numbers for 2012. The second set of information is estimated passenger movements through

Heathrow for the summer of 2012, specifically during the Olympic Games. Using these two sets of information, we are better able to understand how an increase in passengers is going to affect travel through Hounslow.

Information from the Department for Transport document shows the daily passenger air traffic movements for London Heathrow Airport. For each day between July 13 and August 20, the chart (see Appendix D: Arrival and Departure Increase) shows the numbers for each of the following for both arrivals and departures: base traffic, Olympic-generated (spectators), and Olympic-generated (other). From the chart we calculated the total additional traffic due to the Olympics and used that number to find the percent increase over the normal traffic flow. Figure 19 shows the percent increase of arriving and departing traffic on each day during the Olympics, for July 26, the day before the Opening Ceremonies to the Olympic Games, we see the greatest increase in arrival traffic, over 32% While, on August 13, the day after the Closing Ceremonies, there is the greatest increase in departing traffic, over 55%.

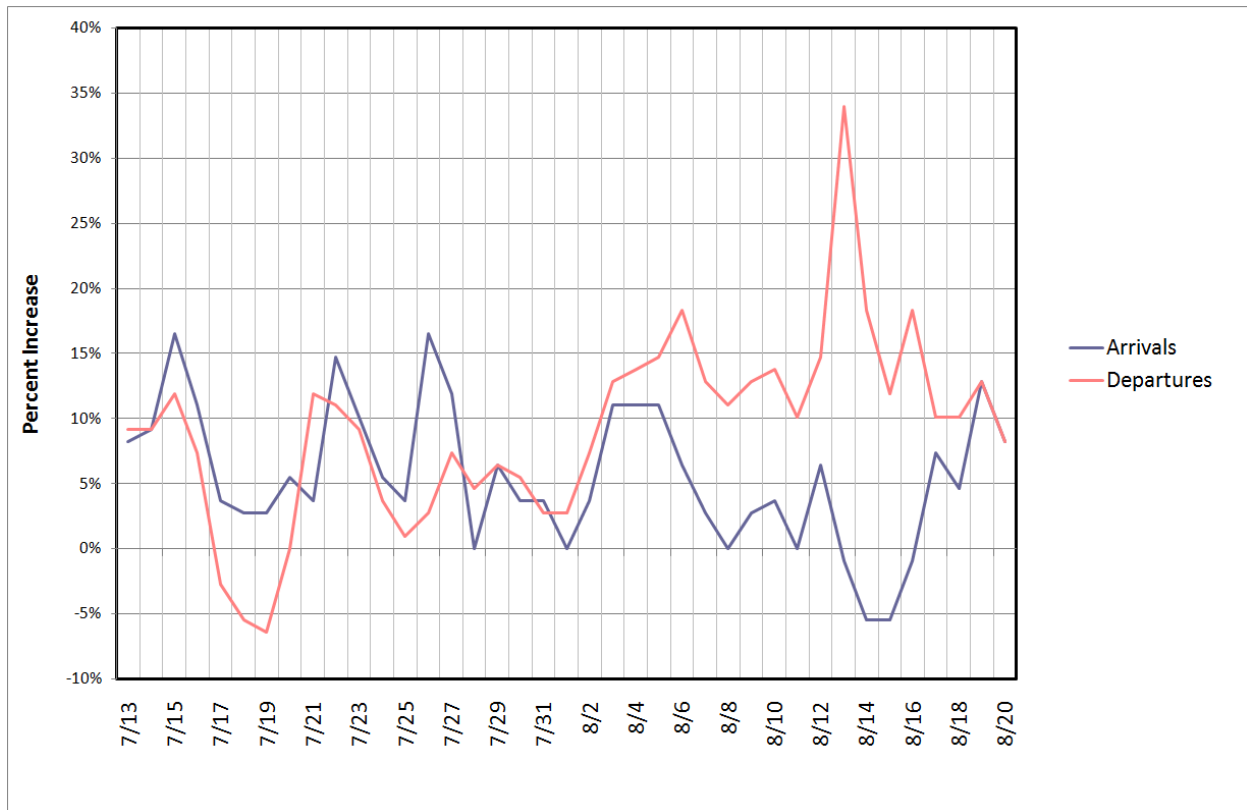


Figure 19: Percent Increase of LHR Traffic by Day During 2012 Olympics

These two sets of information we have gathered from the Department for Transport report show us how Heathrow is going to have to operate in 2012 and see what days Heathrow will have a higher number of additional people moving through due to the Olympics Games in London.

4.5 Cars on the M4 Motorway

After gathering the data from the Department for Transport, we were able to calculate the baseline traffic on the M4 Motorway and get a better perspective of the 2012 Olympics. There are three DfT traffic count points along the M4 in Hounslow which counted an average of 101,462 vehicles per day in 2009 (Department for Transport, 2009). There is also a count point between the M4 and Heathrow Airport which counted an average of 61,428 vehicles per day in

2009 (Department for Transport, 2009). This indicates that roughly 60% of the traffic on the M4 in Hounslow travels to and

Olympic Family Type	Number	Transport
Athletes and Team Officials	18,000	Bus & Coach
Technical Officials	5,000	Bus & Coach
Press	8,000	Bus & Rail
Broadcast	20,000	Bus & Rail
Olympic and Paralympic Family	6,000	Mix of Bus, Shared Car, and Dedicated Car
Marketing Partners	25,000	Cars, Coaches, & Public Transportation

Table 4: Olympic Family Transportation
(The Olympic Delivery Authority, 2011)

from Heathrow. We used publicly available data from the Department for Transport and the Olympic Delivery Authority (see Table 4) to determine how transport for the Olympic Family would affect traffic on the M4. None of the documents we found estimated the impact of the Olympic Family on the M4 Motorway. In order to determine the magnitude of the impact we made the estimates using data that we had gathered from the ODA and DfT. According to the estimates from the Department for Transport, the busiest day for Heathrow will have 12,000 non-spectator Olympic passengers flying out of Heathrow (Department for Transport, 2010). We assumed that all Olympic Family passengers will use the M4 in order to achieve a worst-case situation. In order to determine the impact on the M4 we needed to convert the number

of non-spectator Olympic passengers into vehicles. To start with, we found that Heathrow has an average of 650 departing flights each day (British Airport Authority, 2011). We only accounted for departing flights because all of the Olympic Family passengers are departing on 13 August 2012; there should not be any arriving flights that will consist of Olympic Family or Olympic spectators. Each departing flight with Olympic Family members would require separate transportation along the ORN. Therefore to calculate the greatest number of vehicles on the ORN, we spread all of the Olympic Family members evenly across all of the departing flights. Based on the number of Olympic Family members departing on 13 August 2012 and the average number of flights departing Heathrow per day, there would be an average of 18 Olympic Family members on each flight.

The ODA will provide round-the-clock bus services along the ORN for the press. Therefore, we assumed that all press and broadcast on a single flight will be grouped in the same bus. We assumed this means there will only be an average of one bus for the press and broadcast per flight. Athletes, team officials and technical officials on a single flight will most likely be from the same country. Since all members on a given flight would most likely represent the same country, they would probably all take one bus to the airport. So, we also assumed that all athletes, team officials and technical officials would take an average of one bus to the airport per flight. The Olympic officials make up about 10% of the Olympic Family, which equals roughly 1 or 2 Olympic officials on each flight. Since they are taking a mix of bus, shared car and dedicated car, we assumed there will be somewhere between 1 and 2 Olympic officials per vehicle. So, we believe there will be an average of one vehicle for the officials per flight. Overall, that means there is an average of three vehicles for Olympic Family per departing flight. Since there is an average of 18 Olympic Family members per flight, there is an average of 6 Olympic Family members on each vehicle. Since there are 12,000 Olympic Family members, that means there will be up to 2,000 additional vehicles per day traveling along the ORN. Therefore, the Olympic Family will increase traffic on the M4 by up to 2%.

In July 2010, Heathrow had an average of 216,000 passengers per day, split equally between arrivals and departures (British Airports Authority, 2011). The Department for Transport has published a collection of estimates that it commissioned on how flight traffic into

London’s airports would change during the Olympics (2010). This collection includes day-by-day estimates for the number of passenger arrivals and departures through all major airports in London. These estimates are broken into the base traffic, the Olympic spectator traffic, and other Olympic generated traffic (See Table 5). This table provides a way to estimate the impact of Heathrow traffic on the M4 during the Olympics.

Arrivals					
	Base Traffic	Olympic-Generated	Olympic-Generated (Spectators)	Olympic-Generated (Other)	Total
26/07/2012	96	31	23	7	127
13/08/2012	108	0	0	0	108
Departures					
	Base Traffic (after displacement)	Olympic-Generated	Olympic-Generated (Spectators)	Olympic-Generated (Other)	Total
26/07/2012	112	0	0	0	112
13/08/2012	94	52	40	12	146

Table 5: Estimated Heathrow Passenger Movements during the 2012 Games in Thousands (BAA, 2011)

There are some other potential problems that could occur on the roads in Hounslow. First, there could be an increase in the number of foreign drivers from international spectators renting cars it is unlikely this impact will be significant. However, the Move document estimates that none of the spectators will drive to the venues. Also, the Olympic Family’s transportation is covered by the ODA. While this does not mean there will not be an increase in the number of rental cars, spectators will be forced to use public transportation to go to the venues. Second, the ODA may impose additional parking restrictions along the ORN, making deliveries difficult for businesses and parking difficult for residents. However, the Move document states that for most of the games there will not be any additional parking restrictions on the ORN (2011, p. 35). This is because most of the ORN is highway already, so it is already susceptible to parking restrictions. When needed the ODA will impose temporary restrictions, but these should not last the entirety of the Olympics.

4.6 Rail

After getting data from both Transport for London (TfL) and Office of Rail Regulations (ORR), the organizations responsible for Tube and National Rail data respectively, we were able to predict how much the traffic on these lines would increase due to the Games. We were able to use entrance and exit tallies for both the Tube and National Rail at each station, in order to make our estimates. TfL publishes this information freely on their website.

ODA estimates, for the entire of London, indicate that there will be 800,000 extra visitors and 20,000,000 extra rail trips during the Olympics (ODA, p 40). Using entrance and exit tallies for all stations, we distributed these extra journeys based on existing passenger numbers. After applying these techniques to the stations in Hounslow, we found that the effect on Tube stations throughout London was an average 37% increase in passengers during the Games. Figure 20 shows us the increase in a couple of example stations for Tube stations in Hounslow.

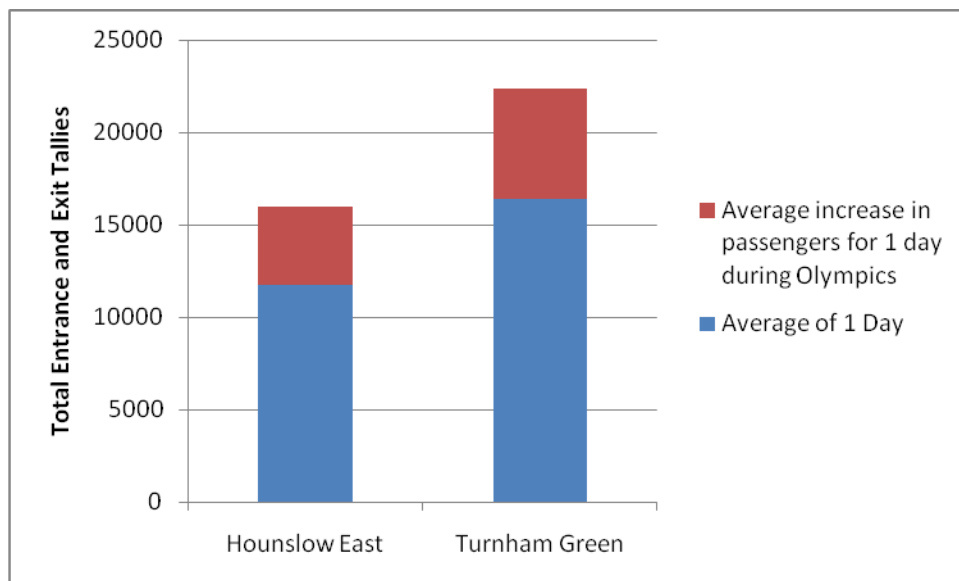


Figure 20: Example of Tube Stop increase Entrance and Exit Tallies

This increase in traffic is due to the population increase in the borough. Since these figures only represent entrances and exits, not people passing through. Given that there are no events being held in Hounslow, most people entering and exiting stations in Hounslow are staying there. This, however, does not include through traffic from Heathrow to the inner city and other boroughs.

The increased number of people visiting the borough would most likely put a strain on the rail system as shown above. However, past Olympic cities have seen an almost inverse effect. In the Sydney 2000 Olympic Games it was found that the rail services were almost unaffected (Hensher and Brewer, 2002). This same effect would be due to London residents working at home, skipping work, and trying to avoid Olympic venues altogether.

4.7 Assumptions vs. Services Matrix

From the lists of Olympic Planning Assumptions (see section 3.2.1) and Services the London Borough of Hounslow provides and comparing each assumption with every service, we created a generalized matrix that shows which assumption will be affected by which service (see Figure 21). For example, any assumptions dealing with telecommunications failures will directly affect the Information and Communication Technology (ICT) services; however, Infectious Disease assumptions and Human Illness assumptions will not be a direct responsibility of the ICT. Instead, if an infectious outbreak in the population occurs there will be many people calling for emergency services. We only took into account direct responsibilities for each service that the borough provides. This indicates to the Hounslow Council who will be responsible if or when some of the assumptions made by the London Resilience Team occur (see section 3.2.1). An example segment of the matrix can be seen in Figure 21. On one axis are planning assumptions from the Olympic Resilience document, and on the other axis are emergency services provided by Hounslow. Each assumption and service is coded with a unique identifier to save space on the matrix. A red cell on the matrix indicates that the assumption in that row has an effect on the service in that column. The matrix contains thousands of comparisons, and specifically highlights weak sections in the emergency plan.

Assumptions	Services	MPa	MP1	MCa	MC1	CC1	CC2	CCa	L1	ICa	IC1	EN1
PS1		X		X								
PS2		X		X								
PS3							X					
PS4												
PS5							X					
T1												X
T2												X
T3												X
T4												X
E1												
RM1						X	X	X	X	X	X	
RM2		X	X	X	X	X	X	X	X	X	X	
RM3										X	X	
G1												
G2												
G3		X		X								
G4												
W1						X	X	X	X	X	X	
W2						X	X	X	X	X	X	
W3						X	X	X	X	X	X	
W4							X					
W5												
W6												
UF1			X									
UF2			X									
UF3												
UF4			X				X					
UF5			X									
UF6							X					
CF1			X									
CF2												
CF3			X									
CF4												
CF5						X	X	X	X	X	X	
CF6			X				X					

Figure 21: Example section from Assumptions vs. Services Matrix.
 (For full matrix, see Appendix E: Assumptions vs. Services Matrix)

From cross-referencing all of the assumptions and services using our matrix, every service provided by the borough of Hounslow is affected in some way. Many of these departments will need to be better prepared to deal with the increased demand for their services they may experience during the 2012 Games.

4.8 Risk Register

We went through each of the hazards in the Community Risk Register and updated them based on our estimates. In total, we found 35 hazards will have a higher impact during the Olympics. See Appendix J: Updated Risk Register, for the newly calculated updated risk register. Many of these hazards will become more devastating because the population of Hounslow will increase during the Olympics. For these hazards, we increased the number of affected people by 15%. Similarly, there will be an additional 37% traveling on the Rail and 2% traveling on the M4 Motorway. These hazards will affect an increased number of people directly corresponding to the percentage increase on each respective transportation system. The only hazard which we found we needed to include more to the hazard outcome description

was hazard H49 which covered a loss of drinking water supplies. One of the outcomes of a loss of drinking water is that the water companies must provide at least 10 liters of water per person per day during the outage. We made a note in the description that this would mean that the water companies would need an additional 325,140 liters per day during the Olympics due to the increased population. We updated the outcomes for all the hazards, but did not touch the likelihood, impact, or risk rating for any of the hazards based on these edits.

4.9 Representation of the Borough

Figure 22 shows the final version of our mind map depicting the impacts on the borough of Hounslow. The blue circle in the middle represents Hounslow, and any bubbles coming off it represent categories of impacts. The colors differentiate among the five major categories we identified: residents, visitors, businesses, infrastructure, and transport. From each main category, we have a number of sub categories. Infrastructure and transport ended up being the two largest categories.



Figure 22: Hounslow Mind Map

Figure 23 is an example of the research we performed for each bubble on the mind map. This example is for the bubble called disabled and elderly in the major category called residents. In this situation, we established a baseline of 8,520 people with a mobility requirement and 8,840 people with a care requirement, with just under 30,000 elderly people in the borough. We identified disruption to home visits, transportation, and food supplies, as well as accessibility as potential problems for these people. Finally, we quantified the impact in a number of different ways, which can be seen in final part of the figure. The results of our research for every bubble on the mind map can be seen in Appendix H: Mind Map Completed Categories.

Residents-Elderly and Disabled

Date: 6/1/11

What the base line is (what it is currently in the borough):

- See accompanying excel document.
- 8520 people with mobility requirement
- 8840 people with care requirement
- Males 65 and over, females 60 and over: 29275

Identify what problems would impact the borough during the Olympics:

- Disruption to home visits
- Disruption to transportation, ability to get food and other supplies
- Accessibility

Quantify Problems/Impacts:

- Accessibility
 - On the busiest day of competition, 23,000 ticket holders could have difficulty using stairs and escalators – will most likely be using public transportation
 - 7% of spectators will have difficulty using stairs and escalators
 - 1% of spectators will be completely unable to use stairs and escalators
 - 1200 wheelchair spaces across Olympic Park venues
 - All are expected to be filled on day 7
 - Major public transport and Blue Badge parking spaces can accommodate up to 1400 people in wheelchairs
 - The number of disabled attending the Olympic Games will be higher than the Paralympic Games.
 - 13 different modes of transport can be used by accessible people to get to the games
 - 25% of the Underground will be step-free by 2012
- Home Care
 - Provided 365 days a year between 6:30am and 10:30pm
- There are 8 residential care homes in Hounslow

Sources:

- ODA Accessible Transport Strategy
- <http://www.neighbourhood.statistics.gov.uk/dissemination/LeadTableView.do?a=7&b=276760&c=hounslow&d=13&e=6&g=338039&i=1001x1003x1004&m=0&r=1&s=1306922388305&enc=1&dsFamilyId=1355>
- <http://www.neighbourhood.statistics.gov.uk/dissemination/LeadKeyFigures.do?a=7&b=276760&c=hounslow&d=13&e=13&g=338039&i=1001x1003x1004&m=0&r=1&s=1306925419282&enc=1>

Figure 23: Example of Completed Mind Map Category

5 Conclusions

The 2012 Olympic Games in London will bring close to a million visitors into the city for a little more than two weeks. Planning for the Olympics is one of the largest logistical challenges a city can undertake. The increase in population will cause strain on lodging and transportation infrastructure and may impede many boroughs' ability to provide services. The Boroughs of Greater London need to assess the impacts of the Olympics in order to be adequately prepared.

Our project assisted the London Borough of Hounslow in their investigations of the impacts of the 2012 Summer Olympics. In order to adequately plan, the Hounslow Council needs to know any possible impacts during the Olympics. Our goal was to create a quantitative representation of the impacts on the borough during the Games in order to assist the Council in its preparation efforts. This entailed determining population and travel increases, and possible secondary effects such as increased travel time for commuters. We quantified the majority of these impacts by adjusting existing estimates and historic data to fit Hounslow's population and infrastructure. The end goal of our research was to develop a set of information, both qualitative and quantitative, that could assist the Borough of Hounslow as it prepares for the 2012 Olympics.

The 2012 Olympics will have a significant impact on two key aspects of the London Borough of Hounslow: the population will be up to 15% higher than normal, and there will be a 37% increase in the number of people traveling on rail through the borough. In order to ensure the borough runs smoothly during the Olympics, it is important that the Hounslow Council is aware of the magnitude of these factors.

The two major sources of population change in the borough are due to hotels and informal letting. In Sections 4.1 and 4.2, we determined the approximate population increases due to hotels and informal letting will be 5,244 and 27,270 respectively. This represents a combined population increase of 32,514 people across the borough, a 15% increase, and is likely to strain Hounslow's services. The Hounslow Council will need to determine if this increase is significant enough to impact local businesses' ability to meet demand.

In addition to population increases, there will be a large increase in the number of people traveling through the borough. Most of this increase will be due to people traveling

from Heathrow Airport into central and eastern London. There will be a 37% increase in Tube and National Rail traffic in the borough, and an additional 2,000 cars per day on the M4, a 2% increase. Lastly, there will be an additional 219,000 people arriving at London Heathrow Airport during the Olympics, a 6.5% increase in arrivals and a 12.5% increase in departures. The difference in arrival and departure increases is due to Olympic athletes and officials arriving months before the Olympics, but leaving immediately after the closing ceremonies. The Hounslow Council will need to take these numbers and decide what needs to be done in order to prepare.

The Borough is particularly interested in the reliability of our estimates. Our population estimates are worst-case scenario estimates, meaning that the estimates will most likely be higher than the actual number. The informal letting portion of this number is comprised of 2001 Census data. However, even though the population of the borough has increased somewhat in the past ten years, we do not believe this will significantly impact our estimates. There have not been a significant number of new housing developments in Hounslow during this time, meaning that any additional people living in the borough will be living in the open rooms already accounted for in our estimates. All of our other estimates are based on information published by institutions such as the Olympic Delivery Authority or the Department for Transport.

6 Recommendations

The Borough of Hounslow should look over our estimates and determine how the borough can prepare for them. We recommend that special attention be paid to the impacts that we rated as the most severe. These severe impacts include: a 15% increase in population, a 37% increase in rail ridership, and a 12.5% increase in Heathrow departures. In addition, we believe that the Borough of Hounslow needs to make local businesses aware of these changes, as 60% of businesses are making no preparations for the Olympics. Finally, we recommend that the Contingency Planning Unit reviews the emergency plan based on our updated version of the Community Risk Register. Certain hazards have had their casualty and fatality figures increased, and will likely need more resources to deal with. One piece of information we were not able to track down within the timeframe of our project was how visitors choose to go into the city (for example 60% choose rail, while 30% take a car or taxi, and 10% use other forms of transportation). This information would allow us to more accurately predict the number of people that would be traveling through Hounslow on any given day using the information we gathered on Heathrow passenger arrivals. We believe that if the London Borough of Hounslow follows these recommendations, they will be better prepared for the London 2012 Olympics.

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Appendix A: Sponsor Description

The London Borough of Hounslow was formed under the London Government Act of 1963 (London Government Act 1963) along with all of the other 31 boroughs of Greater London. It is one of 19 outer boroughs, and lies on the western edge of the city on the northern bank of the River Thames (see Figure 24). The name Hounslow comes from the word “Honeslaw” which means *land that can be used for hunting* (A Brief History of Hounslow).

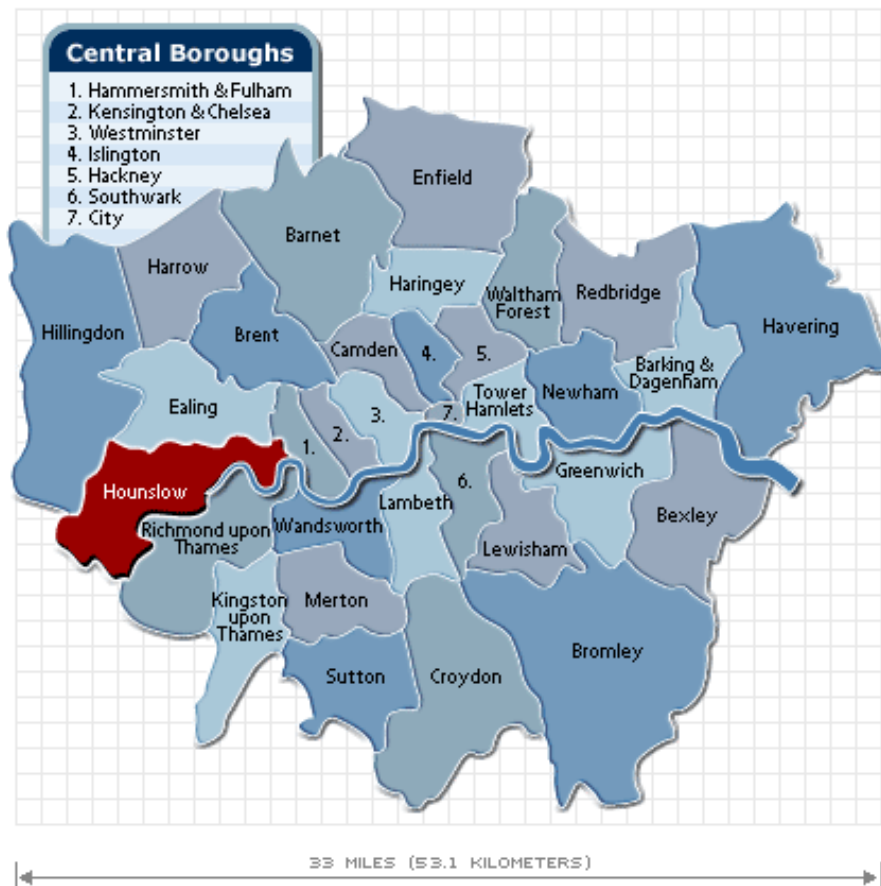


Figure 24: Boroughs of London (London Town)

Hounslow grew in size over the years due to its essential role in transportation. Historically, the main road into London on the north bank of the river always passed through Hounslow, which made it a popular spot for merchants and home to the headquarters of many large corporations. For example, GlaxoSmithKline, (Global 500, 2009) the third largest pharmaceutical health care company in the world, is based in the suburban town of Brentford,

as is the studio complex for British Sky Broadcasting, the largest pay-TV broadcaster in the United Kingdom (BSkyB, 2011). The Fuller’s Griffin Brewery headquarters is also located in the town of Cheswick. From the time it was founded in 1913 until its relocation to Warwickshire, the headquarters for the luxury sports car manufacturer Aston Martin Lagonda Limited resided in the Borough of Hounslow. Due to its proximity to London Heathrow Airport, many airline companies, such as Air France, KLM, also have head offices in Hounslow. Hounslow sees a lot of visitors and travelers passing through because of its proximity to London Heathrow Airport (LHR). LHR has 67 million annual passengers, and of those 11% travel through Hounslow and onto other parts of the UK (Intl Air Pax Route Analysis, 2008). As part of the bigger city of London, Hounslow is incorporated into the interworking of the city, but they operate independently through the Hounslow Council.

Hounslow is about twenty-two square miles and is home to about 212,341 residents as of 2001 (Hounslow Council, United Kingdom: Redeplyment, training and development, 2005). Greater London homes about 7,172,091, and by comparison to the total population of London, Hounslow only makes up about 3.02% (Census 2001: London). Of those 3.02% over 55% are white and about 25% are some ethnicity of Asian (see Figure 25). This ethnic diversity stems all the way back to the British Empire controlling over a majority of Europe and the globe.

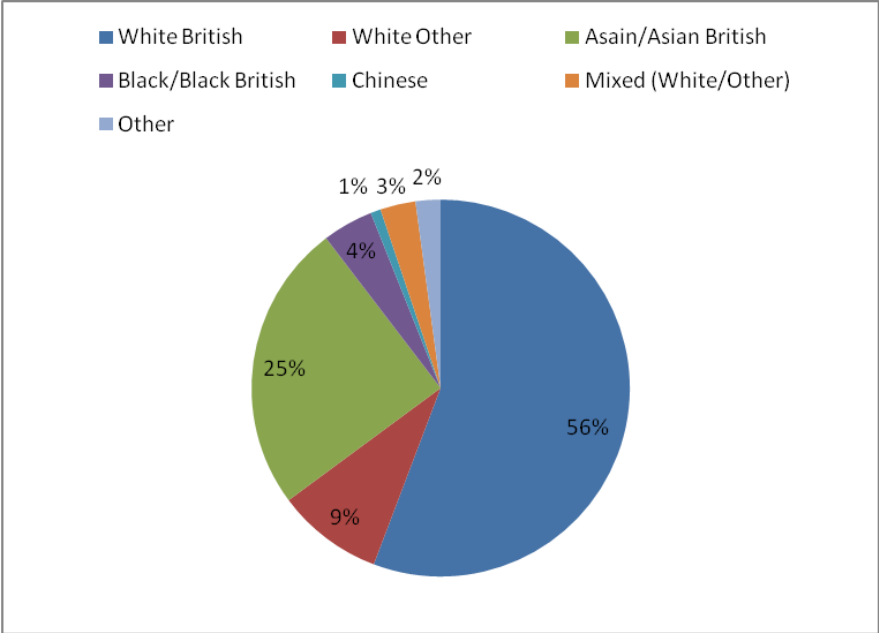


Figure 25: Ethnicity Split in Hounslow (Hounslow Community Plan)

The Borough of Hounslow has its own local governing body, the Hounslow Council, which is responsible for providing services to the community. These services include housing, health & social care, supporting the local economy, and transportation. Hounslow Council, which employs around 2,400 staff members, (Hounslow Borough Profile) consists of six departments: Chief Executive Department, Children's Services and Lifelong Learning, Community Services, Corporate Services, Environment, and Finance. Each of these departments is run by a director who has a number of staff members below him or her. Each of these departments handles a portion of the services that the borough provides to the community such as communications, children's social care, adult social care, customer services, street care, and internal audits (Hounslow, 2011).

The councilors of the borough oversee their policy implementation in various committees (Hounslow, 2011). Sixty councilors are elected from the twenty wards (see Figure 26) in the borough to form the full council. They meet ten times a year to decide on council policy, including "the council tax base and budget elect the mayor and other post holders and decide the main policy framework," (Hounslow, 2011). The current political composition of the full council is 35 Labour and 25 Conservative councilors. In the past Hounslow has voted predominately for the Labour party and by looking at the trends outlined in the table below it could be assumed this would not change anytime soon.

Hounslow also have five scrutiny committees. Each of the five scrutiny committees is made up of councilors and up to three citizens from the community. This committee is an independent body that reviews the decisions of the executive committee and the council. It reviews the current policies and delivers these reviews to the executives. These five committees monitor all the services provided in the areas and plan future infrastructure development (Hounslow, 2011).

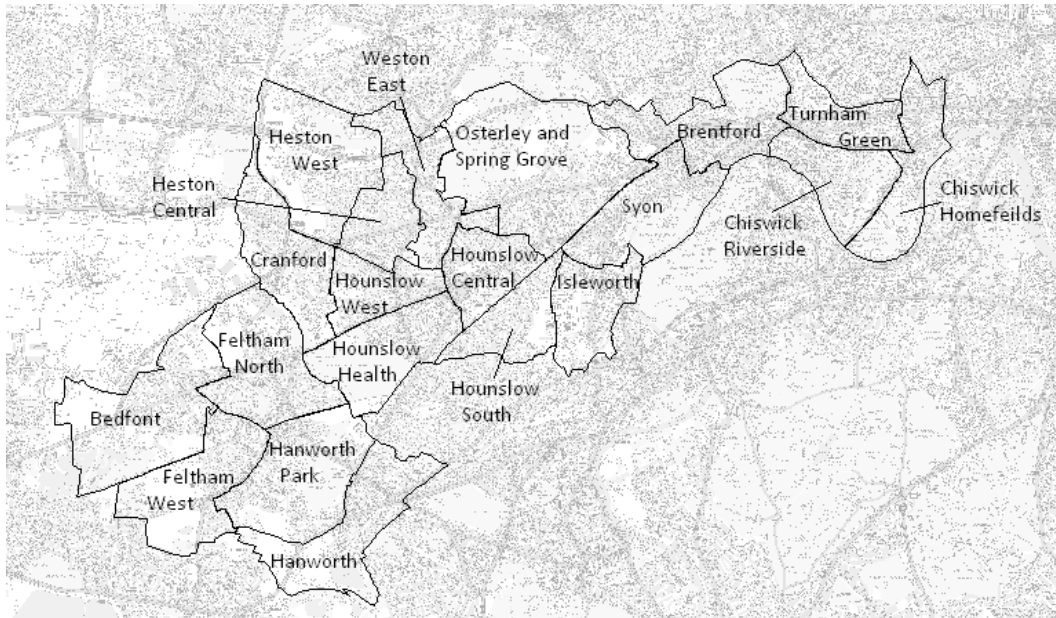


Figure 26: Wards of Hounslow

The Hounslow Council, and in part its scrutiny committees, are in charge of preparing for the Olympics, both for providing services like the fire brigade and metropolitan police and the development of cultural experiences. The Hounslow Council must work together with the other 31 boroughs of London to create the best Olympic experience possible. With good cooperation with the other Boroughs of London Hounslow will be able to benefit greatly from the 2012 Olympics. The Borough of Hounslow, due to the proximity of London Heathrow Airport and the general excitement of the event, will most likely produce a spike in revenue throughout the Borough of Hounslow (Mason, 2009). Below, Figure 27 shows the current breakdown Hounslow revenue. It could be predicted that areas such as Council Tax and Business Rates will bring in more revenue during the 2012 Olympics due to the increase in tourist traffic during and after the Games.

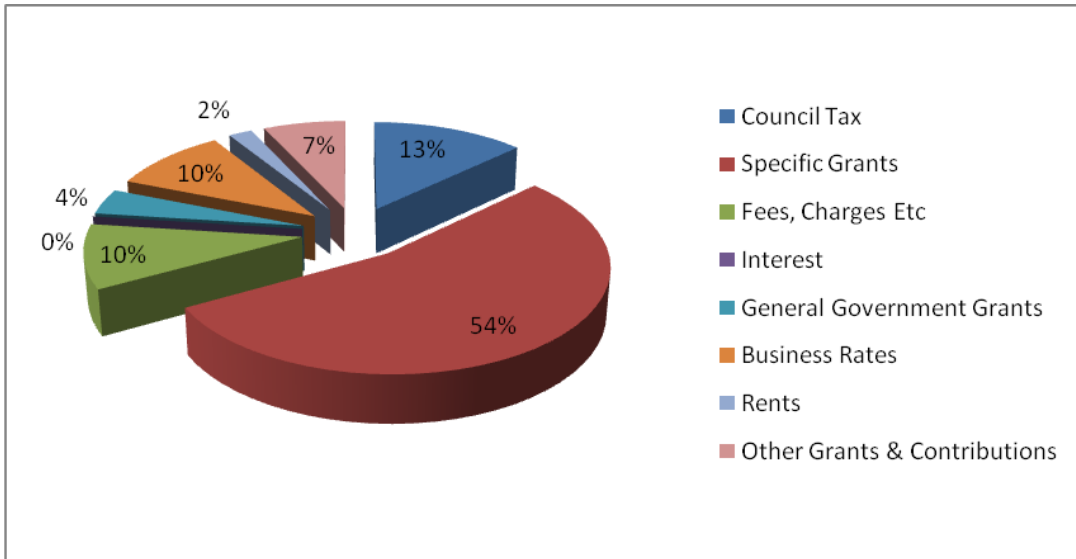


Figure 27: Sources of Revenue (London Borough of Hounslow: Statement of Accounts)

The Olympics will help to put Hounslow more prominently in the public eye, and will then upsurge the borough's economy. By hosting the Olympics in London, all boroughs will reap the rewards. Economy will rise, tourism will grow, and general excitement throughout the city and the U.K. will be evident. With tourism comes new cash flow into hotels, restaurants, and businesses through London and the Borough of Hounslow. This in turn trickles down through the system, helping the overall economy. In the end, any initial cost that Hounslow will face to host the 2012 Olympic Games will in the end be greatly outweighed by the benefits of the visitors and publicity raised during and after the games.

With increased revenue, due to increased amounts of people, comes increased possibility of risk. The Hounslow Council is tasked with creating an accurate risk analysis during the 2012 Olympic Games. Increase population to places like hotels, the M4, and The Underground will become more of a risk to Hounslow and the Hounslow Council. There are two main factors to risk analysis, probability of accident/incident, and amount of people affected. With the amount of people located in Hounslow predicted to spike during the Games it will increase risk to the Council, making analysis and careful preparation very important to the community and the Hounslow Council.

Appendix B: Hotel data collected

Name	Number of Rooms	Max Occupancy	Average Person to Bed Ratio
At Home Chiswick	5	10	
Revive Lodge	5	10	
Heathrow Lodge	7	15	0-50 2.0322581
Chiswick Lodge Hotel	10	20	
Heathrow House Guest House	10	20	
The Bridge House	10	20	51-250 2.1510417
VII Hotel	10	20	
Crompton Guest House	11	22	
Hazel Wood Guesthouse	11	22	
Heathrow Palace	12	24	
The Ambassador Heathrow Hotel	12	24	
High Road House	14	28	
Civic Guest House	15	30	
Lampton Guest House	20	41	
The Cottage	21	43	
Firs Lodge	22	45	
Skylark Hotel	22	45	
Yotel Heathrow Airport	32	65	
Rosemount Hotel	40	81	
Shalimar Hotel	46	93	
Channins Hounslow Hotel	50	102	
Osterley Park Hotel	61	131	
Best Western Chiswick Hotel	64	138	
Travelodge Heathrow M4 Eastbound	66	142	
The Continental Hotel	67	144	
Days Hotel Hounslow	96	207	
Master Robert Hotel	96	207	
Travelodge Feltham	115	247	
Chiswick Moran Hotel	118	254	
Arora Park Hotel Heathrow	119	256	
Holiday Inn London Brentford Lock	134	288	
London Syon Park	137	295	
Travelodge Heathrow M4 Westbound	145	312	
Etap Hotel London Hounslow	148	318	
Marriot London Twickenham	156	336	
Holiday Inn London - Heathrow Ariel	184	300	
Ramada London Heathrow Hotel	200	526	
Thistle Hotels	264	581	
Travelodge Heathrow Terminal 5	297	653	
St Giles Hotel Central London Heathrow	300	660	
Travelodge Heathrow Central	307	675	
Sheraton Skyline Hotel	350	905	
Arora Hotels	351	716	
Hotel Ibis London Heathrow Airport	351	772	
Jurys Inn Heathrow Hotel	364	801	
London Heathrow Marrot Hotel	391	860	
Hilton London Heathrow Airport Hotel	398	796	
Sheraton Heathrow London Airport Hotel	426	937	
Radisson Edwardian International Plaza Hotel	459	1009	
Premier Inn London Heathrow	590	1298	
Sofitel London Heathrow Hotel	605	1331	
London Renaissance London Heathrow Hotel	649	1427	
Park Inn London Heathrow	895	1968	
	9288	20271	

Yellow represents hotels that responded to our email with actually max occupancy.

Appendix C: Population increase due to Hotels by ward

Wards	Population (2001 Census)	Hotel Increase	% Increase
Bedfont	11,668	0	0%
Brentford	10,137	22	0%
Chiswick Homefields	11,668	186	2%
Chiswick Riverside	11,231	0	0%
Cranford	11,255	1245	11%
Feltham North	9,751	1112	11%
Feltham West	13,975	0	0%
Hanworth	10,618	0	0%
Hanworth Park	10,618	44	0%
Heston Central	11,237	297	3%
Heston East	11,009	0	0%
Heston West	11,709	497	4%
Hounslow Central	11,237	237	2%
Hounslow Heath	11,756	0	0%
Hounslow South	10,807	0	0%
Hounslow West	10,676	606	6%
Isleworth	11,095	0	0%
Osterley and Spring Grove	10,689	151	1%
Syon	10,674	583	5%
Turnham Green	11,041	264	2%
Hounslow Borough	222,851	5244	2%
	Hotel Capacity Near Heathrow		14,691

Appendix D: Arrival and Departure Increase

	Base Traffic (after displacement)	Olympic-Generated	Arrivals		Total	2010 Average	Percentage Increase
			Olympic-Generated (Spectators)	Olympic-Generated (Other)			
7/13	117	1	0	0	118	109	8%
7/14	114	5	0	4	119	109	9%
7/15	123	4	0	3	127	109	17%
7/16	118	3	0	2	121	109	11%
7/17	112	1	0	1	113	109	4%
7/18	110	2	0	1	112	109	3%
7/19	111	1	0	1	112	109	3%
7/20	115	1	0	1	115	109	6%
7/21	112	1	0	1	113	109	4%
7/22	118	7	5	1	125	109	15%
7/23	109	11	9	2	120	109	10%
7/24	99	16	13	2	115	109	6%
7/25	95	18	15	3	113	109	4%
7/26	96	31	23	7	127	109	17%
7/27	108	14	13	1	122	109	12%
7/28	109	0	0	0	109	109	0%
7/29	116	0	0	0	116	109	6%
7/30	108	5	3	2	113	109	4%
7/31	103	10	8	2	113	109	4%
8/1	100	9	9	0	109	109	0%
8/2	101	12	12	0	113	109	4%
8/3	105	16	13	2	121	109	11%
8/4	112	9	7	2	121	109	11%
8/5	118	3	2	0	121	109	11%
8/6	109	7	5	2	116	109	6%
8/7	102	10	8	2	112	109	3%
8/8	100	9	9	0	109	109	0%
8/9	104	8	6	2	112	109	3%
8/10	108	5	3	2	113	109	4%
8/11	109	0	0	0	109	109	0%
8/12	116	0	0	0	116	109	6%
8/13	108	0	0	0	108	109	-1%
8/14	103	0	0	0	103	109	-6%
8/15	103	0	0	0	103	109	-6%
8/16	108	0	0	0	108	109	-1%
8/17	117	0	0	0	117	109	7%
8/18	114	0	0	0	114	109	5%
8/19	123	0	0	0	123	109	13%
8/20	118	0	0	0	118	109	8%

Numbers are in Thousands of People

	Departures				Total	2010 Average	Percentage Increase
	Base Traffic (after displacement)	Olympic- Generated	Olympic-Generated (Spectators)	Olympic-Generated (Other)			
7/13	119	0	0	0	119	109	9%
7/14	119	0	0	0	119	109	9%
7/15	122	0	0	0	122	109	12%
7/16	117	0	0	0	117	109	7%
7/17	106	0	0	0	106	109	-3%
7/18	103	0	0	0	103	109	-6%
7/19	102	0	0	0	102	109	-6%
7/20	109	0	0	0	109	109	0%
7/21	122	0	0	0	122	109	12%
7/22	121	0	0	0	121	109	11%
7/23	119	0	0	0	119	109	9%
7/24	113	0	0	0	113	109	4%
7/25	110	0	0	0	110	109	1%
7/26	112	0	0	0	112	109	3%
7/27	117	0	0	0	117	109	7%
7/28	114	0	0	0	114	109	5%
7/29	116	0	0	0	116	109	6%
7/30	113	2	0	2	115	109	6%
7/31	107	5	3	2	112	109	3%
8/1	110	2	2	0	112	109	3%
8/2	112	5	4	0	117	109	7%
8/3	117	6	4	2	123	109	13%
8/4	122	3	0	3	124	109	14%
8/5	121	4	3	1	125	109	15%
8/6	119	10		3	129	109	18%
8/7	109	14	11	3	123	109	13%
8/8	110	11	10	1	121	109	11%
8/9	112	11	8	3	123	109	13%
8/10	117	7	4	3	124	109	14%
8/11	114	7	6	1	120	109	10%
8/12	116	9	7	1	125	109	15%
8/13	94	52	40	12	146	109	34%
8/14	99	30	21	9	129	109	18%
8/15	105	17	15	2	122	109	12%
8/16	108	22	19	3	129	109	18%
8/17	119	1	0	1	120	109	10%
8/18	119	1	0	0	120	109	10%
8/19	122	1	0	1	123	109	13%
8/20	117	1	0	0	118	109	8%

Numbers are in Thousands of People

Appendix E: Assumptions vs. Services Matrix

Assumptions	Services					
	Children's Services	Life-long Learning	Management of Adult Care Services including services such as mental health and disabilities, links with the local care trust and NHS and developing cross agency services. Community Safety	Translation and Interpreting	Contract management of Hounslow Homes and their delivery plan, homelessness, allocations, private sector regulation and development, development of affordable housing	Housing management, day-to-day and major repairs to Council homes, tenancy management, caretaking, cleaning and security on housing estates, sheltered housing and Linkline community alarm, leasehold management and tenant participation
Population and Social Assumptions						
Transport						
Events						
Reputation and Media						
Generic Response Considerations						
Warning and Informing						
Uncontaminated Human Fatalities (up to 1400 in concurrent incidents and up to 350 in a single incident. Based on Greater London Area)						
Contaminated Human Fatalities (up to 300 in a single incident. Based on Greater London Area)						
Uncontaminated Human Casualties (up to 1000 in a single incident. Simultaneous terrorist attacks would require 2000 casualties respectively to be factored into planning. Based on Greater London Area)						
Contaminated Human Casualties (Up to 2000 casualties from a single incident, simultaneous attack possible which would raise that number, based on Greater London Area)						
Industrial, Transport and other non-malicious Incidents						
CBRN and Hazardous Materials Release (could be over 2000 people requiring decontamination, based on Greater London Area)						
Heatwave						
Infectious Diseases and Human Illness						
Major Flooding						
Evacuation and Shelter						
Debris Clearance						
Constraints on Oil and Fuel Supplies						
Disruption to Water Supplies						
Loss of Telecoms						
Disruption to power supplies						
Response to Maritime Incidents						
Command, Control, Coordination and Information (C3i)						
Concurrency						

Services									
	Pollution control	Contingency Planning Unit	Business Regulation	Parking Services	Environmental Direct Services	Transport	Waste Services and Recycling	Management of the parks, open spaces, libraries and other facilities such as the urban farm, crematorium and cemeteries	Management of the Councils leisure services including leisure and community centres
Population and Social Assumptions									
Transport									
Events									
Reputation and Media									
Generic Response Considerations									
Warning and Informing									
Uncontaminated Human Fatalities (up to 1400 in concurrent incidents and up to 350 in a single incident. Based on Greater London Area)									
Contaminated Human Fatalities (up to 300 in a single incident. Based on Greater London Area)									
Uncontaminated Human Casualties (up to 1000 in a single incident. Simultaneous terrorist attacks would require 2000 casualties respectively to be factored into planning. Based on Greater London Area)									
Contaminated Human Casualties (Up to 2000 casualties from a single incident, simultaneous attack possible which would raise that number, based on Greater London Area)									
Industrial, Transport and other non-malicious Incidents									
CBRN and Hazardous Materials Release (could be over 2000 people requiring decontamination, based on Greater London Area)									
Heatwave									
Infectious Diseases and Human Illness									
Major Flooding									
Evacuation and Shelter									
Debris Clearance									
Constraints on Oil and Fuel Supplies									
Disruption to Water Supplies									
Loss of Telecoms									
Disruption to power supplies									
Response to Maritime Incidents									
Command, Control, Coordination and Information (C3i)									
Concurrency									

Services						
	Corporate communications	Legal	Information & Communication Technology (ICT)	Environment non-emergency	Community Services non-emergency	Children's Services & Lifelong Learning
Population and Social Assumptions						
Transport						
Events						
Reputation and Media						
Generic Response Considerations						
Warning and Informing						
Uncontaminated Human Fatalities (up to 1400 in concurrent incidents and up to 350 in a single incident. Based on Greater London Area)						
Contaminated Human Fatalities (up to 300 in a single incident. Based on Greater London Area)						
Uncontaminated Human Casualties (up to 1000 in a single incident. Simultaneous terrorist attacks would require 2000 casualties respectively to be factored into planning. Based on Greater London Area)						
Contaminated Human Casualties (Up to 2000 casualties from a single incident, simultaneous attack possible which would raise that number, based on Greater London Area)						
Industrial, Transport and other non-malicious Incidents						
CBRN and Hazardous Materials Release (could be over 2000 people requiring decontamination, based on Greater London Area)						
Heatwave						
Infectious Diseases and Human Illness						
Major Flooding						
Evacuation and Shelter						
Debris Clearance						
Constraints on Oil and Fuel Supplies						
Disruption to Water Supplies						
Loss of Telecoms						
Disruption to power supplies						
Response to Maritime Incidents						
Command, Control, Coordination and Information (C3i)						
Concurrency						

Appendix F: Toolkit

Building a Quantitative Representation of London Boroughs During the 2012 Olympic Games

Prepared by:

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About this Guide

We are a group of students attending Worcester Polytechnic Institute in Worcester, Massachusetts. Over the course of 14 weeks we worked with the London Borough of Hounslow Contingency Planning Unit to build a picture of the borough during the 2012 Olympic Games. In order to assist other boroughs in the same endeavor, we decided to generalize our work into this guide. Our hope is that this guide will assist other boroughs in their preparations for the 2012 Olympics.

In this guide you will find how we were able to gather population increase data due to hotels and other lodgings as well as informal lettings. This guide will also show how to gather transportation information for your borough during the Olympics. The transportation forms we covered were rail, highways, and park-and-ride.

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1 Mind Map

To get an idea of what your borough will look like during the Olympics, you may find it a helpful to generate a mind map depicting the different areas and services of your borough. Having an idea of what services are affected and how they relate to each other will help keep you on track in finding what the most impacted categories are.

Hounslow Example:

Shown below is the final draft of our mind map. Many of the categories and placement of categories in the original mind map were adjusted until the final product was produced (Figure 1). For example, in the original mind map there was a section labeled people. This was later split into two separate sections labeled Visitors and Residents. This was decided upon because it better represented different sections of the borough.



Figure 1: Mind Map End Product

2 Population

One of the biggest changes that will affect any Greater London borough is a temporary increase in population. This increase is due to two major factors: hotels, and informal letting. Determining the number of people staying in hotels is fairly easy. To start, it is assumed that all hotels in London will be at 100% capacity for the entire duration of the games. Using this assumption, one can simply determine the occupancy of all hotels in the borough to obtain a number that depicts the increase in population due to hotels. Informal lettings provide a greater challenge; they are not published and information regarding lettings is very difficult to track down. Because of these challenges, the best way to ascertain a number for lettings is to build a worst-case scenario for planning purposes. This number is based on the overall amount of free space in the borough. Once a number for hotels and informal letting has been determined, simply adding the two totals together will provide a good estimate of how many additional people will be capable of staying in your borough during the 2012 Olympics.

2.1 Hotels

The first step in determining the hotel population is to identify all the hotels in the borough. This can be done via a variety of methods. We found Google Maps to be a very useful source in identifying hotels. Using Google has the advantage of providing you with the website and contact information of the hotel you are viewing (Figure 2). We found it useful to keep track of all the hotels we discovered using an Excel spreadsheet. Not all hotels will provide contact information on Google Maps, however this should not be difficult to find with some searching.

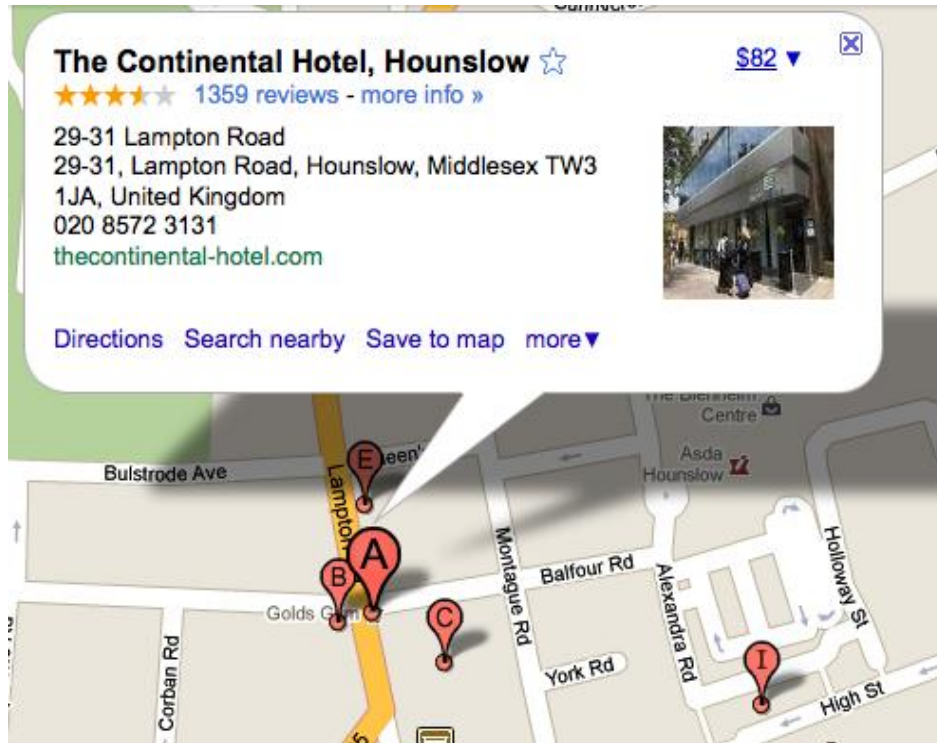


Figure 2: Example hotel on Google maps.

The next step is to contact each hotel and ask them for their room count and maximum occupancy. If they respond with both numbers or just the maximum occupancy, the final step will be easy: simply add together all of the maximum occupancies of each hotel. Most likely you will be unable to find detailed room information about every hotel. If this should occur, we recommend averaging the numbers of people per room of the hotels that you were able retrieve information from. This average can be used to calculate the approximate occupancy of the remaining hotels. Note that this method requires an approximate number of rooms for all hotels. This method can be completed with the following equation:

$$\text{Average People per Room} = \frac{\text{Total Number of People}}{\text{Total Number of Rooms}}$$

Equation 1

$$\text{Occupancy of Hotel} = \text{Average People per Room} * \text{Number of Rooms}$$

Equation 2

Hounslow Example:

To find the number of hotels in Hounslow we first started by searching “hotels in Hounslow” in Google maps and other hotel Websites. We then recorded their locations and contact information in an Excel sheet and individually contacted each to find their number of rooms and maximum occupancies.

Name	Number of Rooms	Max Occupancy	Average Person to Bed Ratio
At Home Chiswick	5	10	
Revive Lodge	5	10	
Heathrow Lodge	7	15	0-50 2.0322581
Chiswick Lodge Hotel	10	20	
Heathrow House Guest House	10	20	
The Bridge House	10	20	51-250 2.1510417
VII Hotel	10	20	
Crompton Guest House	11	22	
Hazel Wood Guesthouse	11	22	251-infinity 2.1992721
Heathrow Palace	12	24	
The Ambassador Heathrow Hotel	12	24	
High Road House	14	28	

Figure 3: Example hotel data for the London Borough of Hounslow

In this example, we found the most accurate way to calculate the occupancies was to use three separate groups:

- Hotels with 1-50 Rooms
- Hotels with 51-250 Rooms
- Hotels with > 251 Rooms

This small subset of our data shows an example of a hotel from the group of hotels with less than 50 rooms. Occupancies highlighted in yellow are hotels that we were able to collect reliable information from. Using the hotels highlighted in yellow, we calculated an average number of hotels per room. These are shown in the far right column and outlined in bold. These numbers were used to calculate the non-highlighted numbers in the Max Occupancy column by multiplying the number of rooms by the average person to bed for the category the hotel falls in, as seen in Equation 2. The calculated numbers were rounded to the nearest integer. This gave us a relatively accurate number for hotel occupancy in Hounslow.

2.2 Informal Letting

Informal letting can be difficult to analyze. Most of the information regarding lettings is not formally recorded anywhere. In addition to letting, we must also account for people having family to stay during the Games. The best way analyze this increase is to develop a worst-case scenario estimate based on the number of free rooms in the borough. This data was collected during the 2001 Census and is available from the Office for National Statistics (statistics.gov.uk). Of particular interest is the overcrowding indicator, which shows the number of free rooms in the borough. Each household is given a score based on the number of rooms and the number of people living there. For example, houses with one room too few are given a score of -1, and houses with an extra room are given a score of 1. The overcrowding indicator adds all of these numbers up and effectively gives the net number of open rooms across the borough. This is helpful because it gives the total number of rooms that could possibly be filled during the Olympics. Although it is unlikely that every one of these rooms will be filled, it is a good worst-case scenario indicator. Finally in order to calculate the number of people that could be staying in the borough due to informal lettings multiply the overcrowding indicator number by 2. In the Office for National Statistics description of occupancy rating, they state that 2 people is the maximum number of people they recorded for each room.

Hounslow Example:

Housing		▶ national commentary	
(all households)	Value	Eng & Wal Rank/376 ⓘ (proportion)	Regional Rank/33 ⓘ (proportion)
Number of households with residents	83994	66	22
Number of people per hectare	37.9	32	25
Average household size	2.51	12	6
Vacant household spaces	1965	302	17
Owner-occupied	50890	337	15
Without central heating	4895	207	26
Without own bath/shower & toilet	853	23	14
Overcrowding indicator ⓘ	13635	18	17

Figure 4: 2001 Census data from the Office for National Statistics (statistics.gov.uk)

The number in the black box represents the overcrowding indicator for the London Borough of Hounslow. Essentially this means that there are 13,635 free rooms in Hounslow. The Office for National Statistics assumes that each house needs two common rooms, and all

excess rooms can be used for sleeping. This can be somewhat unrealistic for larger houses with more than two common rooms. In these situations it is unlikely that all 13,635 rooms will be filled, but it gives us a good baseline number for making estimates for the borough.

		Bedfont	Hounslow (London Borough)	London	England
All Households (Households) ¹	Count	4,171	83,994	3,015,997	20,451,427
Occupancy rating of + 2 or more (Households) ¹	Count	1,271	26,785	991,846	10,050,403
Occupancy rating of + 1 (Households) ¹	Count	1,200	21,018	713,181	5,223,887
Occupancy rating of 0 (Households) ¹	Count	1,148	22,556	788,499	3,719,625
Occupancy rating of -1 (Households) ¹	Count	400	8,691	325,013	1,026,030
Occupancy rating of -2 or less (Households) ¹	Count	152	4,944	197,458	431,482

Figure 5: Detailed breakdown of occupancy rating for the Bedfont Ward (statistics.gov.uk)

Another useful section of the 2001 Census housing data is the breakdown by ward. Although a total sum of all the occupancy ratings is not provided, it gives a breakdown of how many households fit into each category. This can give a good picture of which areas in the borough might be most prone to population increase. As can be seen in Figure 5, Bedfont has most of its houses on the positive end of the spectrum. This means that there are a large number of houses with the potential to have guests during the Olympics. This information can be useful for more location-specific analysis.

3 Transportation

With a large population comes large strain on the host cities' infrastructure. One of the most affected areas of the infrastructure is transportation. In planning for the 2012 Olympics, many forms of transportation must be analyzed to see how they will be impacted by the Games. In London, these affected systems include buses, taxis, cyclists, rail (both Tube and National Rail), river, and pedestrian traffic. The best way to assess the impacts on these systems is to assume the worst case scenario.

3.1 Rail

The rail system in London consists of two main rail providers: the London Underground (TfL) and the National Rail. To calculate the increase during the Olympics for a specific station or borough, we must first get the entrance and exit tallies from both TfL and National Rail. Using this information and the total amount of entrances and exits tallies (EET) on the Tube and National Rail on average a day,

3,422,384 and 2,918,866 respectively, we can calculate the percent of all rail journeys that take place on that specific Tube or Rail station.

$$\text{Percent Stations Usage} = \frac{\text{Average day EET for station or borough}}{\text{Average day EET for all rail}}$$

Equation 3

Once we have received a percent of the population that uses a specific station we can calculate how many additional people a day will use this station during the Olympics. The ODA predicts that there will be an estimated 20,000,000 more journeys on the Tube during Games time. This equates to 1,250,000 additional people per day riding on the Tube. We can extrapolate this to a specific station using the formula below.

$$\text{Additional people at station} = 1,250,000 * \text{Percent Station Usage}$$

Equation 4

Using the comparison between National Rail and Tube in your local borough, you can calculate the percent of people that take one service over another.

$$\begin{aligned} &\text{Percent Usage of Tube and National Rail} \\ &= \frac{\text{Average Service Usage}}{\text{Average Service Usage (1)} + \text{Average Service Usage(2)}} \end{aligned}$$

Equation 5

*Note (1) and (2) correspond to ether Tube or National Rail

The formula above will let you calculate how many people will take the Tube over National Rail or vice versa. We then apply this percent ratio over the increase in tube to find the quantitative amount of people that will take National Rail over Tube.

$$\begin{aligned} &\text{Additional people at National Rail Stations} \\ &= \frac{\text{Average service usage of National Rail} * \text{Additional people at station}}{\text{Average sevice usage of Tube}} \end{aligned}$$

Equation 6

Hounslow Example:

Year Entry and Exit Total	Average of 1 Day	% Total of Hounslow Rail Service	% of Service Tube	Average increase in passengers for 1 day during Olympics
2010				
29957010	11725	8.27%	10.51%	4262
27964110	10945	7.72%	9.81%	3998
22628540	8857	6.25%	7.94%	3235
17771120	6955	4.91%	6.23%	2540
41924630	16409	11.57%	14.70%	5993
28493360	11152	7.87%	9.99%	4073
13299870	5205	3.67%	4.66%	1901
14423705	5645	3.98%	5.06%	2062
23695435	9274	6.54%	8.31%	3387
17953255	7027	4.96%	6.30%	2566
27189945	10642	7.51%	9.54%	3887
19851255	7770	5.48%	6.96%	2838
285,152,235	111,806	78.71%	100.00%	40,763
2009-2010			National Rail	
954,572	2615	1.84%	8.67%	965
516,968	1416	1.00%	4.69%	517
1,116,026	3058	2.16%	10.13%	1117
770,508	2111	1.49%	6.99%	771
3,130,642	8577	6.05%	28.42%	3138
1,181,780	3238	2.28%	10.73%	1183
998,704	2736	1.93%	9.07%	999
848,790	2325	1.64%	7.71%	849
785,958	2153	1.52%	7.14%	787
711,426	1949	1.37%	6.46%	712
11,015,374	30,179	21.29%	100.00%	11,023
Total Both		141,785		

Figure 6: Example data from Hounslow Tube and National Rail Stations

As shown above, the stations in Hounslow had 111,606 passengers that take the Tube on average per day and 30,179 people that take National Rail per day. By taking Equation 3 and applying it to our Tube and National Rail number we get 1.76% and 3.26% of all rails respectively.

After we have received the percentages, we can extrapolate over the average amount of people predicted to increase on the Tube. To do this we will apply Equation 4 as shown above. We find that in Hounslow there will be 40,763 additional people using Tube stations. Using the ODA prediction that 79.94% of people will be taking a rail service, we can extrapolate this number over National Rail.

$$\frac{30,179}{111,606 + 30,179} = 21.29\%$$

Using Equation 6, we can calculate the amount of people expect to take national rail.

$$\frac{21.29 * 40,763}{78.71} = 11,023$$

For stations in Hounslow there is an expected 11,023 additional people taking national rail. Using the additional people and the normal amount for an average day, we found there is an increase of 36.52% increase on Hounslow stations. This is very close to the expected 35.71% increase that will be seen in London as a whole.

3.2 Highways

The Olympic impact on highways can be split into three categories: spectators traveling to the venues, the Olympic Family being transported to and from the Olympic Village, and spectators traveling to their accommodations. The Olympic Delivery Authority publishes their estimated breakdown for how spectators will travel to the Olympic venues (See Figure 7). The figure shows what percentage of spectators is going to use each form of transport to travel most of the distance to the venues. Only four of these modes of transportation use the highways in London: park-and-ride, direct coach, local bus, and taxi.

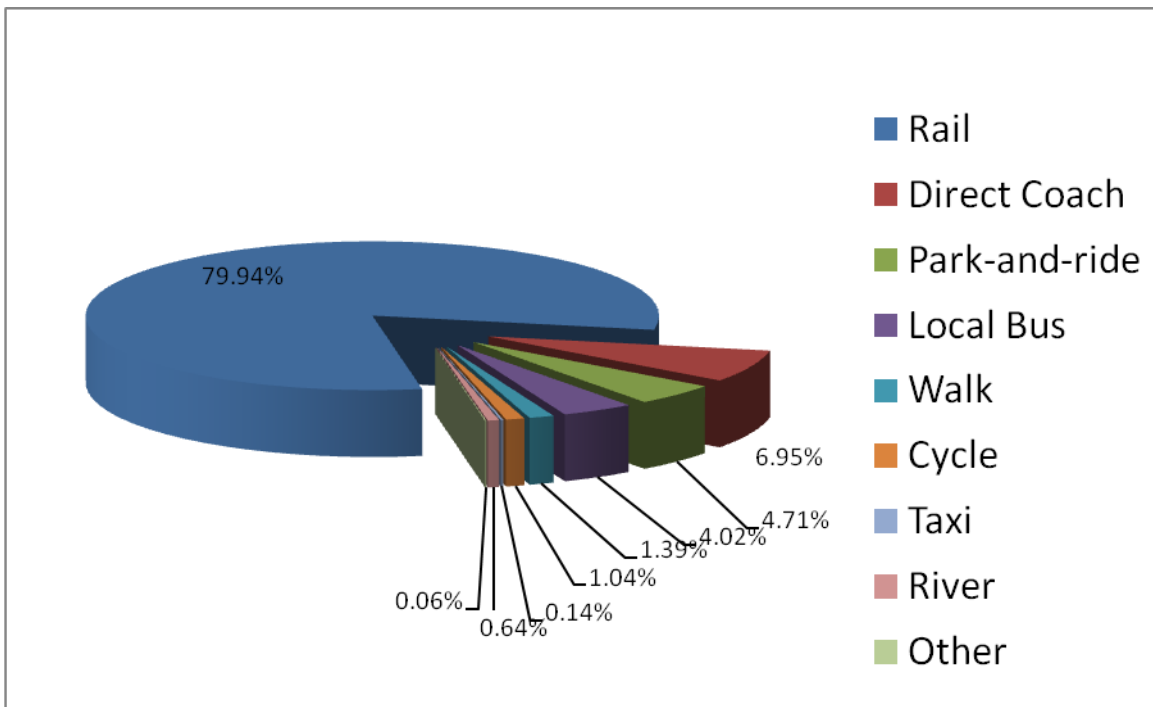


Figure 7: Spectator Transport to Venues (Data From: Olympic Delivery Authority, 2009)

3.3 Park-and-Ride

The ODA has three locations marked for park-and-ride: “Redbourn in Hertfordshire, at the Lakeside and Bluewater shopping centres and at Ebbsfleet International station” (Olympic Delivery Authority, 2011, p. 80). Park-and-ride produces bus traffic to and from those locations and the venues. Any boroughs near these locations would need to take into account the increased traffic from these Park-and-ride coaches. Direct Coach has a similar impact on the highways as park-and-ride, except there are dozens of locations across the United Kingdom. The ODA has published the planned routes that the coaches will take to the Olympic venues in their Move document (see Figure 8). This picture shows that all of the coaches will be entering London along one stretch of highway. To get more information on nearby routes, contact the ODA. Both local buses and taxis should not be a problem in any part of London. It was found that taxi and bus usage went down during the Sydney Games Henshera, D. A., & Brewera, A. M. (2010). Do not expect any change on local bus usage or taxi usage

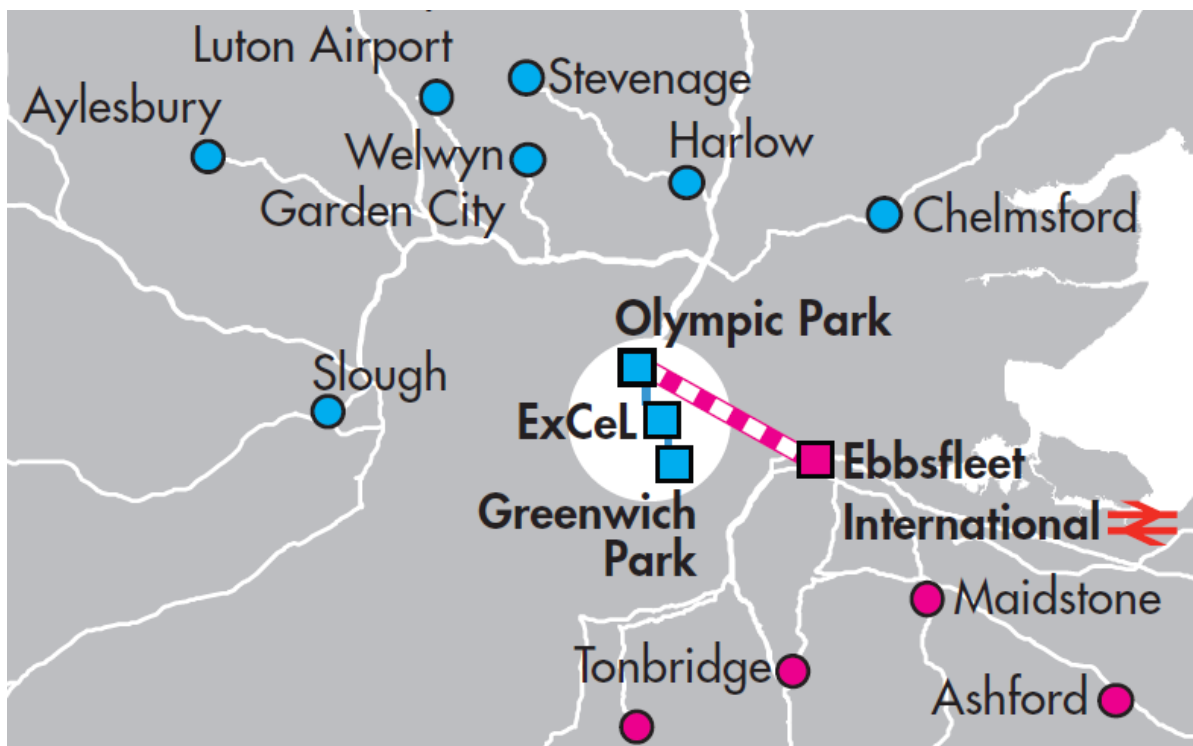


Figure 8: 2012 Games coach service network
(Olympic Delivery Authority, 2011, p.79)

There will be a significant increase in airline passengers traveling into London during the Olympics. To calculate the increase, we need estimates on how Olympic spectators travel compared to

average airline passengers. To gather this information you may need to contact your local airport. The DfT has compiled information on the increase in daily traffic through Heathrow airport, and it is possible that they have collected data on other airports as well, such as Gatwick Airport and London City Airport. Using this information we can calculate the baseline for the impact on airports on the highways. To do this, multiply the percentage of airline passengers who travel along the highway by the average number of airline passengers traveling through the airport per day. The BAA should have the average number of passengers departing the airport per day available on their website. Take the number of non-Olympic airline passengers arriving and departing and multiply it by the percentage of airline passengers who take the highway to and from the airport. That gives us the non-Olympic highway traffic generated from the airport. Next, multiply the number of Olympic spectators flying out that day by the estimated percentage of Olympic spectators who take the highway from the airport. Add the result to the number of non-Olympic highway traffic generated from the airport to find the total highway traffic generated from the airport during the Games. Compare this number to the baseline we calculated before to determine the impact that the airport will have on highway traffic.

Hounslow Example:

Direct Coach/Park-and-Ride

We found that both the Direct Coach service and the Park-and-ride services will avoid Hounslow completely. This is because the Direct Coach map shows that none of the coaches will pass through the borough and the three Park-and-ride locations are nowhere near Hounslow.

General M4 Traffic

The Department for Transport estimated that on the busiest day there would be 12,000 Olympic Family members departing Heathrow Airport. We divided that by the 6 Olympic Family members per vehicle and found there would be up to an additional 2,000 vehicles per day traveling along the highways in Hounslow. The Department for Transport has three count points on the M4 Motorway within Hounslow which are numbered 18487, 26012, and 47892. We averaged the reported daily vehicle counts and got 101,462 vehicles travel along the M4

Motorway in Hounslow per day in 2009 (Department for Transport, 2009). We divided the additional 2,000 vehicles by the average of 101,462 and found a 1.96% increase along the highways during the Olympics from the Olympic Family. This was all we could calculate for the effect on the M4 Motorway, because we could not find quantifiable data on how Heathrow passengers travel to and from the airport.

4 Works Cited

Department for Transport. (2009). *Annual Average Daily Traffic Flows*. Retrieved From www.dft.gov.uk/matrix on June 14, 2011

Department for Transport, (2010). *Air Traffic Review and Airport Capacity Assessment associated with the London 2012 Olympics and Paralympics*

Henshera, D. A., & Brewera, A. M. (2010) *Going for gold at the Sydney Olympics: How did transport perform?* *Transport Reviews* , 22 (4), 381-399.

The Olympic Delivery Authority. Retrieved 3/29, 2011, from <http://www.london2012.com/about-us/the-people-delivering-the-games/the-olympic-delivery-authority/index.php>

Appendix G: Informal letting breakdown

Wards	All Households (2001 Census)	Open Rooms (Calculated)	Under-crowded Households	Percentage	Percentage of 13,635	Occupancy rating + 2 or more	Occupancy rating + 1	Occupancy rating of 0	Occupancy rating of -1	Occupancy rating of -2 or less
Bedfont	4171	3038	3742	5.43%	740	1271	1200	1148	400	152
Feltham West	4394	2835	3602	5.06%	690	1172	1258	1372	417	175
Hanworth Park	4234	3393	4004	6.06%	826	1368	1268	1120	309	151
Feltham North	3822	3267	3791	5.83%	796	1334	1123	955	296	114
Hanworth	4320	2666	3545	4.76%	649	1198	1149	1303	461	209
Hounslow Heath	4091	1603	2993	2.86%	390	1036	921	1142	594	398
Cranford	3860	1893	3080	3.38%	461	1069	942	1022	467	360
Hounslow West	3551	1743	2850	3.11%	424	1015	820	924	477	315
Heston West	3875	1724	2964	3.08%	420	1036	892	1067	520	360
Heston Central	3775	2150	3229	3.84%	524	1157	915	929	469	305
Heston East	3816	2321	3379	4.15%	565	1226	927	915	438	310
Hounslow Central	4215	2030	3311	3.63%	494	1168	975	1170	523	379
Osterley and Spring Grove	4113	4179	4796	7.46%	1018	1929	938	789	297	160
Hounslow South	3838	3988	4529	7.12%	971	1790	949	705	247	147
Isleworth	4554	2434	3477	4.35%	593	1111	1255	1407	519	262
Syon	4150	2708	3418	4.84%	659	1117	1184	1296	396	157
Brentford	4682	2537	3620	4.53%	618	1283	1054	1538	531	276
Chiswick Riverside	4906	4110	4974	7.34%	1001	1930	1114	1223	414	225
Turnham Green	5076	3223	4415	5.76%	785	1636	1143	1416	570	311
Chiswick Homefields	4551	4149	4851	7.41%	1010	1939	973	1115	346	178

Definitions:

- All Households (2001 Census): the number of households in each ward according to 2001 census data
- Open Rooms (calculated): The approximate number of open rooms in each ward based off the occupancy rating columns (the last five columns). Note that this is not an exact number, but was used to distribute the total number of open rooms across the borough
- Under crowded households: The number of households with open rooms.
- Percentage: This column shows the percentage of open rooms that each ward accounts for.
- Percentage of 13,635: The number 13,635 is the census number for all open rooms in Hounslow. This number was distributed across each ward based on the percentage column.
- The remaining columns show how many households in each borough fit into each category of occupancy rating

Appendix H: Mind Map Completed Categories

H.1 Infrastructure

Fuel

What the base line is (what it is currently in the borough):

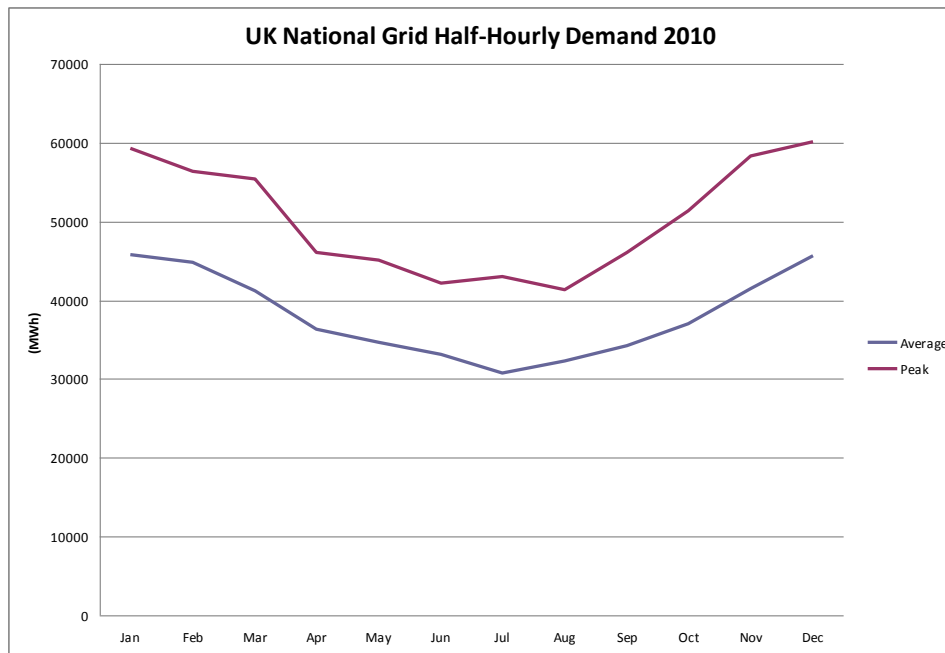
- UK Petroleum Industry Association sold £99 billion in gross sales in 2007 (ukpia-statistical-review-2010.pdf, p.11)

Identify what problems would impact the borough during the Olympics:

- Electricity & Petrol increase
- Spikes during TV breaks
- Supply chain
- Price spike

Quantify Problems/Impacts:

- We recognise that the need for fuel is going to increase due to business needs and the increase of people



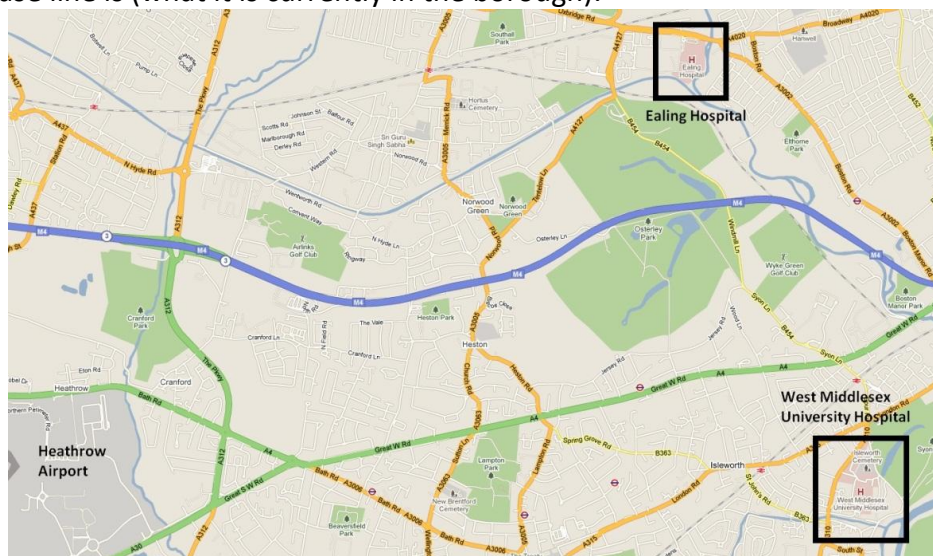
- Above chart shows the average and peak electricity usages over the 2010 year by month
 - Note: peak for august < average for December

Sources:

- ukpia-statistical-review-2010.pdf, <http://www.ukpia.com/files/pdf/ukpia-statistical-review-2010.pdf>

Heath

What the base line is (what it is currently in the borough):



Identify what problems would impact the borough during the Olympics:

- A+E attendance
- Staff shortages

Quantify Problems/Impacts:

- During Sydney:
 - 1740 cases of notifiable communicable diseases
 - notifiable diseases are high risk diseases that healthcare providers are required by law to notify authorities. At Sydney, 22 diseases were identified as high risk
 - This number was 1479 in 1999 and 2143 in 2001. Given an underlying upward trend, this number was not abnormally high
 - No unusual patterns or disease clusters were detected
 - 55339 emergency room visits
 - 5% greater than corresponding days in 1999 (51117) and 2001 (53173)
 - 1431 (approx. 2.7%) were from overseas visitors
 - This was 1.5% in 1999 and 1.9% in 2001
 - 12755 (23%) were for Olympic Surveillance target conditions
 - see attached table
 - similar number of target presentations in 2 weeks leading up to Games (344/day)
 - increased target presentations on Saturdays and Sundays (384/day)

- the day immediately after the closing ceremony had the highest number of target visits: 452
- country of residence recorded for 11718 target visits
 - 11213 (96%) were Australian residents
- slight increase in illicit drug related visits
- more injuries attributed to being struck by or colliding with a person or object
- more bicycle injuries
- more injuries on beaches, swimming pools, and premises licensed to sell alcohol.
- Only 217 (3.3%) of injuries occurred at Olympic venues
- Olympic family accounted for 225 presentations
 - 72 (32%) by athletes
 - 153 (68%) by officials
- Athens Olympic Pharmacy Data (possibly limited relevancy, as this seems to be the Olympic pharmacy for the Olympic family and volunteers and workers)
 - 240 different drug products
 - 3,802 prescriptions dispensed during the Olympics
- From London 2012 Public Health Lit Review
 - Major anticipated medical problems at the Olympics: heat-related illnesses, foodborne and waterborne illnesses, sexually transmitted diseases, and communicable diseases.
 - Events held in hot weather increase patient visit rates significantly
 - Mass gathering produce a higher incidence of injury or illness
 - Patient presentation rate of 0.992 per 1000 spectators
 - At Sydney, only 1 in 10 GPs reported that they were well prepared for the Games
 - Heat-related conditions increase from 0.4 to 11.5 cases per 1000 people at temperatures from 86F (30C) to 121F (49.4C)
 - Heat-related illnesses account for 2% of emergency room visits
 - Respiratory illnesses, minor injuries, heat-related injuries and minor problems comprise 75% of patient presentations
 - Many of these can be prevented via robust pre-Games information to attendees

Sources:

- London 2012 Public Health Lit Review
- Athens Olympic Pharmacy
- Sydney Public Health

Leisure Centres

What the base line is (what it is currently in the borough):

- Brentford Fountain Leisure Centre
- Heston Pool
- Lampton Sports Centre
- Osterley Sports & Athletics Centre

- Wellington Day Centre
- Hanworth Air Park Leisure Centre & Library
- Isleworth Leisure Centre & Library
- New Chiswick Pool
- Southville Community Centre & Children's Centre

Identify what problems would impact the borough during the Olympics:

- Usage increase

Quantify Problems/Impacts:

- Usage may increase due to 15% population increase of tourists

Background:

- All leisure centres are open to anyone
- Pre-established entry fees

Sources:

- http://www.hounslow.gov.uk/index/leisure_and_culture/leisure.htm

Parking

What the base line is (what it is currently in the borough):

- Currently no major parking problems in Hounslow

Identify what problems would impact the borough during the Olympics:

- No place to park
- No parking for local residents
- Local Rail Stations may be crowded for Event transportation

Quantify Problems/Impacts

- Local Rail Stations may be crowded
 - Gunnersbury Over ground station may be over crowded due to transportation into Olympic Park
- No Parking for local residents
 - Local parking problems areas will start requiring parking permit so resident can find parking during Games time
 - Low parking frequency areas will not be affected

Sources:

- Parking Consultation Summary Booklet:
 - Controlled parking Zone K (Hackney Wick)

Parks

What the base line is (what it is currently in the borough):

- Hounslow has highest percent of parks and open spaces out of London Boroughs
- Has 6 parks and open spaces

Identify what problems would impact the borough during the Olympics:

- Increased Use
 - Due to increase amount of people in the Borough
- Littering (Waste)
 - Also due to increased amount of people
- Upkeep
 - Also due to increased amount of people

Information and background:

- Open spaces attract less tourists than parks do

Quantify Problems/Impacts:

- Increased Use
 - About 20% of visitors to parks are tourists (1) (p39)
 - 72% of visitors were domestic
 - 22% were UK tourists
 - 6% were overseas visitors (p40)
- Littering/Upkeep (2) (p1)
 - 30% of people litter in public places
 - There is no stereotypical litter

Sources:

- <http://www.lga.gov.uk/lga/aio/341744>
- http://www.litter.vic.gov.au/resources/documents/060725_Fact_Sheet_Littering_Statistics_HR.pdf

Contacts:

Tel: 0845 456 2796.

Email: hounslow-info@laing.com

Telecoms

What the base line is (what it is currently in the borough):

Identify what problems would impact the borough during the Olympics:

- Coordination of emergency response
- Transportation
- Increased demand for data

Quantify Problems/Impacts:

Information and background:

- BT is creating dedicated mobile service for VIP's, Athletes, and dignitaries (BT Considering Public....)
- BT is looking into putting in Wi-Fi to all Olympic areas to lessen load on cellular networks. (BT Considering Public....)
- Wi-Fi will be put into tube to help with data streaming and network usage.

Sources:

- <http://www.redswhitesandblacks.com/blog/entry/1521391/bt-considering-public-wifi-network-for-london-2012-olympics>
- <http://www.eweekurope.co.uk/news/news-networking/bt-targets-olympic-deadline-for-nga-rollout-2849>
- <http://www.broadbandbuyer.co.uk/Shop/PageTextDetail.asp?TextID=980>

Waste

What the base line is (what it is currently in the borough):

- N/A

Identify what problems would impact the borough during the Olympics:

- Olympic Route Network (ORN)
 - How will this effect trash pick up
- Staff Shortages
 - How will Games Time affect the amount of people that show up for work
- Increased Demand
 - More people in the borough will increase the amount of rubbish in the area
- Frequency of Pickups
 - Possible increase in pickups to compensate for increased demand

Quantify Problems/Impacts:

- To get quantifying information we will need to go through the ORN on which days and figure our which 'zones' are effected during Games Time

Background:

- The London Borough of Hounslow is using SITA UK for their rubbish service (Hounslow Recycling)
- Rubbish Collection is split up into zones which are collect on a calendar (Hounslow Recycling Collection Calendar).

Sources:

- http://www.hounslow.gov.uk/index/environment_and_planning/recycling.htm
- http://www.hounslow.gov.uk/index/environment_and_planning/recycling/collection_days/collection-calendar-apr2011.htm

Contacts:

recycling@hounslow.gov.uk

Tel: 020 8583 5555

Fax: 020 8583 5134

Weather

What the base line is (what it is currently in the borough):

Identify what problems would impact the borough during the Olympics:

- Good Weather
 - Event attendance Up
 - AirCon and Electricity up
 - Parks/attractions/leisure
 - Transportation usage
 - Business demand
 - Nigh time economy
 - A & E attendance
 - Crime Increase/Fire
- Bad Weather
 - More transportation usage
 - Road incidents
- Water Shortages
 - Leisure Centres
 - Vulnerable People
 - Business
 - Bottled Water
 - Restaurants

Quantify Problems/Impacts:

- Good Weather
 - A & E attendances
 - The better the weather the more A & E attendances there are specifically in children (Effect of weather on attendance....) about a 30% increase during summer months
 - Crime Increase
 - Many types of violent crimes increase around 85F but decrease sharply at 90F (Weather and Crime) (p. 7)
 - Temperature and Aggression (p 1164)

- Business demand
 - Shown that warm better weather does increase spending, normally is a push over a season but might increase if better weather during games card. (p 15) (The Effect of weather on retail sales)
- Electricity usage
 - Can expect more then 2,800 megawatt surges after major events (Britain sees royal wedding....)
- Drought
 - According to the risk register it would take 3 dry winters to cause a severe drought.
 - Average Annual rainfall is 598.8mm
 - 2010 was a dry year with only 421.4mm, but 2009 and 2008 are both pretty wet years (582.8mm and 656.6 respectful)
 - If 2011 is a dry year there is a risk of a drought
 - Worst-case there will be roughly 30,000 more people in need of water (number from our population density)

Sources:

- <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1726036/pdf/v020p00204.pdf>
- http://www.geog.ubc.ca/courses/geob370/students/class07/crime_weather/misc/weather_and_crime.pdf
- <http://www.seattlepi.com/entertainment/article/Britain-sees-royal-wedding-electricity-surge-1358510.php>
- <http://www.metoffice.gov.uk/climate/uk/stationdata/heathrowdata.txt>

H.2 Transport

Buses

What the base line is (what it is currently in the borough):

Identify what problems would impact the borough during the Olympics:

- Increased demand
- Change routes

Quantify Problems/Impacts:

Background:

- 3.4 million boardings per week in August 2000
- 3.2 million boardings per week during the Olympics
- adds up to more than 5.5 million, which is the publicly released figure
- “Patronage overall did not increase much, if at all during the Olympics. STA lost some patronage due to school holidays, extended university holidays, commuters on leave or different work patterns, and gained some due to increased tourists, but not all Olympic ticket holders bought bus tickets on the STA route services, as was expected” Stott 2000). It is difficult to compare the September holidays the previous year owing to different circumstances plus annual growth. STA did not experience the high loadings predicted by the ORTA model on some corridors (although that was a ‘worst-case’ planning scenario).”

Sources:

- Going for gold at the Sydney Olympics: how did transport perform?

Cars

What the base line is (what it is currently in the borough):

Count Points on M4 in Hounslow (Traffic Data – Hounslow, dft.gov.uk)

RName	LACode	LName	CP	Road	RdSeq	Year	CAR	All_MV
London	5540	Hounslow Borough Council	18487	M4	740	2009	105563	125029
London	5540	Hounslow Borough Council	26012	M4	750	2009	72439	86388
London	5540	Hounslow Borough Council	47892	M4	760	2009	78902	92968

Count Points Between M4 & Heathrow (Traffic Data – Heathrow to M4, dft.gov.uk)

RName	LACode	LName	CP	Road	RdSeq	Year	CAR	All_MV
London	5510	London Borough of Hillingdon	36013	M4	3720	2009	56903	61428

Daily Passengers into Heathrow (Aug 2009) – **212,790**

Need to know how many people take a car/taxi from Heathrow

Identify what problems would impact the borough during the Olympics:

- Spectator Transport Types which use the Road/ORN
 - Park-and-ride
 - The Park-and-ride stops are West and North of the venues, not near Hounslow (ODA Move)
 - Coach
 - The Coach route does not pass through Hounslow (ODA Move)
 - Local Bus
 - Sydney saw almost no change in bus usage
 - ODA only expects 3.5% of spectators to use the buses during the Olympics
 - ODA says “buses will be a significant local facility, including for those working at and around
 - Games venues.” (Move: June 2011, p.81)
 - Taxi
 - At Sydney, taxis at the airport reported the quietest days.
 - We expect no change in taxi usage during the Olympics
- Increased number of cars
- ORN limiting the road usage
 - Lose of a lane, with the same amount of traffic passing through
 - Increased chance of congestion
- More foreign drivers
 - Not likely, since the ODA estimates that none of the ticketed spectators will drive to the venues.
 - Minor increase
- More congestion on side roads
 - Taxi usage is not going to increase
 - Congestion on highways could spill over onto side roads

Quantify Problems/Impacts:

- Spike in car traffic to/from Heathrow on 26/07/2012 & 13/08/2012. DfT predicts those to be the largest spikes in Olympic related flights out of Heathrow.
 - Avg. Heathrow – 106,000 arrivals & departures
 - Avg. Cars traveling to/from the M4 & Heathrow 56,903 (from DfT count point 36013)

○ Estimated Airport Stats

			<u>Arrivals</u>		
	Base Traffic (after displacement)	Olympic- Generated	Olympic- Generated (Spectators)	Olympic- Generated (Other)	Total
26/07/2012	96	31	23	7	127
13/08/2012	108	0	0	0	108
			<u>Departures</u>		
	Base Traffic (after displacement)	Olympic- Generated	Olympic- Generated (Spectators)	Olympic- Generated (Other)	Total
26/07/2012	112	0	0	0	112
13/08/2012	94	52	40	12	146

- There needs to be collected for how many arriving & departing passengers take a car or taxi to/from Heathrow
- This should also be estimated for the Olympic-generated arriving & departing passengers
- Also, determining the number of non-passengers (employees, etc) traveling to/from Heathrow would make predictions much more accurate

Sources:

- Olympic Move Document
- Going for gold at the Sydney Olympics: How did transport perform?

Cyclist

What the base line is (what it is currently in the borough):

- About 16,000 bike trips per day in Hounslow
- 545000 cyclist trips in London per day * ratio of Hounslow to London populations from 2001 census
- In 2008, 27 casualties per 100,000 population so Hounslow estimate about 60 casualties

Identify what problems would impact the borough during the Olympics:

- Increased demand for bicycles
- More accidents

Quantify Problems/Impacts:

- 1% of spectators are expected to use bicycles to transport to the Olympics
 - Due to the 15% increase in population there will be more than 16,000 bike trips made per day in Hounslow
- 27 casualties per 100,000 population, 32500 population increase therefore an increase of 9 casualties

Background:

- In Sydney the amount of bicycle accidents increased during Games Time

Sources:

- 2001 Census
- <http://www.thisislondon.co.uk/standard/article-23731158-bike-thefts-soar-by-75-as-crime-gangs-move-in.do>
- <http://www.dft.gov.uk/pgr/statistics/datatablespublications/accidents/casualtiesgb/ar/suppletablesfactsheets/pedalcyclist2008.pdf>

Flights

What the base line is (what it is currently in the borough):

- 481,000 planes in 2007
- 479,000 planes in 2008
- 467,000 planes in 2009
- 484,000 estimated planes in 2012
- Average 112,000 passengers arriving in Heathrow during Games Period (Minus Olympic-Generated)
- Average 116,000 passengers departing Heathrow during Games Period (Minus Olympic-Generated)

Identify what problems would impact the borough during the Olympics:

- Increase of passengers
- Time-related peaks during the Games
- Indirect increase in public transport

Quantify Problems/Impacts:

- Increase of passengers:
 - Average extra 8000 passengers entering through Heathrow per day between 13/7 and 10/8
 - Average extra 11,000 passengers departing through Heathrow per day between 30/7 and 20/8
- Time-related peaks during the Games:
 - Most people entering day before Opening Ceremonies (26/7)
 - Most people leaving day after Closing Ceremonies (12/8)

- Indirect increase in public transport: more people coming out of Heathrow will increase traffic on Tube and ORN

Sources:

- Heathrow Base Data Table
- Passenger Movement for Heathrow Summer 2012 Table

Pedestrian

What the base line is (what it is currently in the borough):

Identify what problems would impact the borough during the Olympics:

- More crowded

Information and background:

- Legion provided software that predicts pedestrian movement, this helped planners of Sydney Olympics to find troubled bottle necks to help movement in and out of Olympic Park which would help with entrance/exit and potential emergency evacuation. (Sydney Olympics: Simulation)

Quantify Problems/Impacts:

Sources:

- <http://www.legion.com/case-studies/sydney-olympics>

Rail

Identify what problems would impact the borough during the Olympics:

- Additional Services
- Increased demand
- Heathrow
- Movement in stations slow down
- Reduced access to pay stations
- Additional parking
 - Park and Ride
- Increased luggage

Information and background:

- Train usage was well below forecasted figures
- Use of volunteers in stations provided a high level of community service and improved flow substantially
- Normal rail stations were largely unaffected

Table 1. CityRail patronage during the Games (total daily passenger journeys 3 am to 3 am).

	Date September	Journeys	Initial forecast	Revised forecast	Olympic Park* journeys	Cumulative Olympic Park journeys
Wednesday	13	1 126 000	1 336 000		169 900	169 900
Thursday	14	1 252 000	1 536 000		91 600	261 500
Friday	15	1 264 000	1 515 700		182 000	443 500
Saturday	16	1 089 000	1 705 800		223 000	666 500
Sunday	17	1 178 000	1 600 100	1 332 000	315 000	981 500
Monday	18	1 394 000	1 824 600	1 674 600	235 200	1 216 700
Tuesday	19	1 495 000	1 858 400	1 450 000	295 200	1 511 900
Wednesday	20	1 511 000	1 799 000	1 400 000	314 500	1 826 400
Thursday	21	1 588 000	1 770 600	1 594 000	293 800	2 120 200
Friday	22	1 918 000	2 104 300	1 894 000	584 200	2 704 400
Saturday	23	1 767 000	2 063 900	1 858 000	596 800	3 301 200
Sunday	24	1 719 000	1 863 500	1 677 000	557 700	3 858 900
Monday	25	1 775 000	1 928 800	1 736 000	508 100	4 367 000
Tuesday	26	1 639 000	1 790 100	1 522 000	253 900	4 620 900
Wednesday	27	1 839 000	1 986 200	1 788 000	508 200	5 129 100
Thursday	28	1 741 000	1 971 300	1 774 000	495 700	5 624 800
Friday	29	1 882 000	1 966 600	1 770 000	516 600	6 141 400
Saturday	30	1 675 000	1 841 900	1 658 000	522 000	6 663 400
Sunday	1 Oct	1 628 000	1 588 300	1 429 000	289 700	6 953 100
Total					*Includes Concord West.	
		29 480 000				

Source: Rail Coordination Centre (Rail Development).

Quantify Problems/Impacts:

- Heathrow
 - Look at Heathrow section of report to find amount of new passengers coming into Country during games times.

Sources:

- www.rail-reg.gov.uk
 - Go to Rail Statistics
 - Stations usage data
- During Sydney
- <http://www.rail-reg.gov.uk/server/show/nav.1529>
- http://www.rail-reg.gov.uk/upload/pdf/stn_usage_report_0910.pdf

River

Identify what problems would impact the borough during the Olympics:

- Increased moorings

Quantify Problems/Impacts:

- Number of boats on the water should not increase

Background:

- Boats only allowed on Thames during Olympics if they have pre-booked and confirmed mooring site

Sources:

- <http://www.boatingonthethames.co.uk/London-Olympic-and-Paralympic-Games-2012>

Taxis

What the base line is (what it is currently in the borough):

- 23500 licensed taxis in London

Identify what problems would impact the borough during the Olympics:

- Increased Demand
- Additional taxis
- Additional illegal taxis
- More road accidents
- More congestion on side roads

Quantify Problems/Impacts:

- If similar to Sydney, will not have a problem, there will actually be an excess of taxis

Background:

- During Sydney:
 - Taxis were predicted to be a major problem prior to the Olympics
 - Taxis handled the demand well
 - Distinct lack of demand away from the airport
 - One of the quietest times ever for taxis due to successful train system
 - Free bus and train travel
 - 10% surcharge on taxi travel

Sources:

- Olympic Move Document
- Going for gold at the Sydney Olympics: How did transport perform?

H.3 Businesses

Business Owners

What the base line is (what it is currently in the borough):

All VAT and/or PAYE Based Local Units	10220
Agriculture, Forestry & Fishing	15
Production	340
Construction	705
Motor Trades	235
Wholesale	650
Retail	1010
Transport & Storage (Including Postal)	640
Accommodation & Food Services	610
Information & Communication	1380
Finance & Insurance	195
Property	340
Professional, Scientific & Technical	1575
Business Administration & Support Services	950
Public Administration & Defence	55
Education	205
Health	475
Arts, Entertainment, Recreation and Other Services	840

Yellow Cells – Directly Impacted Industries

Red Cells – Indirectly Impacted Industries

White Cells – Unaffected Industries

Identify what problems would impact the borough during the Olympics:

- Misuses of IT (Not relevant)
 - Employees will be using IT to track scores. Can't be quantified accurately
- Increase staff levels
 - Unlikely for businesses to have more people on hand
 - More likely that workers will work longer hours
- Increased sickness
 - Expect up to 27% of employees to call in sick or take leave during the Games
- Supply chain
 - Delivery restrictions
 - Delivery Delays
 - route changes
- Manage deliveries with restriction (same as Supply Chain)
 - Extra restrictions during the Olympics
- Change business plan
 - At least 40% of businesses will be adjusting their business plan, since they reported to Deloitte that they believe the Games will have more than a minimal impact on their business.
- Predict increase of sales
 - Expect an increase in sales based on the increased population (15%)
 - Businesses could run out of supplies faster
 - Sales in tourist locations increased by 40-80%
(http://pandora.nla.gov.au/pan/13323/20020919-0000/www.gamesinfo.com.au/pdf/PWC_RPT_8_Final_4jul02_Tourism_Retail.pdf gotten on 02 Jun. 11)
- Increase price (Not Relevant)
 - Expect retail to increase prices
- Widen target audience (Not Relevant)
 - Retail businesses will create a market for the extra tourists
- Sell Olympic merchandise
 - Retail businesses will create a market for the extra tourists
 - Opportunity for business owners
- Parking restrictions
 - The increased the number of cars and parking restriction during the Games will cause problems for certain business owners
- Advertising
 - Businesses have the opportunity to advertise more during the Olympics
- Waste cleared
 - Reference waste clearance
- Change in licensing

- Business Owners may want to change licenses to stay open longer hours during the Games
- No meeting/hotel rooms
 - Business owners need to be prepared for all hotels to be fully booked

Quantify Problems/Impacts:

- Increased sickness
 - Expect up to 27% of employees to call in sick or take leave during the Games (data from Sydney)
- Supply chain
 - Manage deliveries with restriction
 - Current restrictions on Sainsbury's are deliveries must be from 6am to 11pm
 - Current restrictions on heavy goods vehicles (maximum gross weight >18 tonnes) traveling through London
 - The times below are the times trucks cannot drive in London
 - **Times of restrictions and charges**
Monday to Friday: 9pm - 7am (including 9pm Friday night to 7am Saturday morning).
Saturday: 1pm - 7am Monday morning.
 - The Olympics might force businesses to have night deliveries, which would increase noise pollution
- Change business plan
 - At least 40% of businesses will be adjusting their business plan, since they reported to Deloitte that they believe the Games will have more than a minimal impact on their business.
- Predict increase of sales
 - Expect an increase in sales based on the predicted increased population (up to 15%)
 - Businesses could run out of supplies faster
- Sell Olympic merchandise
 - Retail businesses will create a market for the extra tourists
 - Opportunity for business owners
 - Only expect around a 15% increase in customers (higher for retail businesses near Heathrow and lower further east)
- Parking restrictions
 - The increased the number of cars (Transport Stat) and parking restriction during the Games will cause problems for business owners needing parking during the games. Parking will be scarce.
- Waste cleared
 - Reference waste clearance
- Change in licensing

- Business Owners may want to change licenses to stay open longer hours during the Games
- Suggested Business owners adjust their hours to allow customers and employees to arrive at off-peak hours, may require some businesses to be open earlier/later
- No meeting/hotel rooms
 - Business owners need to be prepared for all hotels to be fully booked

Sources:

- 2001 Census
 - Business Types:
 - <http://www.neighbourhood.statistics.gov.uk/dissemination/LeadTableView.do?a=7&b=276760&c=hounslow&d=13&e=9&g=338039&i=1001x1003x1004&o=1&m=0&r=1&s=1306934897988&enc=1&dsFamilyId=2066>
- ODA Keep on Running
- London Lorry Control
 - <http://www.londoncouncils.gov.uk/services/londonlorrycontrol/default.htm>

Customers

What the base line is (what it is currently in the borough):

- GLA Economics estimates that London's total exports of goods and services totalled £58.7bn in 2007 (ec-evidence-base-oct-2009.pdf, p.20)
- In 2007 London's GVA (Gross Value Added, way of calculating goods sold) on a workplace basis was over £250 billion (ec-evidence-base-oct-2009.pdf, p.43)

Identify what problems would impact the borough during the Olympics:

- Harder to shop/park/be a customers
 - Parking Problems
- Reduced merchandise
- Increased prices

Quantify Problems/Impacts:

- Sydney Sales
 - Estimated Olympic sales totalled \$1,393 million (in 1992 prices)
 - Estimated by the Auditor General in 1994 (p. 25 Sydney Olympics 2000)
 - \$1,393 million in 1992 = £1,356.81 million in 2011
- Industry Impact at Sydney
 - Personal Service Estimated Increase in New South Wales for the Olympics \$108.4 million (1990-91 prices)
 - \$108.4 million in 1992 = £105.58 million in 2011

- 0.05% increase in London's GVA

Sources:

- 'Sydney Olympics 2000: Performance Audit Report: Review of Estimates
 - http://www.treasury.nsw.gov.au/data/assets/pdf_file/0020/6644/TRP97-10_The_Economic_Impact_of_the_Sydney_Olympic_Games.pdf
- GLA Economics: Economic Evidence Base – October 2009 version
 - <http://www.tfl.gov.uk/assets/downloads/corporate/ec-evidence-base-oct-2009.pdf>
- US Inflation Calculator
 - <http://www.usinflationcalculator.com/>
- http://www.london.gov.uk/archive/mayor/publications/2009/docs/consumer_expenditure/consumer_expenditure-report-p1.pdf (p. 23)

Employees

What the base line is (what it is currently in the borough):

- There are currently **103,623** workers in Hounslow.
- Industries are broken up into three categories: directly affected, indirectly affected, and unaffected. Directly affected businesses will be directly impacted by the increased population in London during the Olympics. Indirectly affected businesses will be affected by the directly affected businesses needing to handle increased demand. Unaffected businesses will be minimally affected by the Games.
 - **Directly Affected Industries:** (Wholesale & retail trade; repair of motor vehicles; Hotels and catering; Financial intermediation; Health and social work; Other)
Based on the ODAs
 - **Indirectly Affected Industries:** (Agriculture; hunting; forestry; Fishing; Manufacturing; Electricity; gas and water supply; Transport storage and communication)
 - **Unaffected Industries:** (Mining & quarrying; Construction; Real estate; renting and business activities; Public administration and defence; Education)
 - **41%** of workers and **28%** of businesses are involved in an industry which will be directly affected by the Olympics.
 - **25%** of workers and **39%** of businesses are involved in an industry which will be indirectly affected by the Olympics.
 - **34%** of workers and **28%** of businesses are involved in an industry which will be minimally affected by the Olympics

	Count	Percentage
People aged 16-74 who usually travel to work by: Underground, Metro, Light Rail or Tram	13112	12.65%
People aged 16-74 who usually travel to work by: Train	5671	5.47%
People aged 16-74 who usually travel to work by: Bus, Mini Bus or Coach	12314	11.88%
People aged 16-74 who usually travel to work by: Motorcycle, Scooter or Moped	1448	1.40%
People aged 16-74 who usually travel to work by: Driving a Car or Van	46771	45.14%
People aged 16-74 who usually travel to work by: Passenger in a Car or Van	3479	3.36%
People aged 16-74 who travel to work by: Taxi or Minicab	301	0.29%
People aged 16-74 who usually travel to work by: Bicycle	3185	3.07%
People aged 16-74 who usually travel to work by: On foot	8265	7.98%
People aged 16-74 who usually travel to work by: Other	410	0.40%
Total	103623	

Identify what problems would impact the borough during the Olympics:

- Slower commute/business travel
 - How much slower is the Tube/Bus/Roads? (division in borough is above)
- HR restrictions
 - We don't care about HR restrictions much
- Parking problems
 - How many more cars are in each areas?
- Change in working patterns
 - What are the new working patterns?
 - 22% will work from home
 - Non-retail businesses will likely have over 27% of employees taking leave from work
 - Statistics from Sydney
 - 27% of employees took leave from work
 - 24% of employees changed the number of hours they worked per week
 - 22% of employees worked remotely

- 18% of employees travelled to/from work at different times
- 15% of employees changed the number of days worked per week
- London is attempting to get similar numbers from its businesses

Quantify Problems/Impacts:

- Need Transport Estimates for commute and parking
- Change in working patterns
 - Statistics from Sydney
 - 27% of employees took leave from work
 - 24% of employees changed the number of hours they worked per week
 - 22% of employees worked remotely
 - 18% of employees travelled to/from work at different times
 - 15% of employees changed the number of days worked per week
 - London is attempting to get similar numbers from its businesses
 - Businesses should expect these numbers from their employees unless strict HR policies are in place. If HR policy does not allow leave from work during the Games, expect up to 27% of employees to call in sick.
 - Businesses should use the statistics from Sydney as a point of reference for preparing for staff shortages. According to Deloitte's research, 60% of businesses think the Games will have minimum impact on their business. However, over 28% of businesses in Hounslow deal with retail, personal service, tourism, leisure, food, or entertainment. The ODA says that these services are unlikely to allow workers to have time off. This is most likely because these businesses are going to be directly impacted by the increase in visitors. The impact on these businesses will indirectly affect the suppliers of the businesses as well, which includes another 39% of businesses. Therefore, planners should prepare for businesses to be unprepared to deal with the Olympics.

Background:

- The Sydney data is in the ODA's *Keep on Running* document. The worker demographics are in the 2001 census under Economic Deprivation and Work Deprivation.

Sources:

- 2001 Census – Worker breakdown
 - Travel Type - <http://www.neighbourhood.statistics.gov.uk/dissemination/LeadTableView.do?a=7&b=276760&c=hounslow&d=13&e=9&g=338039&i=1001x1003x1004&o=1&m=0&r=1&s=1306931012961&enc=1&dsFamilyId=123>

- Businesses by Type -
<http://www.neighbourhood.statistics.gov.uk/dissemination/LeadTableView.do?a=7&b=276760&c=hounslow&d=13&e=4&g=338039&i=1001x1003x1004&o=1&m=0&r=1&s=1306930982133&enc=1&dsFamilyId=2066>
- Industry of Employment -
<http://www.neighbourhood.statistics.gov.uk/dissemination/LeadTableView.do?a=7&b=276760&c=hounslow&d=13&e=9&g=338039&i=1001x1003x1004&o=1&m=0&r=1&s=1306930996570&enc=1&dsFamilyId=27>
- Keep on Running Document – Sydney data

Supply Chain / Food

What the base line is (what it is currently in the borough):

- Current Delivery
 - Current restrictions on Sainsbury's are deliveries must be from 6am to 11pm
 - Current restrictions on heavy goods vehicles (maximum gross weight >18 tonnes) traveling through London
 - The times below are the times trucks cannot drive in London
 - Times of restrictions and charges
Monday to Friday: 9pm - 7am (including 9pm Friday night to 7am Saturday morning).
Saturday: 1pm - 7am Monday morning.

Identify what problems would impact the borough during the Olympics:

- Disruption to transport
 - Plan routes that avoid the Olympic Route Network
- Increased demand on Supply Chain
 - The overall impact of the Games is to increase Australian economic activity by 0.12% over a 12 year period from 1994-95 (Haynes, p. 6)
- Parking/stopping restriction
 - Could prevent trucks from delivering goods
 - Unlikely to have many more restrictions than there already are around ORN, except temporary restrictions to maximize the efficiency of ORN when needed. (Move, p. 37)
 - Increased number of cars could slow down trucks
- Impacts on suppliers
- Reduction in supplies

Quantify Problems/Impacts:

- Impact on suppliers
 - Expect to need supplies to service up to 15% more customers. This will change depending on the business' proximity

- “Over the 60 days of Games time approximately 14 million meals will be needed – equivalent to around 2% of the number of school meals served in the UK over a year.” (Only accounts for meals served at Olympic venues & the Olympic village) (<http://www.soilassociation.org/LinkClick.aspx?fileticket=ys9NTDlvulA%3D&tabid=387>)
- Olympic Village catering, Sydney 2000
 - Milk 75 000 litres
 - Eggs 19 tonnes
 - Cheese 21 tonnes
 - Bread 25 000 loaves
 - Seafood 82 tonnes
 - Poultry 31 tonnes
 - Meat 100 tonnes
- “During the period 1 September to 4 October 2000, food inspection teams reported details of 6278 food safety inspections of food outlets at Olympic venues, including 2469 compliance audits and 3809 hygiene checks. Of these, 540 compliance audits (21.9%) and 245 hygiene checks (6.4%) were unsatisfactory, resulting in verbal warnings and follow up inspections. Food vendors voluntarily destroyed 7.5 tonnes of food after they had been advised of food safety risks. This included 7 tonnes of spoiled food from a single food outlet, caused by a refrigeration failure.” (Watching the Games: public health surveillance for the Sydney 2000 Olympic Games.)
 - Source is on Dropbox->Urban Planning->Health
- Impact on Businesses
 - The Olympics might force businesses to have night deliveries, which would increase noise pollution

Background

- Information stated above concerning Sydney Olympics

Sources:

- Jill Haynes http://olympicstudies.uab.es/pdf/od013_eng.pdf got on 02 Jun. 11
- ODA's Move Document

H.4 Residents

Children

What the base line is (what it is currently in the borough):

- 2001 Census: 43732 0-15 year olds
- Adjusted 2008 Data: 45845 0-15 year olds

Identify what problems would impact the borough during the Olympics:

- More Child Care

Quantify Problems/Impacts:

- Consider Sydney method

Background:

- Sydney:
 - Extra child care available during 3 week period of the Olympics
 - Government approved pool of places able to be used to provide extra child care
 - No specific number of facilities set aside for child care

Sources:

- <http://www.formerministers.fahcsia.gov.au/larryanthony/mediareleases/2000/Pages/olympicchildcare.aspx>

Elderly and Disabled

What the base line is (what it is currently in the borough):

- See accompanying excel document.
- 8520 people with mobility requirement
- 8840 people with care requirement
- Males 65 and over, females 60 and over: 29275

Identify what problems would impact the borough during the Olympics:

- Disruption to home visits
- Disruption to transportation, ability to get food and other supplies
- Accessibility

Quantify Problems/Impacts:

- Accessibility
 - On the busiest day of competition, 23,000 ticket holders could have difficulty using stairs and escalators – will most likely be using public transportation
 - 7% of spectators will have difficulty using stairs and escalators

- 1% of spectators will be completely unable to use stairs and escalators
- 1200 wheelchair spaces across Olympic Park venues
 - All are expected to be filled on day 7
 - Major public transport and Blue Badge parking spaces can accommodate up to 1400 people in wheelchairs
- The number of disabled attending the Olympic Games will be higher than the Paralympic Games.
- 13 different modes of transport can be used by accessible people to get to the games
- 25% of the Underground will be step-free by 2012
- Home Care
 - Provided 365 days a year between 6:30am and 10:30pm
- There are 8 residential care homes in Hounslow

Sources:

- ODA Accessible Transport Strategy
- <http://www.neighbourhood.statistics.gov.uk/dissemination/LeadTableView.do?a=7&b=276760&c=hounslow&d=13&e=6&g=338039&i=1001x1003x1004&m=0&r=1&s=1306922388305&enc=1&dsFamilyId=1355>
- <http://www.neighbourhood.statistics.gov.uk/dissemination/LeadKeyFigures.do?a=7&b=276760&c=hounslow&d=13&e=13&g=338039&i=1001x1003x1004&m=0&r=1&s=1306925419282&enc=1>

Ethnic Concentrations

What the base line is (what it is currently in the borough):

- 56% White British
- 9% White Other
- 25% Asian/Asian British
- 4% Black/Black British
- 1% Chinese
- 3% Mixed (White/Other)
- 2% Other

Identify what problems would impact the borough during the Olympics:

- Ethnic Conflicts
- Translation Services
- Spontaneous Events

Quantify Problems/Impacts:

- 203 different countries participating in the Olympics
- English, French are 2 main Olympic languages
- Different countries/religions may have cultural celebrations during Games Time

- 299 languages spoken at Sydney 2000 Olympics
- How you got the information:
- Find major languages spoken by each individual country participating in the Olympics (link below). Make list of languages, eliminating doubles.

Sources:

- http://wiki.answers.com/Q/What_countries_will_be_competing_in_the_2012_Olympics

Healthy Adults

What the base line is (what it is currently in the borough):

- There are (69.56% of population) economically active people ages 16-74 in Hounslow (From 2001 Census)

Identify what problems would impact the borough during the Olympics:

- Work Disruption
- HR restrictions

Quantify Problems/Impacts:

- Statistics from Sydney
 - 27% of employees took leave from work
 - 24% of employees changed the number of hours they worked per week
 - 22% of employees worked remotely
 - 18% of employees travelled to/from work at different times
 - 15% of employees changed the number of days worked per week
 - London is attempting to get similar numbers from its businesses
- Businesses should use the statistics from Sydney as a point of reference for preparing for staff shortages. According to Deloitte's research, 60% of businesses think the Games will have minimum impact on their business. However, over 28% of businesses in Hounslow deal with retail, personal service, tourism, leisure, food, or entertainment. The ODA says that these services are unlikely to allow workers to have time off. This is most likely because these businesses are going to be directly impacted by the increase in visitors. The impact on these businesses will indirectly affect the suppliers of the businesses as well, which includes another 39% of businesses. Therefore, planners should prepare for businesses to be unprepared to deal with the Olympics.

Sources:

- 2001 Census
- Keep on Running Document – Sydney data

H.5 Visitors

Athletes

Identify what problems would impact the borough during the Olympics:

- Security threat
- Accessibility to training grounds
- Ethnic conflicts
- Getting lost
- Missing returning transport

Quantify Problems/Impacts:

- Security threat – see background for security budgeting
- Accessibility to training grounds – small roads leading to training grounds, difficult to navigate through with large busses
- Ethnic conflicts – 203 different countries participating
- Getting lost – hopefully athletes could be tracked like in 2010
- Missing returning transport – pending Joe's minutes from meeting

Background:

- Five Hounslow Pre-Training Venues:
 - Indian Gymkhana Club
 - University of Westminster Chiswick Sports Ground
 - Hounslow Badminton Centre
 - Heathrow Gymnastics Club
 - Brentford Football Club
- In Vancouver athletes were tracked via GPS systems
- £757 million for Olympic security by government
- £363 million in event of incident by government
- £282 million for venue security by LOCOG
- £238 million for additionally contingency security by LOCOG

Sources:

- <http://www.tracking-system.com/for-businesses/vehicle-tracking-system/267-gps-tracking-olympic-athletes.html>
- <http://www.telegraph.co.uk/sport/othersports/olympics/8488285/London-2012-Olympics-security-remains-No-1-priority-for-IOC-despite-Osama-Bin-Laden-death.html>

Community Events

What the base line is (what it is currently in the borough):

- Sponsored walks
- Sports days
- Chiswick Summer Fair
- Football Tournaments

Identify what problems would impact the borough during the Olympics:

- Increased attendance (unexpected)

Quantify Problems/Impacts:

- It is possible that attendance to community events will increase due to the estimated 15% population increase due to Olympic tourists

Background:

- Hounslow Street Parties & Small Outdoor Events document shows advice and guidelines for events
- Hounslow Street Party Application form

Sources:

- http://www.hounslow.gov.uk/street_parties_guidance_mar11.pdf

Spontaneous Events

Identify what problems would impact the borough during the Olympics:

- Teams Winning
- Cultural Holidays
- People excited about Olympics
- Increased attendance

Quantify Problems/Impacts:

- Teams Winning – 302 medal events to celebrate for
- Cultural Holidays-
- People excited about Olympics- People may attempt to recreate Olympic events during their own recreation
- Increased attendance- due to the increase of the population it is possible that there will be more people that will be participating and starting these events

Background:

- Large masses of celebrations in Vancouver 2010 after Canadian win in hockey final

Sources:

- www.olympics.org

The Olympic Torch Route

What the base line is (what it is currently in the borough):

N.A.

Identify what problems would impact the borough during the Olympics:

- Route & Road Closures
- Media Attention
- Publicity
- Community Engagement
- Events Management

Quantify Problems/Impacts:

- Route & Road Closures: CLASSIFIED ROUTE: North across Kew Bridge to A315, Southwest on A315 to Bath Rd, Northwest on Bath Rd to The Parkway, North on The Parkway out of the borough.
 - Route is about 7.4 Miles
- Media Attention: network coverage following the torch route (BBC, NBC, etc.)
- Publicity: network coverage following the torch route (BBC, NBC, etc.)
- Community Engagement: Hounslow is encouraging residents to nominate people to carry Torch
- Events Management

Background:

- Olympic Torch will be carried by 8000 people
 - Torch Route is 70 days through UK
 - Travels from Wandsworth on Day 66, 23 July to Ealing on Day 67, 24 July
- Goal is that 95% of residents of UK will be within an hour's journey of seeing to torch

Sources:

- <http://www.dailymail.co.uk/sport/olympics/article-1388238/Olympic-torch-route-Flame-travel-8-000-miles-UK.html>
- http://www.hounslow.gov.uk/news_mod_home/news_mod_year/news_mod_month/news_mod_show?year1=2011&month1=5&NewsID=46850

Population Increase

What the base line is (what it is currently in the borough):

- 53 Hotels in London Borough of Hounslow

Identify what problems would impact the borough during the Olympics:

- Increased Demand

- Empty rooms will be filled

Quantify Problems/Impacts:

- Increased Demand
 - All hotels are assumed to be filled during the Olympics.
 - Total of over 20,000 visitors staying in hotels in Hounslow and around Heathrow
- Empty rooms will be filled- estimated possible 27,270 people staying in resident houses
- Total of potential 15% increase of population

Sources:

- Hotel info spreadsheet
- 2001 UK census

Tourists

Identify what problems would impact the borough during the Olympics:

- Unfamiliarity with transportation
- Getting lost
- Overcrowding resident houses
- Filling up hotels
- Unfamiliar with communication outlets
- Support illegal vendors/outlets/economy

Quantify Problems/Impacts:

- Unfamiliarity with transportation – 15% increase of population, more people unaware of how to use public transportation
 - 175 tube stations are modernizing to improve signs to help people navigate around stations and trains
- Getting lost - 15% increase of population, more people getting lost
- Overcrowding resident houses – 27,270 people staying in resident houses
- Filling up hotels - >5400 tourists filling hotels
- Unfamiliar with communication outlets – Add more methods of conveying information to tourists
- Support illegal vendors/outlets/economy - 15% increase of population, more people paying for illegal services and goods

How you got the information:

- Overcrowding resident houses –
 - 2001 census data for vacant rooms * 2 people/room
- Filling up hotels –
 - Sum of hotel maximum occupancies
- Total of 15% increase to London Borough of Hounslow's population due to tourists

Sources:

- 2001 UK Census
- Accessible Transport Strategy – London 2012. ODA

Appendix I: Results Handout

London Borough of Hounslow Executive Summary Sheet

Population	Percent Increase	Grade
Additional Hotels	2.47%	C
Informal Letting	12.84%	C
Total	15.31%	C

Elderly and Disabled	Percent Total	Grade
Spectators that will have trouble using stairs/escalators	7%	G
Spectators that will be unable to use stairs/escalators	1%	G

Businesses	Percent Total	Grade
Amount of retail, personal service, tourism, leisure, food or entertainment businesses	28%	G
Likely to take leave from work	27%	G
Likely to change number of hours worked	24%	G
Likely to work remotely	22%	G
Likely to change number of days worked per week	15%	G
Likely to travel to/from work at different times	18%	G
Businesses that believe that Olympics will have minimum to no impact	60%	G
Increase in tourists business sales	40-80%	G

Key	
Grades	
Given	G
Calculated	C
Impact	
High	Red
Medium	Yellow
Low	Green

Health	Percent Total	Grade
Overseas A&E visitors during Olympics	2.70%	G
Incidence of heat related illnesses at 38C (Hottest Temperature recorded in London)	0.48%	G
Increase in A&E visits	5%	G

Parks/Open Spaces/Leisure Centers	Percent Total	Grade
Tourists visitors to parks	20%	G
People who will litter in public	30%	G

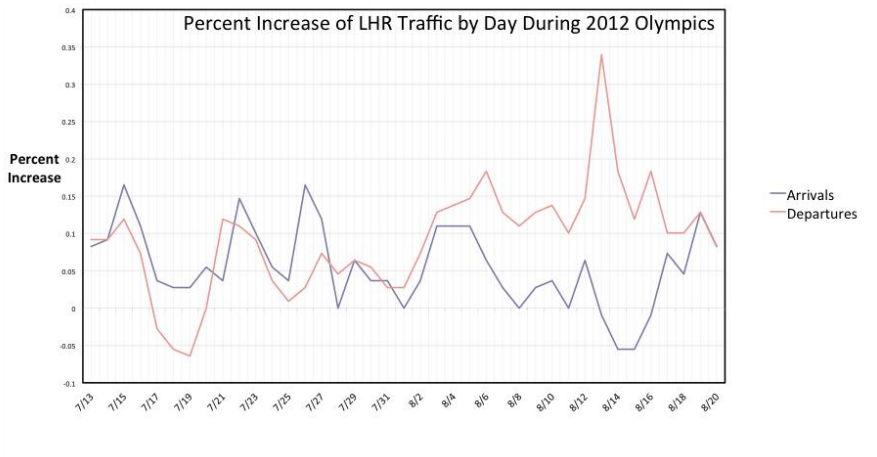
Modes of Transportation to Olympic Events	Percent Total	Grade
Rail	79.94%	G
Direct Coach	6.95%	G
Park and Ride	4.71%	G
Local Bus	4.02%	G
Walk	1.39%	G
Taxi	0.14%	G
River	0.64%	G
Other	0.06%	G
Cyclists	1.04%	G

Rail Transportation	Average increase in Journeys a day during Olympics	Grade
Tube	36.52%	C
National Rail	36.52%	C

M4/ORN	Percent Increase	Grade
Extra Cars on M4 per day	1.97%	C

Cyclists	Percent Total	Grade
Rate of Casualties for Cyclists	0.03%	G

Flights	Number increase	Grade
Average additional passengers arriving between 13 July - 10 August	6.61%	C
Average additional passengers departing between 30 July - 20 August	12.59%	C



Appendix J: Updated Risk Register

(Note: **Outcome description codes:** 'H' – hazard which will require a national as well as a local response (nationally defined); 'HL' – hazards which would not ordinarily prompt a national response and would usually be dealt with locally (nationally defined); 'L' – hazards which have been added to national outcome descriptions as a result of local considerations (locally defined). All outcome description codes are followed by a sequential numerical suffix (either nationally defined for 'H' and 'HL' codes or locally defined for 'L' codes.)

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
INDUSTRIAL ACCIDENTS AND ENVIRONMENTAL POLLUTION							
HL25	Industrial Accident & Environmental Pollution	Fire or explosion at a flammable gas terminal including LPG/LNG storage sites.	<p>Outcome Description</p> <p>Up to 1km around site, causing up to 57 fatalities and 172 casualties.</p> <p>Variation & Further Information</p> <p>Gas terminal event likely to be of short duration once feed lines are isolated; event at a storage site could last for days if the explosion damaged control equipments. Impact on environment, including widespread impact on air</p>	Low (1)	Moderate (3)	Medium	LFB

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			quality.				
H2	Industrial Accident & Environmental Pollution	Fire or explosion at an onshore ethylene gas pipeline.		Not applicable			
HL26	Industrial Accident & Environmental Pollution	Localised fire or explosion at an onshore ethylene gas pipeline		Not applicable			
H3	Industrial Accident & Environmental Pollution	Fire or explosion at an oil refinery		Not applicable			
HL27	Industrial Accident & Environmental Pollution	Localised fire or explosion at an oil refinery		Not applicable			
HL7	Industrial Accident & Environmental Pollution	Industrial explosions and major fires	<p>Outcome Description Up to 1km around site, causing up to 11 serious injuries and up to 11 casualties. Explosions would cause primarily crush / cuts and bruise-type injuries, as well as burns.</p> <p>Variation and Further Information Plant of this nature is assumed to be more or less evenly distributed across the</p>	Medium Low (2)	Minor (2)	Medium	LFB

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			country.				
H4	Industrial Accident & Environmental Pollution	Fire or explosion at a fuel distribution site or a site storing flammable and/or toxic liquids in atmospheric pressure storage tanks	<p>Outcome Description</p> <p>Up to 3km around site causing up to 172 fatalities and 2298 casualties. Might be disruption to air transport in the short term until fuel supply redirected. Regional excessive demands on health care services and social care. Closure of roads in locality for a short period of time.</p>	Low (1)	Catastrophic (5)	Medium	LFB
HL28	Industrial Accident & Environmental Pollution	Localised fire or explosion at a fuel distribution site or tank storage of flammable and/or toxic liquids.	<p>Outcome Description</p> <p>Up to 1km around the site, causing up to 17 fatalities and 230 casualties.</p> <p>Variation & Further Information</p> <p>Impact on environment, including widespread impact on air</p>	Medium Low (2)	Moderate (3)	High	LFB

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			quality.				
H5	Industrial Accident & Environmental Pollution	Fire or explosion at an onshore fuel pipeline	<p>Outcome Description Up to 1km around site causing up to 115 fatalities and 574 casualties.</p> <p>Variation and Further Information A release point close to a populated (i.e. urban) area. Impact on environment, including persistent/widespread impact on air quality.</p> <p>Plant of this nature is assumed to be more or less evenly distributed across the country, although there may be clustering in some coastal and industrial areas.</p>	Low (1)	Moderate (3)	Medium	LFB
H6	Industrial Accident & Environmental Pollution	Fire or explosion at an offshore oil/gas platform		Not applicable			

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
H7	Industrial Accident & Environmental Pollution	Explosion at a high pressure natural gas pipeline	<p>Outcome Description</p> <p>Local to site causing up to 230 fatalities and up to 230 casualties.</p> <p>Variation & Further Information H7 & HL30</p> <p>Risk is based on the release point close to a populated (i.e. urban) area. Impact on environment, including persistent/widespread impact on air quality.</p> <p>Plant of this nature is assumed to be more or less evenly distributed across the country, although there may be 'clustering' in some coastal and industrial areas.</p>	Low (1)	Moderate (3)	Medium	LFB
HL30	Industrial Accident & Environmental Pollution	Localised explosion at a natural gas main.	<p>Outcome Description</p> <p>Causing up to 115 fatalities and up to 115 casualties.</p>	Low (1)	Moderate (3)	Medium	
H103	Industrial Accident &	Fire or explosion at a gas LPG or LNG terminal (or associated onshore		Not applicable			

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
	Environmental Pollution	feedstock pipeline)					
HL104	Industrial Accident & Environmental Pollution	Industrial Accident & Environmental Pollution		Not applicable			
H8	Industrial Accident & Environmental Pollution	Very large toxic chemical release		Not applicable			
H9	Industrial Accident & Environmental Pollution	Large toxic chemical release	<p>Outcome Description</p> <p>Up to 3km from site of toxic chemical release causing up to 57 fatalities and up to 2,298 casualties. Depending on the nature and extent of the contamination there could be impacts on air, land, water, animal welfare, agriculture and waste management. The risk might require remediation and/or decontamination. Excessive demands on health care locally both short and long term. Water</p>	Low (1)	Catastrophic (5)	Medium	LFB

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			<p>supplies might be at risk. Contamination of farm land could lead to avoidance of certain foodstuffs.</p> <p>Variation and Further Information</p> <p>Eg a chlorine release or large industrial complex or bulk storage of chemicals near to a populated (i.e. urban) area. There are some sites of this nature within the M25, and there is 'clustering' of such sites in other parts of the country.</p>				
HL2	Localised industrial accident involving large toxic release	Localised industrial accident involving large toxic release (e.g. from a site storing large quantities of chlorine).		Not applicable			
HL3	Industrial Accident & Environmental Pollution	Localised industrial accident involving small toxic release	<p>Outcome Description</p> <p>Up to 1km from site causing up to 11 fatalities and up to 115 casualties.</p>	Medium (3)	Moderate (3)	High	LFB

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			<p>Variation & Further Information</p> <p>Plant of this nature is assumed to be more or less evenly distributed across the country, although there may be 'clustering' in some coastal and industrial areas.</p>				
H10	Industrial Accident & Environmental Pollution	Radioactive substance release from a nuclear reactor accident.		Not applicable			
HL31	Industrial Accident & Environmental Pollution	Limited radioactive substance release from a nuclear reactor accident.		Not applicable			
H11	Industrial Accident & Environmental Pollution	Accidental release of radioactive material from incorrectly handled or disposed of sources.	<p>Outcome Description</p> <p>Up to five fatalities and up to 115 contaminated people requiring medical monitoring. Many worried people may present at hospitals. Radiation may be spread over several kilometres but most</p>	Low (1)	Significant (4)	Medium	Environment Agency

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			<p>concentration where source is opened. This risk could result in environmental contamination with associated environmental impacts. Depending on the nature and extent of the contamination there could be impacts on air, land, water, animal welfare, agriculture and waste management. This risk may require remediation an/or decontamination.</p> <p>Variation & Further Information</p> <p>Assume radioactive material is a medical source from radiotherapy machine.</p>				
H12	Industrial Accident & Environmental Pollution	Biological substance release from facility where pathogens are handled deliberately (e.g.	<p>Outcome Description</p> <p>H12 – Up to 11 fatalities and serious injuries or off-site impact causing up to</p>	Medium Low (2)	Moderate (3)	High	Health

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
		pathogen release from containment laboratory)	1,149 casualties. Variation and Further Information Assume release in an urban area. Biological agent (mainly HG3 & 4 human & animal pathogens) release from containment (e.g. infection of laboratory worker or animal) – example SARS release from lab in China resulted in 2 deaths & several hundred people quarantined. This type of release could be the source of an outbreak that leads to H23-H26 risks.				
H46	Industrial Accident & Environmental Pollution	Biological substance release during an unrelated work activity/industrial process (e.g. Legionella release due to improperly maintained building environmental	Outcome Description Up to 11 fatalities and serious injuries or off site impact requiring up to 1,149 hospital admissions. Variation and Further Information Specifically	Medium High (4)	Moderate (3)	High	

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
		control systems)	related to Legionella release from an industrial process. Inadvertent Legionella contaminant of wet cooling systems such as cooling towers and evaporative condensers, and air conditioning systems such as humidifiers and industrial air scrubbers.				
H14	Industrial Accident & Environmental Pollution	Major contamination incident with widespread implications for the food chain, arising from: 1. Industrial accident (chemical, microbiological, nuclear) affecting food production areas eg Chernobyl, Sea Empress oil spill, animal disease. 2. Contamination of animal feed eg dioxins, BSE. 3. Incidents arising from production	Outcome Description Food production/ marketing implications depending on scale and area affected e.g. major shellfisheries, dairy, livestock production areas. Potential direct animal and consumer health effects. Consumer confidence affected leading to lost markets or panic buying of staple produce ie bread or milk. Variation and Further Information	Medium High (4)	Minor (2)	Medium	Local Authorities

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
		processes, eg adulteration of chilli powder with Sudan I dye.	An incident similar to that which occurred in Belgium in which animal feed is contaminated with Dioxins, resulting in contamination of animals and animal products.				
H15	Industrial Accident & Environmental Pollution	Maritime pollution	<p>Outcome Description Release of 100,000 tonnes of crude oil into the sea, polluting up to 200km of coastline. This risk could result in environmental contamination with associated environmental impacts. Depending on the nature and extent of the contamination there could be impacts on air, land, water, animal welfare, agriculture and waste management. This risk may require remediation and/or decontamination.</p> <p>Variation and</p>	Low (1)	Minor (2)	Low	Maritime & Coastguard Agency

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			<p>Further Information A large fully laden oil super tanker sinks in the approach to a UK port, e.g. the Thames estuary, fully laden and with strong north-easterly winds and with the tide flowing up the Thames estuary. Assume no loss of access to the LNG terminal on the Isle of Grain.</p>				
HL4	Industrial Accident & Environmental Pollution	Major pollution of controlled waters	<p>Outcome Description Pollution incident impacting upon controlled waters (for example, could be caused by chemical spillage or release of untreated sewage) leading to persistent and/or extensive effect on water quality, major damage to aquatic ecosystems, closure of potable abstraction point(s), major impact on amenity (i.e. tourism) value, serious impact on human</p>	Medium (3)	Moderate (3)	High	Environment Agency

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			health.				
HL33	Industrial Accident & Environmental Pollution	Forest or moorland fire	Outcome Description Forest or moorland fire across up to 50 hectares. Evacuation of up to 100 residential homes required. Up to 6 fatalities and 23 casualties.	Low (1)	Minor (2)	Low	LFB
TRANSPORT ACCIDENTS							
H42	Transport Accidents	Rapid accidental sinking of a passenger vessel in or close to UK waters.		Not applicable			
HL34	Transport Accidents	Fire, flooding, stranding or collision involving a passenger vessel in or close to UK waters leading to the ship's evacuation or partial evacuation at sea	Outcome Description Up to 50 fatalities and up to 100 casualties.	Low (1)	Moderate (3)	Medium	Maritime and Coastguard Agency
HL8	Transport Accidents	Fire, flooding, stranding or collision involving a passenger vessel in or close to UK waters or on	Outcome Description Up to 50 fatalities and up to 100 casualties Variation and Further Information	Low (1)	Moderate (3)	Medium	Maritime and Coastguard Agency

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
		inland waterways, leading to the ship's evacuation.	The risk is based on an accident to a smaller passenger vessel on the UK coast or inland waterways.				
HL37	Transport Accidents	Release of significant quantities of hazardous chemicals/materials as a result of major shipping accident		Not applicable			
H16	Transport Accidents	Aviation accident over a semi-urban area	<p>Outcome Description</p> <p>Loss of up to two aircraft and passengers, with debris over a semi-urban area.</p> <p>Variation and Further Information</p> <p>Collision of two commercial airliners - death of all passengers and crew on aircraft (600 fatalities), up to 57 fatalities and 345 casualties on the ground. No significant damage to key infrastructure.</p>	Low (1)	Significant (4)	Medium	LFB
HL9	Transport Accidents	Aviation accident	<p>Outcome Description</p> <p>Aviation accident causing up to 57 fatalities and up to</p>	Medium Low (2)	Moderate (3)	High	LFB

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			287 casualties. Variation and Further Information Accident involving one commercial aircraft, probably on take off or landing.				
HL10	Transport Accidents	Local accident on motorways and major trunk roads	Outcome Description Multiple vehicle incident causing up to 10 fatalities and up to 21 casualties (internal injuries, fractures, possible burns); closure of lanes or carriageways causing major disruption and delays.	Medium High (4)	Limited (1)	Low	MPS
HL11	Transport Accidents	Railway Accident	Outcome Description Up to 41 fatalities and up to 137 casualties (fractures, internal injuries – burns less likely). Possible loss of freight. Major	Medium High (4)	Moderate (3)	High	British Transport Police

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			disruption to rail line including possible closure of rail tunnel.				
HL12	Transport Accidents	Local accident involving transport of hazardous chemicals	<p>Outcome Description Up to 57 fatalities and up to 574 casualties (direct injuries from the accident would be similar to road or rail accidents; indirect casualties are possible, if substance covers wide area). The extent of the impact would depend on substance involved, quantity, nature and location of accident. The assumption is based on phosgene / chlorine.</p> <p>Variation and Further Information Hazardous chemical traffic is not thought to vary significantly at local levels, so likelihood will be similar throughout. However, a high density of</p>	Medium Low (2)	Significant (4)	High	LFB

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			hazardous chemical infrastructure in area may affect likelihood scores.				
HL13	Transport Accidents	Maritime accident or deliberate blockage resulting in blockage of access to key port, estuary, maritime route for more than one month		Not applicable			
HL14	Transport Accidents	Local (road) accident involving transport of fuel/explosives	<p>Outcome Description</p> <p>Up to 34 fatalities and up to 23 casualties within vicinity of accident/explosion . Area would require evacuating up to 1 km radius depending on substances involved. Potential release of up to 30 tonnes of liquid fuel into local environment, watercourses etc. Large quantities of fire fighting media (foam) would impact on environment. Roads and access routes impassable for a time. Emergency access into/out of large populated areas difficult or</p>	Medium Low (2)	Moderate (3)	High	LFB

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			impossible.				
SEVERE WEATHER							
H17	Severe Weather	Storms & Gales.	<p>Outcome Description Storm force winds affecting most of the South East England region for at least 6 hours. Most inland, lowland areas experience mean speeds in excess of 55 mph with gusts in excess of 85 mph. Up to 57 fatalities and 574 casualties with short term disruption to infrastructure including power, transport networks, homes and businesses.</p> <p>Variation and Further Information England and Wales are at the lower end of the</p>	Medium (3)	Moderate (3)	High	Local Authority

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			likelihood range.				
H18	Severe Weather	Low temperatures and heavy snow.	<p>Outcome Description Snow falling and lying over most of the area for at least one week. After an initial fall of snow there is further snow fall on and off for at least 7 days. Most lowland areas experience some falls in excess of 10cm, a depth of snow in excess of 30cm and a period of at least 7 consecutive days with daily mean temperature below -3°C. Up to 1,149 fatalities (excess deaths) and thousands of casualties, mainly amongst the elderly and there is likely to be some disruption to transport networks, businesses, power supply and water supply, and also school closures.</p> <p>Variation and</p>	Medium (3)	Moderate (3)	High	Local Authority

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			<p>Further Information</p> <p>The cold/snow event definition is based on a February 1991 type event. the impacts experienced at more recent events, however, have been taken into account (such as January 2003 M11 closure and February 2007)</p>				
H48	Severe Weather	Heat Wave.	<p>Outcome Description</p> <p>Daily maximum temperatures in excess of 32°C and minimum temperatures in excess of 15°C over most of the UK for at least 5 consecutive days and nights. Up to 1,149 fatalities and 5,744 casualties mainly amongst the elderly. There could be disruption to power supply and transport infrastructure.</p> <p>The heatwave</p>	Medium High (4)	Minor (2)	Medium	Health

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			event definition is based on and August 2003 type event, but more serious.				
H19	Severe Weather Hazard Category Flooding: Major coastal and tidal flooding affecting more than two UK regions	Outcome Description Many coastal regions and tidal reaches of rivers affected. Major sea surge, tides, gale force winds and potentially heavy rainfall. Excessive tide levels and many coastal and/or estuary defences overtopped or failing. Drains 'back-up'. Inundation from any breaches of defences would be rapid and dynamic with minimal warning and no time to evacuate. Inundation from over-topping of defences would allow as little as 1 hour to evacuate. Widespread structural damage. Flooding of up to 300,000 properties for up to 14 days. Up to 172 fatalities, 2,298 casualties and up to 2,298 missing persons. Up to 0.4m people (including tourists) in coastal villages and towns evacuated from flooded sites. People stranded over a large area and up to 45,952 people in need of rescue. Up 45,952 people needing assistance with sheltering for up to 12	Medium Low (2)	Catastrophic (5)	High	Environment Agency	

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			<p>months.</p> <p>Variation and Further Information Assumes: Storm tide forecasting service shows risk of over-topping (up to 8hrs lead time). Rescue can only be by boat, helicopter or high-clearance vehicles. Emergency services affected if located in the flood zone. Evacuation warnings given to emergency services. Multiple failure of flood defence systems. Damage or failure (at several sites) of telecommunications, power stations, road and rail links. There are hospitals, schools, shops and industrial/ commercial premises in the flooded area (& possibly rest centres). 'Properties' includes occupied mobile homes and caravans sites in low-lying coastal zones (summer tourists).</p>				
H21	<p>Severe Weather</p> <p>Hazard Category</p> <p>Severe inland flooding affecting more than 2 UK regions</p>		<p>Outcome Description A single massive fluvial event or multiple concurrent regional events following a sustained period of heavy rainfall extending over two weeks (perhaps combined with snowmelt or intense summer rainfall leading to widespread surface water flooding). The event would include major fluvial flooding affecting a large, single urban area. Across urban and rural areas (with a greater proportion occurring in urban areas) flooding of up to 50,000 properties (homes & Businesses) for up to 10 days. Up to 11 fatalities and 574 casualties and</p>	Medium (3)	Catastrophic (5)	Very High	Environment Agency

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			<p>23 missing persons (“missing” means: not accounted for during the first 48 hrs). Up to 63,184 people needing assistance with evacuation. Up to 6,893 people in need of rescue or assistance in-situ. (H20 in earlier assessments).</p> <p>Variation and Further Information Assumes: Up to 4 days of advanced severe weather alerts from the Met Office</p> <p>Severe Flood Warnings issued up to 24 hrs in advance by the Environment Agency</p> <p>Hazard is not evenly distributed across the UK</p> <p>Rescue can only be by boat, helicopter, or high-clearance vehicles</p> <p>Emergency services affected if located in the flood zone</p> <p>Evacuation warnings given to emergency services (up to 12 hrs lead time)</p> <p>Multiple failure (breaches) of flood defence systems and significant overtopping</p> <p>Damage or failure at several sites of telecommunications, electrical substations, water and sewage treatment works, road bridges and rail embankments, rendering these essential services inoperable for up to 14 days</p> <p>Closure of key and essential transport</p>				

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			<p>routes for up to 5 days leading to national disruption to commuters and supplies of goods and services</p> <p>There are hospitals, schools, shops and industrial/commercial premises in the flooded area (& possibly rest centres)</p> <p>For evacuation and emergency sheltering and accommodation, the following assumptions are made:</p> <p>Of all evacuees, 60% leave the affected area and stay with relatives/friends or holiday-makers return home. 30% use available hotels in safe areas [may need tourists to vacate rooms for local residents]</p> <p>142,000 (22%) of people flooded need assisted sheltering for up to 5 days and 35% of displaced households need temporary accommodation for up to 12 months.</p>				
HL16	Severe Weather Hazard Category Local coastal / tidal flooding (affecting more than one Region)	Outcome Description	Sea surge, spring tides, gale force winds, heavy rainfall affecting more than one Region, some defences overtopped or failing at multiple locations. Flooding of 1000 to 10,000 properties for up to 14 days. Up to 23 fatalities, 345 casualties and up to 230 missing persons. Up to 57,440 people (including tourists) in coastal villages and towns evacuated from flooded sites. People stranded over a large area and up to 5,744 people in need of rescue. Up to 11,488 people needing assistance with sheltering for up to 12 months. Multi-agency response invoked, possible large	Medium Low (2)	Catastrophic (5)	High	Environment Agency

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			<p>scale evacuation required. Suddenness of failure of defences would not be possible to predict. Tidal inundation would be rapid and wave impact would cause structural damage to properties. Impact on infrastructure includes: widespread disruption for 7-14 days, salt damage, road and bridge damage, debris and contaminated water supplies and pollutants from affected businesses. Rural impacts include: widespread livestock carcasses, waterborne disease. Sewage treatment works flooded. Numerous properties destroyed. Many more uninhabitable or 12 months.</p> <p>Variation and Further Information The flooding event would have a regional impact, translating into loss of lives, severe economic damage and need between 6 and 18 months recovery before business as usual conditions are restored. Significant mutual aid would be deployed from inland counties. Assumes: See H19 (Many of the assumptions are the same for a major regional flood as they would be for a major national flood. Consequence management will not be achievable with in a regional response capability.</p>				
HL17	<p>Severe Weather</p> <p>Hazard Category</p>		<p>Outcome Description Sea surge, high tides, gale force winds affecting the coastline and one Region, a defence system overtopped or failing at a single location. Localised impact with infrastructure affected and up to 1000 properties flooded for up to 14 days. Up to 11</p>	<p>Medium Low (2)</p>	<p>Moderate (3)</p>	High	<p>Environment Agency</p>

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
	Local coastal / tidal flooding (in one Region)		<p>fatalities, 172 casualties and up to 115 missing persons. Up to 25,274 people (including tourists) in coastal villages and towns evacuated from flooded sites. People stranded over a large area and up to 2,298 people in need of rescue. Up to 3,446 people needing assistance with sheltering for up to 12 months. Multi agency response invoked with some local evacuation and cordoning off of affected areas. Tidal inundation would be rapid and wave impact would cause structural damage to properties. Impact on infrastructure includes: localized disruption for up to 7 days, salt damage, road damage, debris and contaminated local water supplies and pollutants from affected businesses. Rural impacts include: livestock carcasses, waterborne disease. Some properties destroyed and others uninhabitable for 12 months.</p> <p>Variation and Further Information</p> <p>The flooding event would have a local impact, translating into some loss of lives, some economic damage and need between up to 12 months recovery before business as usual conditions are restored. Mutual aid will be needed within a Region. Assumes: See H19 (Many of the assumptions are the same for a significant local flood as they would be for a major national flood.) However, the impact may be specific</p>				

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			to one area rather than several sites. Consequence management will be achievable within a regional level response capability.				
HL18	Severe Weather Hazard Category Local / Urban flooding fluvial or surface run-off		<p>Outcome Description A sustained period of heavy rainfall extending over two weeks, perhaps combined with snow melt, resulting in flash flooding and steadily rising river levels over entire counties and could threaten a large urban town. Localised flooding of 1,000 to 10,000 properties for 2-7 days. Up to 17 fatalities and 172 casualties. Up to 17,232 people evacuated. Up to 574 people stranded over a large area and in need of rescue. There would be a major impact road and rail links, making them impassable for up to 5 days.</p> <p>Impact on infrastructure includes: some building collapse, water damage, road and bridge damage. Sediment movement and contamination of water supplies. Loss of essential services (gas, electricity & telecoms) to 20,000 homes for up to 14 days, significant debris and pollutants from affected businesses. Up to 1,149 people needing assistance with sheltering for up to 12 months. Rural impacts include: widespread livestock carcasses, waterborne disease. Sewage treatment works flooded. Up to 57 properties destroyed and many more uninhabitable. Up to 2,298 people needing assistance with sheltering for up to 12 months.</p> <p>Variation and Further Information The flooding event would have a</p>	Medium (3)	Significant (4)	Very High	Environment Agency

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			<p>regional impact, possibly translating into loss of lives, localised economic damage and need between 6 and 18 months recovery before business as usual conditions are restored.</p> <p>The depth and velocity of water flows will vary.</p> <p>Significant mutual aid would be deployed from neighbouring regions, although other regions are also likely to be at risk or impacted at the same time. See H21 (Many of the assumptions are the same for a major regional fluvial flood as they would be for a major national incident.</p> <p>Consequence management will not be achievable with in a regional response capability.</p>				
HL19	Severe Weather		<p>Outcome Description</p> <p>A sustained period of heavy rainfall extending over two weeks, perhaps combined with snow melt, resulting in steadily rising river levels over a region. Localised flooding of more than 100 and less than 1,000 properties for 2-7 days. Up to 6 fatalities and 57 casualties. Up to 5,744 people evacuated, up to 230 people stranded over a large area and in need of rescue. There would be some impact on minor roads and some A roads and trunk roads impassable for a time. Some main rail lines may need to be closed for a week for repairs. Most waterways closed to traffic because of strong currents and high water levels. Impact on infrastructure includes, water damage, road and bridge damage. Sediment movement and contamination of local water supplies. Localised loss of essential services</p>	Medium High (4)	Moderate (3)	High	Environment Agency

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
		<p>(gas, electricity & telecoms) Up to 5000 for up to 14 days. Up to 287 people needing assistance with sheltering for up to 12 months. Substantial disruption within a county for 7-14 days. Significant debris and pollutants clear-up needed.</p> <p>Variation and Further Information The flooding event would have a sub-regional impact, and is a real threat to lives. Localised economic damage and need 6 - 18 months recovery before business as usual conditions are restored. Depth and velocity of water flows will vary. Significant mutual aid deployed from neighbouring counties but the response effort could be contained within a region. See H21 (Many of the assumptions are the same for a significant local fluvial flood as they would be for a major regional flood. However, the impact may be specific to one area rather than several sites. Consequence management will be achievable within a regional level response capability.)</p>					
HL20	Severe Weather	Localised, extremely hazardous flash flooding	<p>Outcome Description Heavy localised rainfall in steep valley catchments leading to flash flooding. Likely that no flood defences in place. Possibility no flood warning service available / suddenness of events means timely flood</p>	Medium High (4)	Moderate (3)	High	Environment Agency

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			<p>warnings not possible. Flooding of up to 200 properties.</p> <p>Variation and Further Information Assumes: Very little time to evacuate (as little as 15 minutes). Flooding lasts less than 24 hours. Emergency services not pre-warned Extent of downstream effect could reach 30-50km. Significant local infrastructure damage - gas, electricity supplies, telecommunications, road and rail links.</p>				
H50	Severe Weather	Drought	<p>Outcome Description</p> <p>Periodic water supply interruptions affecting 385 000 businesses in London for up to 10 months. Emergency Drought Orders in place authorising</p>	Medium Low (2)	Significant (4)	High	Environment Agency

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			<p>rota cuts in supply according to needs of priority users as directed by Secretary of State. The 2.24 million households in London would not be subjected to supply interruptions. A drought of this severity is unprecedented and would take at least 3 dry winters to develop.</p>				
STRUCTURAL							
HL21	Structural	Land movement (i.e. caused by tremors or landslides)	<p>Outcome Description</p> <p>Roads and access routes impassable for a time. Emergency access into/out of large populated areas difficult or impossible; severe congestion over wide geographical area. Loss of power and other essential services over wide geographical area. Potential for a number of persons to be</p>	Low (1)	Moderate (3)	Medium	LFB

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			<p>trapped or missing either in landslides itself and/or in collapsed structures. Up to 6 fatalities depending on the size and location of land movement.</p> <p>Variation and further information</p> <p>Such incidents are rare within the UK with some areas being more prone to landslides than others. Geography and climatic conditions will determine likelihood.</p>				
HL22	Structural	Building Collapse.	<p>Outcome Description</p> <p>Collapse of low rise building, or part thereof. Potential for a number of persons to be trapped or missing. Localised loss of power and other essential services. Local access routes affected due to road closures. Up to 6 fatalities and 23 casualties</p>	Medium High (4)	Minor (2)	Medium	Local Authorities

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			<p>depending on the size and construction of building, and occupation rates.</p> <p>Variation and Further Information A number of such incidents annually within the UK. Some areas will be more at risk than others due to age of local building stock.</p>				
HL22a	Structural	Large Building Collapse	<p>Outcome Description</p> <p>Collapse of a large building (high-rise block, shopping mall etc). Up to 115 fatalities depending on the size and construction of building, and occupation rates, and 402 casualties. Potential for a number of persons to be trapped or missing. Localised loss of power and other essential services. Local access</p>	Medium Low (2)	Moderate (3)	High	Local Authorities

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			routes affected due to road closures.				
HL23	Structural	Bridge Collapse.	<p>Outcome Description Roads, access roads and transport infrastructure impassable for considerable length of time. Severe congestion over wide geographical area. Emergency access into / out of large populated areas severely restricted. Potential for a number of persons to be trapped or missing.</p> <p>Variation and Further Information It is considered that such incidents are rare within the UK.</p>	Low (1)	Moderate (3)	Medium	Local Authorities
H44	Structural	Major reservoir dam failure/collapse	<p>Outcome Description Collapse without warning resulting in almost instantaneous flooding. Significant</p>	Low (1)	Catastrophic (5)	Medium	Local Authorities

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			<p>movement of debris (including vehicles) and sediment. Complete destruction of some residential and commercial properties and serious damage of up to 500 properties. Several thousand other properties could be flooded. Serious damage to or destruction of strategic infrastructure and disruption to major communication routes.</p> <p>Multiple fatalities. Up to 1,149 casualties. Up to 57 missing persons and people stranded. Hazardous recovery amongst collapsed infrastructure and debris. Water supply to homes and business is lost. Up to 230 people need temporary accommodation for 2-18 months.</p>				

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
HL105	Structural	Complex Built Environments	<p>Outcome Description</p> <p>A consequence of a major incident affecting large buildings / complex built environments. Incidents in these facilities have the potential to trigger a complex chain of events that lead to serious consequences for public.</p>	Medium Low (2)	Moderate (3)	High	Local Authorities
HUMAN HEALTH							
H22	Human Health	Influenza Type Disease (Epidemic).	<p>Outcome Description</p> <p>A serious epidemic of much greater severity than the usual seasonal flu. Weekly GP consultations for new episodes of flu-like illness likely to exceed 400 per 100,000 of population at the peak (compared with a peak of around 200 per 100,000 population per week in an average year).</p>	Medium High (4)	Moderate (3)	High	Health

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
H23	Human Health	Influenza Type Disease (Pandemic).	<p>Outcome Description Each pandemic is different and the nature of the virus and its impacts cannot be known in advance. Previous pandemic have led to markedly different outcomes. Based on understanding of previous pandemics, a pandemic is likely to occur in one or more waves, possibly weeks or months apart. Each wave may last around 15 weeks. Up to half the population could be affected in a reasonable worst case scenario. High number of cases could overwhelm health and other critical services, and adversely affect business and the economy.</p> <p>Variation and Further Information Pandemic planning recognised a</p>	Medium High (4)	Significant (4)	Very High	Health

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			reasonable worst case scenario clinical attack rate of up to 50% spread over 1 or more waves with case fatality of up to 2.5%. this means, at the upper end of assumptions, up to some 750,000 excess deaths in the UK across the whole period of the pandemic and over 100,000 population per week at peak. Probable peak in weeks 6 to 8 following first case, with 22% of total cases occurring at the time.				
H24	Human Health	Emerging infectious diseases	Outcome Description Based on a SARS outbreak resulting in up to 115 fatalities and up to 2,298 casualties	Medium (3)	Moderate (3)	High	Health
HL24a	Human Health	Legionnaires Disease.	Outcome Description A point source outbreak of Legionnaires' disease, a serious form of atypical pneumonia	Medium High (4)	Minor (2)	Medium	Health

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			caused by poorly maintained water systems.				
HL24b	Human Health	Meningococcal Disease.	Outcome Description Cluster of cases of meningococcal disease caused by Neisseria Meningitidis.	Medium High (4)	Minor (2)	Medium	Health
HL102	Human Health	Oak Processionary Moth (OPM)	Outcome Description Infestation of Oak Processionary Moth (OPM) caterpillars to plague proportions causing severe defoliation of trees and epidemic numbers of people requiring medical treatment. Variation and Further Information The caterpillar form of the OPM can cause irritation and allergic reaction if people touch the caterpillars or if the hairs are blown by wind into people's eyes, ears, nose, throat or skin. The irritation can	High (5)	Minor (2)	Medium	Local Authorities

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			require medical attention especially in people with conditions such as asthma, including hospitalisation in extreme cases. The hairs can also affect animals including cats, dogs and horses. Previous outbreaks (Europe) have required small areas of countryside or villages to be quarantined.				
ANIMAL HEALTH							
H25	Animal Health	Non-zoonotic Notifiable animal diseases (e.g. foot and mouth disease (FMD), classical swine fever, blue tongue and Newcastle disease of birds).	<p>Outcome Description The most serious disease in this category is FMD which drives the impact assessments. Assessment based on the need to cull and dispose up to 4 million animals across GB with up to 900 infected premises.</p> <p>Variation and Further</p>	Medium (3)	Minor (2)	Medium	Local Authorities

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			<p>Information Assessments based on credible worst case scenario outbreak of foot & mouth disease starting in upland, extensively farmed area taking into changes to policy and current livestock movement data.</p>				
H26	Animal Health	Zoonotic Notifiable animal diseases (e.g. Highly Pathogenic Avian Influenza (HPAI), rabies and West Nile virus).	<p>Outcome Description The most significant disease in this category is the highly pathogenic avian influenza HPAI, it is largely a disease of birds. Realistic worst case scenario based upon the need to cull 30 million poultry across GB. The major outbreak scenario is of much greater scale than that experienced in any of the recent outbreaks of avian influenza in the UK, where the disease has been contained and</p>	Medium (3)	Minor (2)	Medium	Local Authorities

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			limited to 1 or 2 infected premises plus associated contact premises.				
INDUSTRIAL ACTION							
HL42	Industrial Action	Loss of cover due to industrial action by workers providing a service critical to the preservation of life (such as emergency service workers).	<p>Outcome Description</p> <p>A number of three day strikes with significant support over a two month period affecting a single emergency service.</p> <p>Variation and further information:</p> <p>Likelihood and impact will vary between, and geographically within, emergency services.</p>	Medium High (4)	Moderate (3)	High	LRAG
H30	Industrial Action	Emergency services: loss of emergency fire and rescue cover because of industrial action.	<p>Outcome Description</p> <p>A series of strikes by fire fighters takes place, spread over a period of two months, perhaps lasting up to 24 hours each.</p> <p>Variation and further</p>	High (5)	Moderate (3)	High	LFB

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			<p>information:</p> <p>Chief Fire Officers would all deploy the emergency cover they could make available in line with an optimum response to their locally assessed risk profiles. London, and possibly other metropolitan areas, would have only thin cover. A number of fire and rescue authorities (FRAs) would be self sufficient in the provision of emergency cover. Assumes no military assistance.</p>				
H31	Industrial Action	Significant or perceived significant constraint on fuel supply at filling stations e.g. industrial action by tanker drivers, or effective fuel blockades at key refineries/ terminals by protesters, due to the price of fuel	<p>Outcome Description</p> <p>Filling stations, depending on their locations, would start to run dry between 24 - 48 hours. Panic buying would exacerbate the situation. Replenishment of sites would take between 3 - 10 days depending on location much</p>	Medium (3)	Minor (2)	Medium	Metropolitan Police Service

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			would depend on whether drivers from other companies would be prepared to cross picket lines, whether companies judged that they were able to maintain safe operations in the presence of picket lines or protests, and the extent of the supply of fuel from other locations.				
H33	Industrial Action	Unofficial strike action by prison officers leading to a serious shortfall in the number of personnel available to operate and maintain control of prisons.	Outcome Description Prison Officer strike action, for up to 48 hours in 80% of prisons	Not assessed			
H35	Industrial Action	Industrial action by key rail or London Underground workers.	Outcome Description Strike action resulting in the total shut down of either London Underground or the rail network on a national scale (e.g. action by key rail workers, e.g. infrastructure	Low (1)	Minor (2)	Low	British Transport Police

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			workers such as signallers) for > 3 days. Greater impact if action occurs in a co-ordinated manner. Variation and Further Information L Underground. Industrial action lasting a week.				

INTERNATIONAL EVENTS

H37	International Events	International security incident resulting in influx of British Nationals who are not normally resident in the UK.	Further Information Up to 10,000 British nationals deciding to return to UK to a single region within a 4-6 week period following conventional war, widespread civil unrest or sustained terrorism campaign against British and other western nationals Variation and Further Information Majority of the incoming nationals have no UK base and have no	Medium High (4)	Minor (2)	Medium	Local Authorities
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Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			means to provide for themselves. May require medical or other services.				
INDUSTRIAL TECHNICAL FAILURE							
H38	Industrial Technical Failure	Technical failure of a critical upstream oil/gas facility, gas import pipeline terminal, or Liquefied Natural Gas (LNG) import reception facility leading to a disruption in upstream oil and gas production	Outcome Description Catastrophic accident destroying all parts of a critical upstream facility and, in the worst case, taking months or more to restore to normal levels of service. This could potentially result in <11% loss of gas supply to the UK which could impact on power generation if demand were high. As 40% of power is generated by gas fired stations then a reduction in generation might be felt. Downstream oil would not be immediately so adversely affected given alternative	Medium Low (2)	Significant (4)	High	LFB

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			means of supply.				
H39	Industrial Technical Failure	Failure of water infrastructure or accidental contamination with a non-toxic contaminant.	<p>Outcome Description Loss of or non-availability for drinking, of the piped water supply, for up to 57,440 people, for more than 24 hours and up to 3 days.</p> <p>Variation and Further Information Domestic, industrial, commercial and agricultural premises without piped water. Lack of water for fire fighting. Water Companies required to provide at least 10 litres per person per day until supply restored. However, could lead to suspension of services at hospitals, schools, and businesses etc which do not maintain their own on-site water storage.</p>	Medium High (4)	Moderate (3)	High	LFB
H40	Industrial Technical	No notice loss of significant	Outcome Description	High	Minor	Mediu	Metropolitan Police

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
	Failure	telecommunications infrastructure in a localised fire, flood or gas incident.	Loss of service to up to 114,880 people for up to 72 hours Variation and Further Information Building damage to a large urban telecoms facility.	(5)	(2)	m	Service
H41	Industrial Technical Failure	Technical failure of national electricity network (Blackstart)	Outcome Description Total blackout for up to 3-5 days due to loss of the National Grid. Three days is best time. If there is damage to the network (i.e. from storms) this timescale could be extended up to 5 days. Possible loss of life support machines, civil unrest, no alarms, street lighting, gas heating, rail transport, water supplies and mobile (PMT) telecommunications etc. Back up generators available for limited time for individual businesses and emergency services in some	Medium Low (2)	Catastrophic (5)	High	LFB

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			instances. Variation and Further Information Assume that no serious damage has been sustained by the electricity supply system.				
H43	Industrial Technical Failure	Telecommunication infrastructure - human error.	Outcome Description Widespread loss of telecommunications (including public land line and mobile networks) at a regional level for up to 5 days. Variation and Further Information Assume emergency services' communication systems are also affected.	Medium (3)	Catastrophic (5)	Very High	LFB
H45	Industrial Technical Failure	Technical failure of regional electricity network	Outcome Description Total shutdown of the electricity supply over an entire region (or Developed Administration), occurring during working week and lasting for	Medium Low (2)	Significant (4)	High	LFB

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			24hours.				
H49	Industrial Technical Failure	Loss of drinking water supplies due a major incident affecting infrastructure	<p>Outcome Description</p> <p>Loss of or non-availability for drinking, of the piped water supply, for a population of up to 350,000 for more than 24 hours and up to 2 weeks.</p> <p>Variation and Further Information</p> <p>Domestic, industrial, commercial and agricultural premises without piped water. Lack of water for fire fighting. Water Companies required to provide at least 10 litres per person per day until supply restored; requires a multi-agency response due to prolonged nature of outage and logistics. Due to the increased population during the Olympic Games, Water Companies will need to supply an</p>	Low (1)	Significant (4)	Medium	Environment Agency

Risk ref.	Hazard category	Hazard sub-category	Outcome Description/ Variation and Further Information	Likelihood	Impact	Risk rating	Lead responsibility
			<p>additional 325,140 litres per day. Could lead to suspension of services at hospitals, schools, and businesses etc which do not maintain their own on-site water storage. Food industries within the impacted zone may close.</p>				