THE DEVELOPMENT OF AN ACTION PLAN FOR THE SCIENCE MUSEUM OF LONDON

A Report Submitted to:

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April 29, 2005

Abstract

The United Kingdom passed the Disability Discrimination Act (DDA) of 1995, which sets out to protect the rights of disabled citizens. The Science Museum evaluated their level of compliance with the DDA by commissioning an Access Audit. The purpose of this project was to create a plan that effectively outlines how the Museum should implement change to improve access. The action plan was created by assessing the Access Audit and the Museum's constraints in upgrading their facility.

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Executive Summary:

The objective for this project was to create a usable action plan for the Science Museum. The action plan would be defined as usable if it provided a clear pathway from the Access Audit to a point where changes to physical features could be made. We feel that we have produced a final action plan that effectively outlines the process of implementation. It takes into consideration the variables affecting the Science Museum's ability to institute change, whereas the Audit was conducted without considering these restrictions. The action plan was created through an organized process that included background research, data collection, and data analysis.

The motivation for our project was the Disability Discrimination Act. Our first objective after receiving the project proposal was to understand the DDA and how it was going to affect the Museum. After researching the DDA we identified areas mentioned in the Act that we needed to do more research on. It was apparent after reading the DDA that to effectively institute change for disabled people, one must first understand their psychology and their interaction with society. We also researched action plans to find out what information they typically conveyed. In addition to these items, we knew it was vital to understand the contents of Access Audit, which was conducted by the CAE. The Museum hired the CAE to identify physical features in the building which needed to be altered in order to make the building completely accessible. After reading the Access Audit, it was apparent why the Museum was in need of an action plan. The Audit is a lengthy document which is difficult to read and poorly organized. The next step in achieving the action plan was to identify the gaps in the research.

Areas in which we needed to do research on included disability demographics in the UK, identifying possible solutions, the cost of the proposed solutions, and current measures in the Museum to help disabled patrons. These areas would provide us with the knowledge needed to make the action plan. The Museum had requested that we put the action plan into a more useable format. To meet the sponsor's needs, we decided that we must reprioritize the issues into a format that outlined the order in which the work should be completed. We identified these areas to research because they would make up the criteria for determining priority. The next hurdle we faced was taking the results of the research and figuring out how we would use them to create a ranking system.

A decision matrix was the solution chosen to allow us to prioritize the issues. A matrix was created that ranked each of the issues in 4 weighted categories. The matrix assigned a score to each of the issues. We then organized the issues by these scores. The result was a list of issues which were organized in a manner that considered not only DDA compliance, but also the Museums constraints in making physical changes. However, even with task of reprioritizing the Audit completed, the action plan was not complete.

We now had to decide how we would deliver the action plan to the Museum. A major issue which made the Audit difficult to use was that it presented the information in only one format. We chose a database format to deliver the action plan because it would allow the Museum to view and the sort the information by any way they desired. In addition to the database, we felt that there should be written section at the front of the action plan. The function of this written section was to display information that was vital in understanding the contents of the action plan. This written section also contained recommendations to the Museum's disability policy and disability awareness training program. Through the development of this project, it became apparent that these two items influenced the accessibility of the Museum more then any physical feature identified in the Access Audit. To display the importance of these issues the recommendations for improvements were provided at the front of the action plan.

We are confident the action plan that we submitted to the Museum met, if not exceeded, the expectations at the beginning of the project. The action plan contained all the information needed to begin the implementation of physical and operational changes within the Museum. The information was written in a clear manner and presented in a sortable format. Various reports that organized the data by different criteria were created within the database prior to submission. These reports allowed the Museum to view the information in multiple ways at the touch of a button. The action plan was usable and adaptable, as it can be updated as change occurs in the Museum. Thus, the action plan will be useable throughout the process of making the building fully accessible.

Chapter 1: Introduction

Over the past two decades many countries have taken strides toward the establishment of equal rights for the disabled. Prior to the implementation of legislation, the disabled population was subjected to unequal rights and opportunities, as a result of their limitations. In 1990 the United States passed the Americans with Disabilities Act (ADA). The impact of this legislation would go beyond the U.S., as the Act pressured and influenced many other countries to pass similar legislation on the matter of disability rights (Legal briefing: Disability Discrimination Act, 2003, 2/13/2005). The United Kingdom followed suit by passing disability legislation, the Disability Discrimination Act (DDA) of 1995. "The DDA aims to end the discrimination which many disabled people face in the areas of employment, access to goods, facilities and services, and the buying or renting of land or property" (Disability Unit, 1995, 1). The most recent section of the DDA was enacted on October 1, 2004, and provided the disabled population public accessibility rights. This portion, Section III of the DDA, requires that service providers make reasonable adjustments to physical features in order to accommodate its disabled guests.

In a bustling area of London, the Science Museum offers the public an interactive educational experience. As a service provider the Science Museum is subject to the requirements of the DDA. To identify issues with physical features, the Science Museum hired the Centre for Accessible Environments (CAE), a private organization, in 2004. The function of the CAE was to create a disability access audit which identified troubled areas, prioritized them, and suggested recommendations. The CAE set the criteria for the Access Audit above the DDA's minimum requirements. Their goal was to maximize the access and use of the building by evaluating it based on published good practice in design for disabled people (Centre for Accessible Environments, 2004, 4).

The Museum needed to bridge the gap between identifying problems and implementing solutions. Through background research, it was apparent that an action plan was the most effective method to solve this problem. Taking the documented recommendations of the CAE into account, an action plan was created. The action plan defined the work that needed to be done, recommended how the work should be done, prioritized the recommended changes, distributed responsibility for the work, and gave an approximation of cost for the work. In addition to helping the Museum meet the requirements of the DDA, we considered the needs of the patrons in the action plan. The

Museum strives to make all exhibits enjoyable and usable to the public. The result of our work provided the Museum with an outline of how to proceed in order to improve the accessibility of the building. Flexibility was also providing allowing the Museum to more effectively and efficiently implement the necessary changes to work towards their goal of complete accessibility.

This report was prepared by members of the Worcester Polytechnic Institute London Project Center. The relationship of the Center to the Science Museum and the relevance of the topic to the Science Museum are presented in Appendix A.

Chapter 2: Background

2.1 Introduction

The background chapter provides information about the topics and constraints pertaining to the Science Museum in regards to this project. In order to understand how the Science Museum must comply with the DDA the existing measures made for disability access must first be addressed. Next, documents, including the DDA itself, building standards, and the Access Audit on the Museum were considered. In addition, the implications, of the proposed solutions, both to the business and the general public were taken into account. Additionally, we considered the point of view and frustrations of disabled individuals. Finally, the general rules and standards to develop an action plan were researched, in order to include the correct information in the final report.

2.2 Disability Discrimination Act of 1995

The Disability Discrimination Act (DDA) is the governing legislation in the United Kingdom that covers disability rights in employment, membership organizations, and service providers. One of the main provisions of the DDA, as outlined in Section III, prohibits discrimination against disabled people. This includes treating them less favorably, mainly by means of providing them a service of lower quality (Disability Rights Commission, 2002, 5).

The definition of a disabled person spelled out by the DDA is fairly broad, but is described in such a way so that no one who needs reasonable accommodations will be overlooked. A disabled person, as defined by the DDA, is "someone who has a physical or mental impairment which has an effect on his or her ability to carry out normal day-to-day activities" (Disability Rights Commission, 2002, 7). This includes mobility disabilities and impairments of the senses. Mental illness, learning disabilities, and certain medical conditions are also covered, even though they are not always outwardly apparent to others (Disability Rights Commission, 2002, 7).

The term "service provider" is used frequently throughout the Act and describes anyone, either small business or organization, that supplies someone with goods, facilities, or services. These items can be expanded to include labor and other services which may not necessarily be a physical item. Nearly all businesses and organizations, small or large, are

under its jurisdiction including those that are public, private, non-profit, and government run (Disability Rights Commission, 2002, 8).

The Act was established in 1995 with more progressive stages going into effect in recent years. The first major deadline in 1999, required all businesses and service providers to begin to comply and make accommodations for the disabled. At that point, 'reasonable adjustments' were to be made to accommodate disabled people. If they are not currently providing the same quality of service to those with disabilities they must consider changing practices, providing alternatives, or additional assistance to make the service equal (Disability Rights Commission, 2002, i).

The final deadline put into effect by the DDA was in October of 2004. After this time it was no longer adequate to simply offer assistance or alternatives. This last stage was aimed at having service providers completely rethink their facilities and practices, in order to become fully compliant with the Act. The Disability Rights Commission created a code to describe adjustments adequate for different businesses in different situations (Disability Rights Commission, 2002, i).

Although the DDA is government legislation, it does not outline specific penalties for service providers who fail to comply, instead the act is enforced through personal lawsuits. The DDA granted people with disabilities the right to sue organizations for the discrimination against them through unequal service.

Included in the DDA, is a summary of the Approved Document of Part M of England and Wales building regulations. This document outlines how to construct building features which are "'reasonably safe and convenient' for disabled people to gain access to and within a building and to use it" (Disability Discrimination Act, 1995, 64). It is not a requirement to follow the provisions of Approved Document M, however, it simply suggests "one way in which the requirements of the regulations might be met but there is no obligation to adopt any of them" (Disability Discrimination Act, 1995, 65). There have been versions of Approved Document M released in 1992, 1999, and 2004.

The DDA states that physical changes done according to the specifications of Document M are in agreement with the DDA's regulations. This exemption, which is provided by the 2001 regulations of the DDA, states "that the service provider will not have to make adjustments to the feature if 10 years or less have passed since it was constructed or installed" (Disability Discrimination Act, 1995, 65). If a feature uses an alternative design, but yet still provides the same level of accessibility and comfort as it would have if it had

been designed in compliance with the Approved Document, then it is unlikely that the service provider will have to alter the feature if 10 years or less have passed since construction (Disability Discrimination Act, 1995, 64). This was to avoid deterring buildings from being designed using alternative inventive methods. The ten year period begins the first day the service provider is able to make use of the feature. If newer editions of Approved Document M are released after the completion of construction, the building is still regulated by the Approved Document it was built under. It is noteworthy, that the exemption applies to only those features which are covered by the Approved Document, not the entire building.

2.3 Museum of Science's History and Structure

The Science Museum in London is a free admission, non-profit, government run organization. The Museum was founded with the objective of offering and encouraging education in science and technology to the public of London. They offer several floors of exhibits on a variety of subjects concerning the role of technology in society, many of which are interactive (The National Museum of Science and Industry, 1998, 1/24/2005).

The Museum is run by a Board of Trustees with members appointed by the Prime Minister. The Science Museum, which opened in 1857, is one of four museums that make up the National Museums of Science and Industry. Originally it was grouped with the Victoria & Albert Museum, but a separate facility for the Science Museum was created in 1928. The Museum is still located in this facility.

Due to the Museum being both free to the public and non-profit, there are major constraints on the budget allotted to it by the government. This ultimately creates a need to balance the allocation of funds among the different departments within the Museum to comply with the DDA. The Museum is planning major renovations over the next decade to update their facility.

In a Trustees' meeting in December of 2001 a Master Plan was revealed. The master plan was developed to illustrate the vision of the Science Museum in the future. The next iteration of the master plan was entitled the *Museum of the Future*, revealed in March of 2002. The goals for the future have been filtered into two phases, the first to be completed in 2007 and the latter in 2015. The content for the first phase is a pragmatic and realizable vision, supportive of the 2015 plans, that delivers improved visitor resources and facilities on a realistic timescale. The primary focus of the 2007 vision is the Energy Hall, a set of high-

impact, coordinated projects that will create a dynamic new front end to the Museum. Finally, the Museum of the Future for 2015 is an aspirational, holistic vision for their entire estate in South Kensington. (Museum of the Future, 2002, 2)

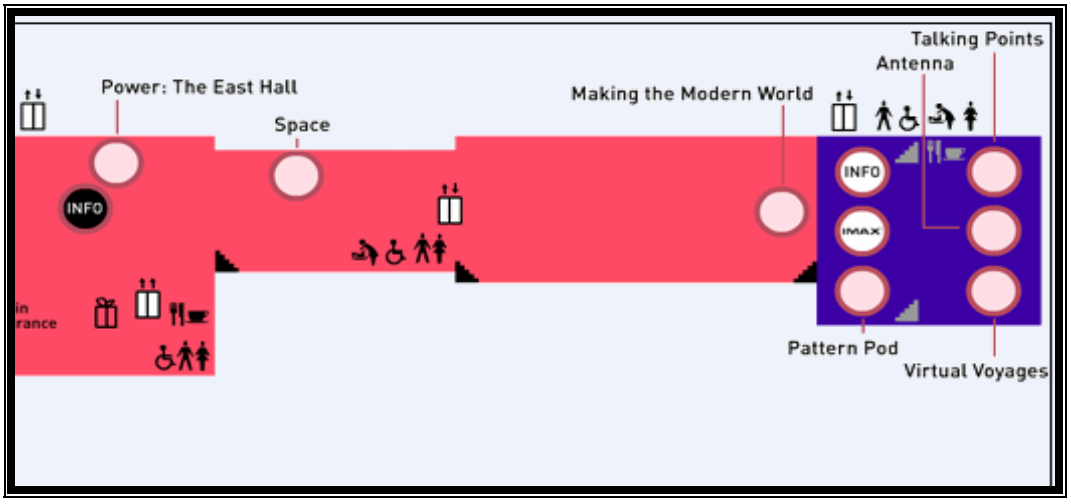
2.3.1 Existing Disability Access in the Science Museum

As of March 2005, the Science Museum did not completely meet the minimum requirements of the DDA. It is the Museum's goal to make their facility fully accessible to the public. A fully accessible building is one in which a patron can enjoy all the Museum has to offer without encountering physical barriers. At the time of this project the Museum had some procedures in place to aid disabled guests, however more needed to be done to make the building fully accessible.

The Museum is located in a busy section of London, see Figure 1, consequently parking for the disabled is extremely limited. Outside the main entrance there are four parking spaces which are used by visitors with disabled parking passes. Along Exhibition Road there are a total of twelve handicapped spaces. However, these are under the control of the local borough council and are distributed on a first come first serve basis. If no handicapped spaces are available upon arrival, assistance may be requested (The National Museum of Science and Industry, 1998, 1/24/2005). The Science Museum is conscious of the needs of the disabilities that exist and do their best to accommodate these patrons. Upon entrance to the Museum a pamphlet, The Museum Ticket Plan, is provided. This map illustrates the location of stairs, lifts, ramps, eating areas, and restrooms, see Figure 2. A large print guide is also available upon request. Problems arise when a person with a vision impairment or learning disability attempts to gain this same information.

Figure 1: Museum Location

Figure 2: Example Floor Plan of Museum



Staff members are available for assistance for both planned and unplanned visits. If scheduled in advance, a Personal Guides Scheme provides disabled people with a two hour tour catered to the interests of the visitor. During this members of staff explain the exhibits in the galleries, which people typically read. For those who need assistance with mobility about the Museum, wheelchairs are available. The number of wheelchairs is limited, but may be

booked in advanced. Customers that require the assistance of a guide dog are not denied service (The National Museum of Science and Industry, 1998, 1/24/2005). The Museum also currently provides its employees with Special Education Needs and Disability Awareness Training.

2.3.2 Staff Disability Training

In Chapter 3 of the DDA entitled *The service provider's duty not to treat a disabled person less favorably* there is section 3.16, *What steps should a service provider consider?* This section states, "Service providers are more likely to be able to comply with their duties under the Act and prevent their employees from discriminating against disabled customers if they consider the following steps: providing regular training to staff which is relevant to the adjustments to be made (Disability Discrimination Act, 1995, 23)." Among other requirements, the legislation states that it is a necessity to conduct a disability training session. Holding such a class educates employees on the legislation, point of view of the disabled, and proper communication skills with the disabled patrons.

To determine the current state of the Science Museum's disability training session a meeting was held with Val Fish, Management Development Consultant and Head of Disability Training throughout NMSI. Val Fish works part time for the NMSI as a management consultant and disability training is a small side project she also undertakes, refer to Appendix G for notes on the meeting. The training session is conducted in a personal atmosphere with groups ranging from 6 to 14 people and lasting for half of a work day. The sources considered when creating the material for the class are the DDA legislation, information presented by disability rights groups, published best practices, and Val's education with 10 years of experience on the subject matter. There are three main objectives of the training session: Explain the main elements of the DDA, demonstrate an increased awareness of the issues faced by people with disabilities and identify ways of making reasonable adjustments in their role, and to identify useful behaviors that enable delegates to assist visitors with disabilities in the galleries.

The course begins with a quiz to measure the knowledge of each individual on disability. Then an open discussion is held based on disability experiences employees have encountered while working. Next, a PowerPoint presentation is given on the contents of the DDA. Then the employees to break into groups of two and are sent to an exhibition in the

Science Museum while it is open to the public. One of the members in each group is limited by one of a variety of disabilities; an example is a mobility impairment carried out by placing the individual in a wheel chair. The second member of the team is to observe the other's struggles and emotions while making note of the reactions. They switch after the allotted time is over. During this phase they are to consider the limitations they encounter and reasonable adjustments the Museum could make. Next, the employees are educated on proper etiquette when interacting with the disabled. Finally, a post course quiz is distributed to gauge the information learned.

2.4 Centre for Accessible Environments Access Audit Report

The Science Museum hired the *Centre for Accessible Environments (CAE)* to formulate an Access Audit report. The driving force behind this hiring was the Museum's need to comply with the legislation set forth in the Disability Discrimination Act of 1995. The Audit was conducted between November 2003 and June 2004. The final report containing recommendations was submitted to the Museum in September of 2004. Areas of the Museum that are not accessible to the public and portions of the Museum located in separate facilities were not taken into consideration as part of the Audit. These areas include staff areas, the Dana Centre, and the Science Museum Library. It should also be noted that the Audit does not assess means of egress for the disabled in case of an emergency. However, it does state that, "A truly accessible building is one which people not only enter and use safely and conveniently, but one which they can leave safely in the event of an emergency" (Centre for Accessible Environments, 5). The Audit was performed based on the needs of disabled, but its recommendations will affect the accessibility of the building for all visitors.

2.4.1 Audit Criteria

Prior to examining the recommendations of the *CAE*, it was beneficial to understand the criteria used to evaluate the Museum's accessibility. The standards are described in Table 1.

Table 1: Audit Criteria

- Need to maximize access to and use of the building and facilities for members of the public and staff.
- Provisions in *Approved Document Part M* of the Building Regulations
- Guidelines in *BS 8300:2001* Design of Buildings and their approaches to meet the needs of disabled people-Code of Practice
- Current guidance on the provisions of the *Disability Discrimination Act of 1995*
- Current published good practice in design and detailing which meets the needs of disabled people
- Need to observe reasonable functional and financial practicalities of implementing action to improve access

[Quoted from: Centre for Accessible Environments, 2004, 4]

The assessment of the Audit was centered on a priority rating system and time scale. There were three possible ratings that a recommendation could receive. As defined by the Access Audit, an item given an "A" was deemed to be essential, meaning it would be required to provide safe access. A "B" rating means that an item is desirable, meaning that the changes would improve access for some disabled people. An item receives a "C" rating if it falls in the best practices category. These items need to be addressed to provide improved access for disabled people in accordance with the recommended best practices of the *CAE* Centre for Accessible Environments (Centre for Accessible Environments, 2004, 1).

Items were also given recommendations as to when the changes should take place. The *CAE* defines short term changes, "s", as those needing modifications immediately in order to comply with the DDA. A medium rating, "m" means that the change should occur

over the next three to five years. Changes which are currently not feasible are given a long term rating, "l", which is characterized by an eight to ten year period (Centre for Accessible Environments, 2004, 1). The Access Audit also identifies items as being part of the "Museum of the Future" plan (Centre for Accessible Environments, 2004, 2).

2.4.2 Structure of Audit

The Audit was comprised of three portions: an introduction, a summary of the findings of the Audit, and a tabular section used to concentrate on each item requiring attention. The introduction identified who the Audit is affecting, how it was formed, a definition of accessibility, and an overview of the section of the DDA affecting accessibility. This portion of the Audit also contained a disclaimer, which states that while the Audit was conducted with consultation of the DDA, it does not provide immunity to the Museum from the award of damages under the Act (Centre for Accessible Environments, 2004, 8). The summary of the Audit gave an overview of its findings and defined the terms used in the tabular portion, as seen in Appendix B. The tabular segment of the Audit contained fourteen sections, items 2.0-15.0 in the table of contents. The CAE evaluated the building by looking at the approaches, entrances, internal routes of circulation for all floors, internal routes and circulation for vertical passage, auditoriums, retail and catering, water closets, motion ride simulators, and emergency egress. The tabular section was divided into four columns which identified the item, provided a brief description of the current condition, a recommendation for change, and a priority rating based on need and time where applicable. An example of the tabular portion of the Audit can be seen below, in Figure 3.

Figure 3: Sample of CAE Access Audit

Column 1		**Column 2** Current situation	**Column 3** Recommendations	
Item	**Area**			
4.1	From SE lift or stairs	The floor is stone immediately outside the lift. Beyond this is a wood floored area is used for temporary exhibitions. A floor number sign is positioned on the route to next level.	It is recommended to locate the number seen on arriving by stairs or lift.	B s

2.4.3 Approaches and Entrances

The items in the approaches and entrances section of the Audit which were given a "s" priority mainly dealt with surfaces, signage, and levelness of ground. The Audit identified areas where the surface was too coarse and would present accessibility issues for someone in a wheel chair. Approaches from various forms of public transportation were evaluated. The *CAE* advised in many instances that a liaison with the local authorities would be beneficial in upgrading the accessibility of stairways, signage, and approaches. In some parts of the Museum, the stairways are too worn, and a nosing of contrasting color is recommended. Signage is generally difficult to find and is presented in a manner that may be difficult for people with certain disabilities to read. Throughout the Audit, it is advised that a consistent form of signage be used. There were also several instances where doorway thresholds were identified as troublesome areas (Centre for Accessible Environments, 2004).

Long term recommendations for change included, making entrances clearly identifiable and a major redevelopment of the South Kensington estate in 2015 to improve the parking situation at the Museum. The *CAE* advises adding a contrasting border around entrances to make them easily identifiable. It is also advised that clear points of orientation be set up in the main lobby area to help the disabled plan their visit (Centre for Accessible Environments, 2004, 14).

2.4.4 Internal Circulation

Within the Science Museum, there were some reoccurring problems throughout the building. One of the most frequent items the *CAE* felt was essential and needed to be addressed immediately was the lighting. In several areas where lighting was problematic the Audit said, "It is understood that low light levels may be required for conservation or desired for special effect. However, it is recommended to increase light where feasible to a minimum of 100 lux on main routes" (Centre for Accessible Environments, 2004, 22). There were other areas where there was a drastic change in the level of the lighting. It was advised that people be warned prior to entering such an area and that transition lighting be utilized.

Establishing a wayfinding system is a top priority for the Science Museum. In cases where signage was confusing or mobility was hindered, the CAE advised considering "[…] a consistent wayfinding system to include simple clear signs using colour and tactile elements

with links to maps and plans, print and recorded information" (Centre for Accessible Environments, 2004, 22). Hard, shiny finishes were identified as being elements that needed to be changed. The acoustics of soft finishes are better for those who have hearing disabilities. High gloss finishes can also be difficult for people with visual impairments and therefore are discouraged from being used. In addition, flooring patterns in the Museum were recognized as being problematic. Boldly patterned flooring systems can be difficult for those with learning disabilities, as they can create confusion. Additionally, large bold geometric flooring patterns should never be used. A change in flooring is only helpful when indicating a directional change. Flooring transitions should be utilized in this manor to avoid confusion (Centre for Accessible ,Environments, 2004,15).

The *CAE* recommended that the Museum clearly identify areas where lifts are located. In parts of the building, the lifts are not located in the same area as the stairs. Confusion is caused and this issue is compounded by poor signage. As part of their long term plan, the Museum aims to fix these lift problems. They have also included an extensive ramp area in their "Museum of the Future" plan (Centre for Accessible Environments, 2004, 14).

Now that the main problems within the Museum had been identified, a plan of action had to be formulated. To better understand the development of such a plan, it was advantageous to look at the implications our work would have.

2.5 Implications

Instituting cultural change within a large organization is a delicate process. There were many underlying aspects that had to be understood. To effectively alter the Museum's physical attributes in a manner that can accommodate all of its patrons, the psychology of the users had to be understood. All disabilities must be considered even if they are not outwardly apparent like learning disabilities. Change could not effectively be implemented based wholly on social implications. Furthermore, the ethical and political issues had to be considered.

2.5.1 Psychology of the Disabled

Being disabled can vastly affect one's day to day activities. An essential aspect of research, as related to the project, was to better understand the needs, emotions, and mental conditions of the people that will be impacted. To effectively address the problem, the Museum needed to find a solution that is as user-friendly as possible, while staying within the budget. The Science Museum had to ensure that all of these factors were considered to successfully accommodate the people it serves, as well as complying with the DDA. The better understanding that there was of the psyche and attitudes of the people it was affecting, the better suited the final plans would be.

Kaufman-Scarbourough writes about the needs and attitudes of the disabled in an article entitled, *Reasonable Access for Mobility-Disabled Persons is More Than Widening the Door*. This article discusses how simply complying with the requirements of the Americans with Disabilities Act (ADA) is not enough, accommodations must also be sensitive to the people it applies to (Kaufman-Scarbourough, 1999, 479). Kaufman-Scarborough focuses on stores and retailers extensively in this report.

From this there was much to be learned about how they feel in public, as well as, how the public feels toward them.

One key notion uncovered in this study and others similar to it, is that those who are disabled would rather not have to seek out people to ask for help (Kaufman-Scarbourough, 1999, 498). However, when this is necessary, places with staff that are ready to assist are more desirable than those with people that are difficult to track down. Furthermore, both expected and unexpected obstacles and situations are not favorable. Accounts show that disabled customers will build a bias for or against places based on how sensitive they are in being ADA compliant and whether potential obstables exist (Kaufman-Scarbourough, 1999, 491).

Differentiation between locations that were "reasonable" and "reasonable enough" in their compliance were also studied. One example is that although on paper the location may be compliant with the ADA in the amount of handicapped parking spaces they provided, they may not put them in convenient or sensible locations. (Kaufman-Scarbourough, 1999, 489). This brings up the issues of being compliant, sensitive, and realistic. Compliance with legislation is only seen as one step of being accessible to those who have disabilities. For example, placing accommodations, which are compliant, in locations that are difficult or at a

great distance in a sense counteract their purpose. In this way, the more likely that a problem or incident that could lead to embarrassments for the person using the facility is, the less likely it is that they will become partial to the location (Kaufman-Scarbourough, 1999, 491)

Thinking past physical disabilities, the Museum also must be accessible to people with mental and learning disabilities. In comparison, dealing with learning disabilities may be more difficult because there are no clear cut, standardized practices or methods. The National Center for Learning Disabilities is a disability rights group that deals strictly with people with learning disabilities. A large portion of what this group advocates is for people to examine their disability in a positive light. The organization states that people with learning disabilities must learn to work around their disability. This experience allows them to think 'outside the box,' often leading to more creative solutions and imaginative answers to problems (National Adult Literacy and Learning Disabilities Center [NALLDC], 1999, 27-30). This is an important concept to understand, when considering people with learning disabilities, as conventional means of conveying and understanding information may not always be as easy to grasp. One has to anticipate alternate interpretations and explanations of concepts that are not always clear. Those affected are usually rather persistent in succeeding when they are presented with tasks (NALLDC, 1999, 27-30).

Looking past the direct obstacles people with disabilities face in a public environment Susan Wendell, in *The Rejected Body*, discusses the social boundaries and implications one faces in being disabled. Wendell examines how often times, the disability can overshadow the person who has it. In other words, the person is better known for their disability opposed to their own accomplishments and values (Wendell, 1996, 6).

People can sometimes be reluctant or ignorant towards acceptance of those with disabilities. Disability is often viewed symbolically. Those who are non-disabled often cannot relate to those who are disabled as they have difficulty looking beyond the disability. This can also lead to the disabled not being valued or listened to in terms of knowledge (Wendell, 1996, 43). Wendell also discusses how the disabled can feel trapped as a result of their disability (Wendell, 1996, 41). In a world that does not cater to their needs or values, a person with disability often has much adversity in finding employment, living accommodations, or everyday necessities. It is a cycle that will not end unless the general view of the disabled changes.

With this knowledge, it was important that the organization strived above and beyond the guidelines that any legislation prescribed. In determining proper actions to take in

modifying the systems and physical building at the Museum, a firm understanding as to the mindset of all individuals with disabilities had to be achieved. Understanding the mindset of people with disabilities is crucial to working with these individuals or making suggestions and decisions with them in mind. Decisions had to be made that were both compliant and sensitive. The less attention and difficulty the person whom is disabled was subject to, the more sound and successful the system was going to be. Balance among all of these factors had to be present to ease the minds of the disabled people. When all this is considered in the design of a public place, like the Science Museum, it reduces their fears, as well as increases their safety and overall enjoyment.

2.5.3 Ethical and Political Issues

Museums have a strong link to political aspects of society. These institutions make states look "progressive, concerned about the spiritual life of it citizens, a preserver of past achievements and a provider for the common good" (Duncan, 1991, 93). Public museums are accessible to everyone and can be seen as a symbol of the state's commitment to equality. According to Duncan, in many historical cultures "only propertied males were full citizens. But in the museum, everyone was in principle equal" (Duncan, 1991, 95). A museum does not discriminate based on education level; it equally welcomes experts and novices alike. A national museum also demonstrates the government's role as a servant and provider of the public. In essence, the museum establishes a direct relationship between each citizen who utilizes the facility and the regime that established it.

Due to the relationship with the state that the Museum established, decision-making had to be done carefully, as it could have affected the dynamic of this connection. "To control a museum means precisely to control the representation of a community and some of its highest, most authoritative truths. It also means the power to define and rank people, to declare some as having a greater share than others in the community's common heritage-in it's very identity" (Duncan, 1991, 102). Thus, implementing change in a museum is more than just a matter of changing material objects within the buildings physical structure; it is to truly change the public's perception of its governing body.

Until recently, disability had been perceived as a private rather than a public concern. According to Susan Wendell, only when people view accessibility as a public responsibility will conditions for disabled people truly be improved. "These attitudes are related to the fact

that many modern societies split human concerns into public and private worlds. Typically, those with disabilities and illnesses have been relegated to the private realm […]" (Wendell, 1996, 52). The implementation of disability legislation has recognized disabled people as full citizens who deserve the same rights available to all members of society. Evidence of progress is apparent in the modern methods used by those running museums. In *The New Museum Registration Methods* by Buck and Gilmore, special consideration has been given to the disabled. "[…] any effort to improve access and traffic flow in a museum should include substantial attention to the needs of persons with disabilities. Such good-faith efforts can range from the obvious (Braille signage, wheelchair ramps) to the practical (lowered lab counters and light switches)" (Buck and Gilmore, 1998, 272).

The changes associated with updating disability access in buildings are of considerable cost. However, most people do not see the changes as an investment, but rather a means of charity to accommodate the disabled. The impact of disability improvements will be greater then anticipated, as those affected will be comprised of an unknown portion of society who had previously been forced into private living because of their disability (Wendell, 1996, 51).

2.6 Design and Cost of Accessibility

The growth of the disabled community has not only lead to the passing of disability legislation, but also a new form of building design that is accessible to all users. Additionally, as the world becomes more accessible to the disabled their economic significance in society increases.

2.6.1 Designing for Accessibility

Disability legislation has transformed the manner in which buildings are designed. Traditional design is being replaced by new methods which take into account the needs of people of all ages and abilities. The need for disability legislation and improved building design has ties to advances in medicine and technology. Medical advances have increased life expectancy, as well as the quality of life for disabled people. Thus, a greater percentage of the population is now in need of a more accessible environment in public buildings. What

has emerged is a type of design that addresses the common needs of people with and without disabilities (Mueller, 1998, 3/16.2005).

This type of design is known as universal design. It provides an alternative to the traditional changes made specifically for the disabled, which are typically expensive and unattractive. In universal design, "many such features could be commonly provided and thus less expensive, unlabeled, attractive, and even marketable…" (Mueller, 1998, 3/16/2005). The purpose of universal design is to eliminate the physical barriers that separate those with or without disabilities. Universal design strives to make buildings usable and comfortable for all people. "Because reasonable cost is a fundamental issue in any design and production process, universal design has become a very marketable approach, since it addresses the diverse needs of a majority of consumers" (Mueller 1998, 3/16/2005).

2.6.2 Cost of Accessibility

The decline of the economy in the 1980s resulted in a loss of funds for rehabilitation engineering research and the removal of environmental barriers. Conversely, manufacturers were beginning to recognize the potential of market-broadening to include disability accommodating products (Mueller, 1998, 3/16/2005). Since this downturn, there have been several instances of large economic impacts due to designing for disability compliance. One example that started a revolution in kitchen utensils is that of the Oxo International Company. In 1990 Oxo International launched its Good Grips division responsible for producing kitchen utensils for people whose physical abilities were limited by arthritis. In a 5 year period, Oxo International grew with an annual rate of 40% to 50% and became a $20 million a year company. Designing for disabilities expands the diversity of the consumer base, other companies quickly began to recognized the economic potentials (Mueller, 1998, 3/16/2005).

Presently in the United Kingdom 16% of the population suffers from a disability. This is over 8.5 million people who have a considerable spending power of an increasing estimated £60 billion a year (Access Made Easy, 2004, 3/16/2005). Designing goods, services, and facilities that are sensitive to individual needs broadens the consumer market, thus ideally resulting in an increasing profit. In achieving DDA compliance there is significant initial cost as well as annual maintenance and staff expenses, however opening up businesses in the long run will increase the base of people it is open to. Avoiding the

legislation could result in a much larger financial loses. With the addition of Part III of the DDA in October of 2004, non-compliant businesses may be subject to personal lawsuits.

2.7 Disability Demographics

As a means to aid decision making in the action plan, disability demographics were researched. Elderly people were also included in this research due to their frequent issues with access. The demographics used were based on the amount of people in Europe with various disabilities. The populations, given in millions, for each group of disabilities in Europe in 2000, are given in Table 2. Both the elderly and those with hearing impairments have populations of roughly 80 million. These two categories account for the largest percentage of any disabled population in Europe. Conversely, wheelchair users accounted for the smallest portion of the population (Gill, 2000, 4/15/2005).

Table 2: Disability Demographics for Europe in 2000

Disability	**Million**
Wheelchairs	3
Mobility Impairment	45
Reduced Strength	22
Dyslexia	25
Learning Disabled	30
Hearing Impairment	80
Vision Impairment	11
Elderly	80

2.8 Template of an Action Plan

"Access plans or access strategies [action plans] are the best way of ensuring that the information gathered and recommendations made in the access audit are effectively used (Designing for Accessibility, 2004, 12)." Before writing an action plan, we had to first understand the general format that they typically followed. It was vital to understand the type of information which needed to be displayed and the most effective manner in which to display it.

2.8.1 Definition of an Action Plan

In a broad sense an action plan can be defined as "a document used to guide the implementation of business process improvements…it contains task assignments, schedules, resource allocations, assignments, and evaluation criteria" (Help Desk Institute, 2004, 1/24/2005). More specifically, when creating an action plan for an establishment that desires to meet the requirements of a disability act, the goal of the action plan is to eliminate disability discrimination from its goods, services, and facilities. Developing and implementing an action plan is voluntary, but it is a practical approach to achieving Disability Discrimination Act compliance. It has benefits for both the organization in question and for its customers with disabilities. The development and implementation of an action plan aids the establishment in terms of delivering services and reaching goals more efficiently. The image of the corporation then becomes first-rate due to the attention of detail the company is giving the issue. For the customers with disabilities, the implementation of action plans essentially results in the elimination of disability discrimination without complaints being made against the organization. Thus, inequality against those with disabilities will be reduced.

The DDA requires that when an action plan is developed, the organization must state how disabled people have been involved in drawing up the equality system, to ensure that good practice is spread widely across the organization (Disability Unit, 1995, 2/5/2005). Involving disabled people in the action plan process helped to ensure that perceptions of access by able-bodied investigators were not biased. Organizations can consult people with disabilities and/or representative organizations, review their policies and practices, identify

barriers for the disabled, and suggest strategies to eliminate those barriers. Despite the fact that the purpose of the action plan was to aid the disabled population, the organization had to continue to strive to serve the whole population fairly, both disabled and non-disabled. The goal of a high-quality action plan should reflect the following, "the priorities of disabled people as elicited through consultation, the strategic priorities of the body, and the key milestones or external pressures faced by the body" (Disability Unit, 1995, 2/5/2005).

The needs of each organization will dictate the different mechanisms used in their action plan. Each organization working to comply with the DDA effectively, should ensure that the action plan they implement meet certain criteria. The first is that the action plan must be focused, clear where the body has the scope to make changes, and what resources are available. Secondly the plan must cover relevant stakeholders, views of current service users, potential service users, staff, and the wider community. Thirdly, the action plan should be proportionate. The size of the public body and the extent of the body's interactions with disabled people should be evident in the recommendations of the action plan. Finally, it should be apparent to people outside the organization how consultation with disable persons has affected the body's plans (Disability Unit, 1995, 2/5/2005).

A database of action plans aiming to comply with the DDA were found on an Australian government website. Although it is a different country, the general ideas of the DDA and action plans are the same. After research on action plans regarding the DDA, we came to the conclusion that the structure of the action plans varied with the issue they were covering and the organization that was forming the plan. General topics covered in action plans that reoccurred during research were, the devising of policies and programs to achieve the objectives of the DDA, methods for communicating the policies and programs to the employees, reviewing current practices within the Museum to uncover any discriminatory practices, establishing goals that comply with the Act, the means of evaluating policies and programs, and the appointment of persons within the service provider to implement the action plan (Human Rights and Equal Opportunity Commission, 2005, 1/24/2005). Prior to the action plan being presented, the main objectives are typically listed in bulleted manner. In some of the case studies viewed, the action plans were broken down into sections by the previously stated objectives. Through these cases studies, we have found that most disability action plans have similar topic headings listed in a tabular format. These topic headings are as follows, Strategies, Person Responsible, Timeframe, Result, and Status. There does not

seem to be a standardized template for making action plans. However, most share these key components.

2.9 Summary

The current problems facing the Museum were presented in a prioritized manner by the CAE in the Access Audit. Implementing the suggested changes required consideration of the DDA, economic implications, social implications, organizational structure, as well as the institutional culture of the Museum. The understanding of these topics allowed us to create a suitable action plan, guiding the Science Museum toward their goal of a fully accessible facility.

Chapter 3: Methodology

The main objective of this project was to develop a useable action plan for the Science Museum. The section describes the processes used to reach the goal of this project. This action plan had to contain solutions for the Museum to work towards being compliant with the DDA while offering a comfortable experience for disabled patrons. The project took place between January 13th, 2005 and April 29, 2005, however it is expected that the implications of our work will not be seen in full until well after our departure. In order to understand how the Science Museum must comply with the DDA we first addressed the existing measures made for disability access. Our team fulfilled these goals through the following objectives:

- Reorganized Access Audit
    - Detailed walk-through of the Museum with Audit
- Determined the Priority of Disability Issues and Edited Recommended Solutions
    - Conducted Staff Interviews
    - Analyzed Complaint Database
    - Obtained Approximate Cost Estimates
- Recommend and Implemented a Useable Action Plan
    - Training and Policy

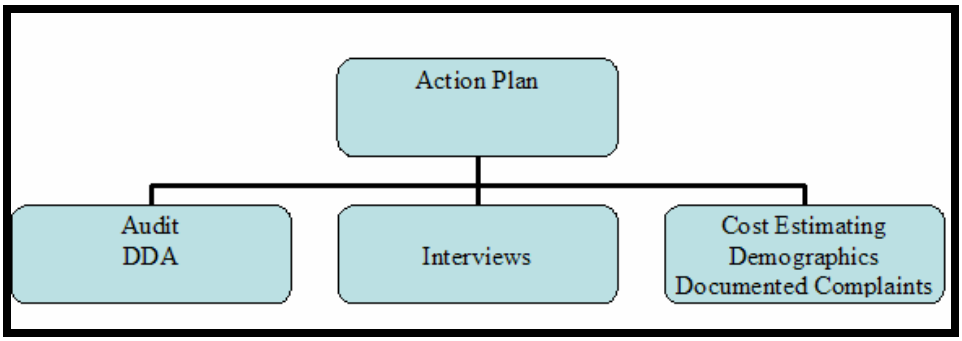
Each of these is discussed in the following sections.

3.1 Connecting Research and Final Product

The information gathered during the project can be divided into three different groupings. They are grouped together both by the type of data they provided and by the way they were analyzed. The DDA established the minimum requirements that the Museum must comply with. Both the DDA and the Access Audit were used as a reference documents for the action plan. The action plan reorganized and built on the information in the Audit. Interviews with staff members provided us insight into common disability problems in the Museum and information on the ability of staff members to identify and aid disabled patrons. This qualitative data was used to develop our rankings and edit recommended solutions. Approximate cost estimates, disability demographics, and documented disability complaints

gave us quantitative information on which to aid our decision making process when establishing priority within the action plan. Similar analytical procedures were applied within each division, shown in Figure 4.

Figure 4: Structure of Research



3.2 Reorganization of Access Audit

The Access Audit, completed by the Centre for Accessible Environments (CAE), identified all the physical elements of the Museum that needed to be changed in order to make the Museum completely accessible. The CAE gave each item a rating and timetable that they should be addressed. However, it was organized by assigned identification numbers which corresponded to various areas of the Museum, both by floor and gallery.

The original format of the Audit presented to the Museum was not usable. The Audit is a lengthy document presented in tabular format. Within the tables, the priority and time ratings appear in the same column and often times it was not clear as to what recommendation they correspond to, refer back to Figure 3, Section 2.4.2. The Museum's main request was that we formulate an action plan that was both clear and functional.

The Audit was imported from a text form into a spreadsheet and then into Microsoft Access, to create a database. This database can be sort the Audit by the information it contains. Using queries, one can set which information they want to filter or sort by. In addition, Microsoft Access is capable of printing out the filtered/sorted information in a visually appealing form. The database's capabilities allowed us to focus on particular areas of the Museum's ratings and timelines for different items mentioned in the Audit with ease

and control. It also allowed those members of staff working on this project an efficient means to access the Audit in the future.

The original state of the Audit was organized into sections according to areas of the Museum. The Access Audit was reorganized by CAE priority, rather than by sections, to mirror the format we will be using in the action plan. Displaying data in this manner provided those making decisions with a visual tool upon which comparisons are easily made. The comparison of the data can then be used to aid the decision maker about what changes need to made immediately and the establishment of a timetable for future changes.

Unlike the CAE's ranking system, the action plan established a new set of priorities for each of the items listed in the Access Audit. These priorities were based on several factors, including the CAE's rankings in the Access Audit, staff interviews, prior disability complaints, disability demographics, and cost data. Our ranking system is different from the CAE's in that it takes into consideration the Museum's decision making constraints. Additionally, the action plan is organized by our priority rather then an assigned identification number used in the Access Audit. This is a more usable format for the Museum, as it clearly demonstrates each items relative importance.

3.2.1 Detailed Walk-through of Museum with Audit

To better understand the Access Audit and the recommendations of the CAE within the Audit, a detailed walk-through was performed. Before going on the walk-through of the Museum, we decided it was beneficial to document our observations of the items being specified by the CAE. We recorded our observations in on a worksheet in Microsoft Excel, this file can be seen in Appendix H. We did this so that the information could be sorted easily through the *Auto Filter* feature. This detailed walk-through allowed us to visually see what we had only read on paper before. Prior to conducting the walk-through, the database sorted the Audit by CAE priority. The walk-through was then performed in two stages. During the first stage the focus was on observing all items that were given an "A" priority. We did this so that we could see all the items the CAE identified as being required by the DDA. Then we went through the items with "B" and "C" priority. We felt this was the best way to go about performing the walk-through because the action plan was going to be organized by priority, not by areas of the building.

3.3 Determining the Priority of Disability Issues and Improvement of Proposed Solutions

In order to create the Action Plan, we needed information from the disabled public to aid us in identifying which problem areas in the Museum were of most importance. This is strongly advised in Section 4.10 of the DDA, which states "Disabled people know best what hurdles they face in trying to use the services provided. They can identify difficulties in accessing services and might also suggest solution involving the provision of reasonable adjustments" (Disability Discrimination Act, 1995). Disabled people could not be contacted directly due to time constraints. Disability references which consulted with disabled people were a second hand source to obtain disabled peoples views and opinions. This information was used along with the Access Audit, staff interviews, disability demographics, and cost estimating data as sources of information to base our decision making. Decisions were made regarding modifications necessary to the Museum, potential and reoccurring difficulties, effectiveness of implemented solutions, and the priority of certain problems. The staff interviews were used to obtain qualitative information, while the disability demographics, and cost estimating references were all sources of quantitative data.

3.3.1 Staff Interviews

The Museum has over 500 full and part time employees. The interviews were focused on the staff members who interact directly with visitors. For this reason, interviews were done with the Visitor Service Assistants (VSAs), Front of House, and explainers. The VSAs were chosen because their job is to assist any visitors that have questions or problems. They also are the members of staff that escort visitors who request a personal tour. The Front of House staff works at all of the various information points in the Museum. These points include the information desk, ticketing desk, IMAX desk, and motion ride simulator desk. The explainers primarily work with children, provide assistance at exhibits, and perform educational demonstrations. The interviews were conducted privately so that staff members would feel comfortable expressing any views they had on the Museum.

Fifteen staff members from each of the three departments were selected randomly. This sample size was chosen because it was a feasible number of interviews to conduct considering our time constraints and the Museum's staffing constraings. Due to the

hierarchical structure of the Museum, we had to meet with department heads and the managers below them before receiving permission to conduct interviews. Another reason for selecting this sample size was it provided us with an accurate representation of the on-floor staff from each department. It was important to interview a diverse group of staff, as it provided us with varying levels of working experience as well as an accurate portrayal of the current state of disability awareness and access in the Museum.

The staff members were asked a series of questions, shown in Table 3. The goal of these interviews was to uncover systematic and physical improvements staff members would like to see in the Museum. Additionally, we inquired about their disability awareness training experience. They were also asked about any issues they have had in dealing with disabled patrons.

Staff members were more apt to explain the access problems they consistently run into during a typical day through interviews. Although the patrons themselves can cite specific areas, they visit the Museum far less frequently than the staff. For this reason, employees were able to cite repeated and consistent problems more accurately than patrons. Another advantage of interviewing the staff over individual visitors was that their answers are not limited to a specific disability. They can provide answers to a variety of questions that concern people with different disabilities they observe during their work. The employees were willing to tell us their frustrations on tasks because they deal with reoccurring issues every day and observe issues which take up a significant amount of their time.

Table 3: Questions for Staff

The interviews included the following questions

- How long have you worked here at the Science Museum?
- How often do you interact with disabled patrons?
- Within your department, what special measures are taken to accommodate disabled patrons?
- What common issues do you face in dealing with disability access?
    - Can you cite some specific examples?
    - What possible solutions have been suggested in the past to help alleviate such issues?
    - Are there any possible solutions you would suggest?
- Have you attended the training session for disability awareness? If so:
    - What are you feelings on the effectiveness of this training?
    - Would you make any changes to the program? If so, what would they be?
    - In your opinion, should this training be made mandatory?
        - If not: Have you heard anything about this session?

3.3.2 Complaint Database

As part of a constant commitment to its visitors, the Science Museum allows patrons to fill out visitor feedback forms concerning their visit to the Museum. They keep track of the complaints in a database, which divides the complaints into various areas. Every comment along with the Museum's response to it is entered into an ongoing response database and filed under different headings. One of the areas the complaints are broken into is disability complaints. We obtained the statistical data for 391 disability complaints over the past 5 years and 19 copies of the actual written complaints by patrons and responses by the Museum. They were carefully read in order to gain an understanding of what patrons find difficult and, possibly more important, worthy of filing an informal complaint. The complaints were read and sorted by more specific issues such as signage and bathrooms. They were organized in this manner to expose any of the same reoccurring issues viewed in the Audit. It was also noted if a possible solution to the problem was given by the patron or in the Museum's response.

3.3.3 Estimating Costs of Proposed Solutions

The biggest constraint in updating the Museums access is cost. The Museum had a very limited budget of 37,000 pounds to address disability access issues in 2005. For this reason, cost was a major determining factor in assessing how usable the action plan was. The Museum requested that the action plan help them decide how to spend the 2005 budget, while also providing them with the necessary data to back up their request for future budgets.

Before getting to the point of cost estimating, we first analyzed the proposed solutions and formulated a list of issues upon which we needed data. The proposed solutions in the Access Audit simply describe how the area should appear after the work is complete. It does not outline the steps needed to make the alteration. In making our list of issues which need to be estimated, we had to consider how to make the appropriate changes. For example, an issue raised by the Audit is that there is poor color contrast between the skirting and the walls in several areas of the Museum. The CAE recommended that they increase color contrast in these areas. In this case, we identified two methods that may be used to solve the problem,

either painting the skirting or replacing it. On our list of items to be estimated we added painting and cost of replacing wood and vinyl skirting, which both appear in the Museum.

The CAE's proposed solutions do not contain quantities and the appropriate details needed for accurate cost estimation. Thus, we were forced to obtain approximate cost data. We contacted the Estates and Design departments within the Museum to help us find costs for the proposed solutions. The Estates department was contacted because it is in charge of making physical changes to the building. The Design department provided us with information regarding the cost of various kinds of signage. The Estates department contacted a lift specialist in the Museum to estimate solutions dealing with lifts and their quantity surveyor for the other issues. The head of the Design department was consulted to obtain the desired signage costs. The basis for much of their pricing was from previous work in the Museum.

3.4 Creating a Useable Action Plan

After all data collection and analysis was complete, we were ready to create the action plan. The biggest challenge facing us was to determine how to incorporate all the information gathered into our ranking. A decision matrix was the most effective method for making the ranking in terms of priority. The decision matrix had four weighted categories, the urgency for compliance, disability demographics, cost, and previous complaints as stated in the staff interviews. These categories each had an assigned weight based on their level of influence in determining the order of issues to address. We met with our sponsor after creating the weighted system to ensure that it accurately represented the factors affecting the Museum's decision making process.

We assigned a value to each item in each of the four weighted categories. The values ranged from 1 to 10. A score of 10 was reserved for the base case scenario in each column. These values were multiplied by the corresponding weights and then added together to create a score. All the items in the action plan were then ranked according to these scores from highest to lowest. The items with the highest score were of the highest priority.

3.4.1 Disability Policy and Disability Awareness Training

The Museum did not have a disability policy in place at the time of this project. Our sponsor requested that we provide recommendations as to what information should be included in their policy. Our sponsor also requested that we assess their disability awareness training. We discovered that disability awareness training is a substantial portion commonly found in a disability policy. To develop recommendations for the Museum on these issues we looked at suggestions in the DDA and disability publications.

It is stated in the DDA that even if service provider have issued instructions not to discriminate, a service provider is still legally liable for its employees under the Act (Disability Discrimination Act, 2004, 22). Thus, it is imperative that the service provider take all steps necessary to prevent their employees from discriminating against disabled customers. Researching other training sessions on disability awareness as well as considering the recommendations of the DDA, we reevaluated the Science Museum's current training program and suggested possible improvements. The standards for the training session and other various guidelines needed to be set forth in a company wide policy on disability.

As mentioned previously, a service provider is legally liable for its employees under the Act. However, in a legal dispute against the service provider due to the actions of its employee, a defense can be that the service provider took "such steps as were reasonably practical" to prevent such actions. A policy on disability which is communicated to the employees could be central evidence to such a defense. It is not suitable defense to simply show that the action took place without its knowledge or approval (Disability Discrimination Act, 2004, 22).

For purposes of setting a company standard on disability as well as protecting the Science Museum in the event of legal proceedings, it was of the utmost importance that a policy on disability is constructed. We did not draw up such a policy, however we did make suggestions as to what should be included in the policy based on research and DDA requirements.

Chapter 4: Results

4.1 Audit Report Database

Taking a step toward the completion of the action plan, the Audit was transferred into a database (Microsoft Access) so that we would be able to organize the data by different sorting criteria. An example of the reports produced by Microsoft Access produced is in Figure 5, to view the entire database refer to the attached CD-ROM. The number in the top left hand corner corresponds to the numbering system used by the CAE in the Access Audit. It also gives the priority rating, timeframe, area, issue, solution, and a section specifying if the issue should be dealt with through management or maintenance procedures. The Audit can be sorted by any of these headings or any combination of these headings. It can also be searched by any information presented in the report; this includes headings and the information given underneath each heading.

An example of how Microsoft Access is an effective tool for accessing the information in the Access Audit is shown in Figure 6. This figure is a table produced in Microsoft Access that was sorted by "A" priority, "s" timeframe, and a 4.0 reference number, which refers to the internal routes and circulation on the first floor. This table can be put into a report format, which displays the information in the manner demonstrated in Figure 5.

Figure 5: Example of Microsoft Access Report Format

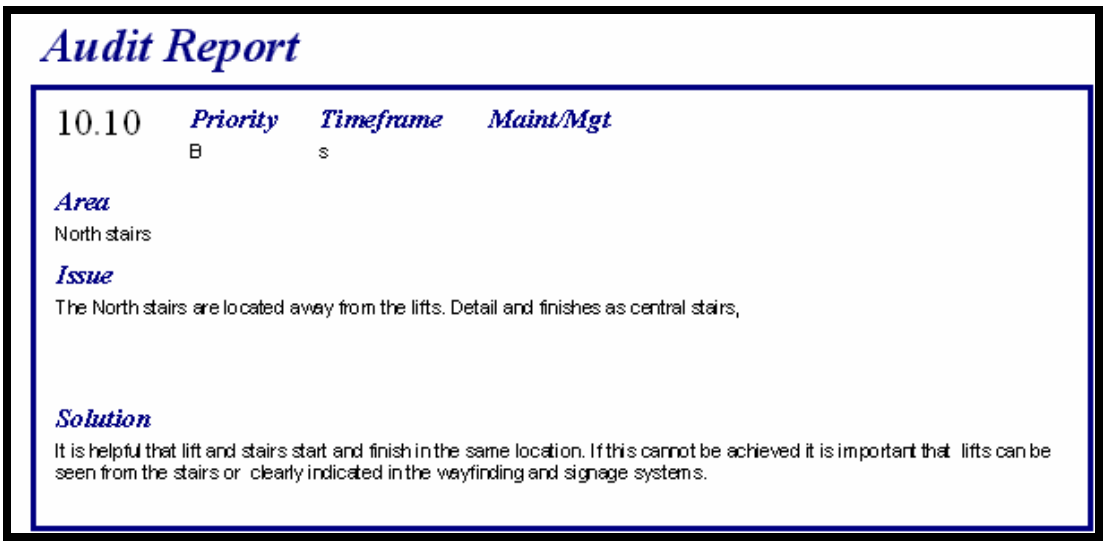


Figure 6: Portion of Filtered Access Audit

Ref	Area	Issue	Solution	Priority	Timeframe	Maint/Mgt	Ref Docs
4.10	Food for Thought	The route at the end of this display area is unclear and disorientating. There are no clear sight lines through and some dead-ends. There are interactive surfaces at 800mm from ff. A ramp to a balcony viewing area is closed.	Short term it is recommended to change finish to indicate start and finish of the ramps. Also extend the rail up and add a rail to the wall side on the exit. Medium term for 2007 changes include stepped and ramp options along routes where feasible.	A	s		See guidance in DfA p40 and Part M item 3.51-3.52 p 42.
4.11	Wellcome Wing	Images are projected in light on the floor.	Short term warn visitors of lighting effect and where possible project only onto secondary not major routes. 'Who am I?' will be maintained and refreshed in 2007 then updated further for 2015.	A	s		
4.3	Glass walkway route	Aluminium treads at 260mm going and set-back risers at 200mm height. There is no contrast and ridges parallel to the nosing create visually confusion. Glass laminated floor is semi opaque. Glass sides rise above handrails at 950mm height. A 1 in 11 ramp	Contrasting nosing is recommended on the step and it is strongly recommended to follow guidance in Part M. It is recommended to provide information about this route for visitors. It is recommended to ensure gradient it no greater than 1 in 12.	A	s		Part M item 1.33 p24.

4.2 Detailed Walk-through

After conducting the detailed walk-through we entered all the recorded observations into a spreadsheet. See Table 4 for a portion of the spreadsheet, the entire spreadsheet can be found on the CD-ROM. The "Area Identified" column lists the numbers corresponding to the items identified by the CAE. In the "Description" column we wrote down any comments on the situation that we felt were applicable. The "Priority" and "Time" column correspond to the ratings given by the CAE. We gave our opinion on the CAE's priority and time rating after viewing the area. Four different symbols under the "Our Rating" column were used: "+" means we feel it is of high importance, "-"means we feel it should be of lower

importance, "=" means we agree with the priority, and "*" means the issue deals with signage. The ratings were based on how we felt the specific change would affect the overall accessibility of the Museum. The items which we decided were of higher importance were the ones that would significantly improve access, meeting the minimum requirements of the DDA, while also being an item that could possibly fit in the budget. Issues that eliminated access to an area of the building for at least one disabled group were also assigned a "+" rating.

An example of an item that we felt was of high importance was the information desk at the entrance of the Museum. The CAE identified it as an "A" priority item because the desk was too high. When we observed the desk it was apparent that the height of the desk would make it very difficult for a disabled person in a wheelchair to communicate with the staff member located behind the desk. Without consulting a contractor, we thought the problem may be solved by simply reducing the height of a portion of the desk. We felt that this problem could be an issue brought up as a complaint which could potentially be fixed within our budget, and hence, received a "+" rating. Our rankings were made as way to establish preliminary ideas on our priority system. We decided to make note of items dealing with signage. Signage issues appear very frequently throughout the Audit and we noted these items to see if the reoccurring problems were related. It is beneficial to document these items as they appear frequently and may be addressed through the development of a clear signage system.

During the walk-through we took pictures of issues where photography was appropriate. Certain items in the Audit could not be photographed because some items were under construction, no longer existed, or were inappropriate, such as bathrooms which were in use. The purpose of taking photographs was so that the Museum can readily view certain items of the Audit. The pictures were an aid in referencing problematic areas when formulating the action plan. An example of the pictures taken is given in Figure 7. In this photograph, the problem area identified by the CAE is that due to the type of benches only the ends of the tables are wheelchair accessible. This is apparent in the photograph as a disabled patron is eating at the end of the table. An additional column containing picture identification was added to the observation table, see Table 4.

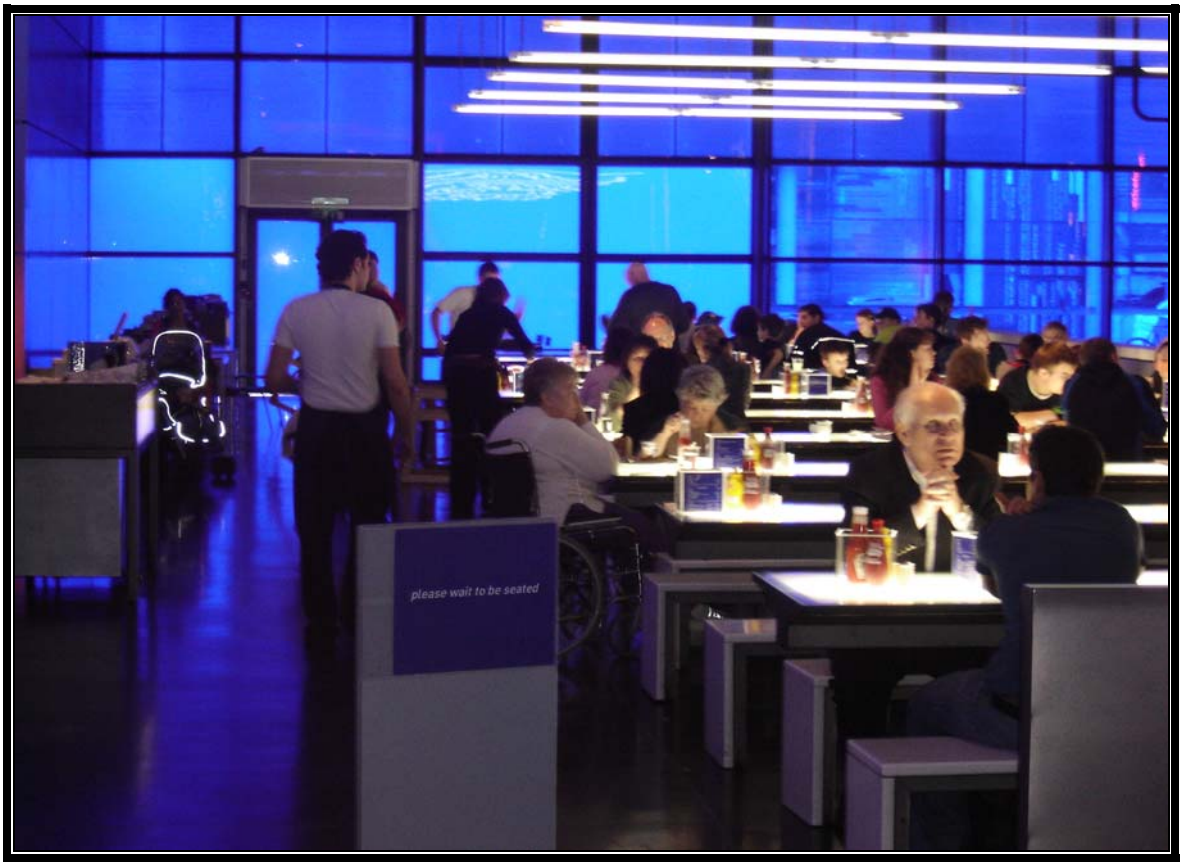
Another useful result was identifying any problems which may have been fixed or improved upon since the time of the Audit. In some cases the problem may have been fixed, whether intentional or not. Several exhibits have been closed for renovation, such as the East

Hall, and therefore were not considered in the final Action Plan. We identified these areas on our spreadsheets by highlighting the item in grey, as shown is Table 4, item 10.4.

Table 4: Portion of Table Used to Record Observations of Detailed Walk-through

Area Identified by Audit	Picture ID	Additional Description	CAE Priority	CAE Time	Our Rating
10.13	101-0258		A	S	-
10.14	101-0259	Sign	A	S	*-
10.14	101-0260	Stairway	A	S	-
10.15	101-0261	Sign/Voice	A	S	*-
10.15	101-0262	Want Signs Next to Lift/Dark Walls	A	S	*-
10.17	101-0263		A	S	*-
10.17	101-0264	Sign Indicating Help	A	S	*-
10.2	101-0281-2	There is Voice	A	S	-
10.4		Part of Construction	A	S	

Figure 7: Example Picture from Detailed Walk-through



4.3 Staff Interviews

As part of our research carried out to assist the Museum in improving disability access, it was imperative that members of staff who interact with the disabled most often were interviewed. Forty-five people were interviewed, fifteen from each group of VSA, Front of House, and Explainers. All of the interviews were conducted by the same method and included the same questions as mentioned in the methodology. Together they provided both feedback and solutions for problems within the Museum. Since the majority of the questions were open ended, analysis was done by simply tallying the number of people who mentioned an issue. A running list was made for all of the issues. The spreadsheet containing these numbers is in Appendix C.

The Science Museum's Visitor Service Assistants (VSAs) are the members of staff that deal with assisting the public on a day-to-day basis. They provide answers to patrons'

questions, directions to exhibits, and assistance to disabled and elderly patrons. The Front of House staff members are responsible for point of sales transactions as well as the call center at the Museum. The Museum's explainers were interviewed as well. These members of the explainer staff are in charge of assisting visitors in the five interactive galleries. Because these galleries are geared towards children, the explainers have more specialized training for people with learning disabilities.

When asked how often they interact with disabled patrons, the answers varied both across and within the three groups. Some stated that they rarely worked with them while others indicated the interacted with them on a daily basis. When interviewed a few staff members said they were unsure of the definition of disabled or mentioned that they only consider people using wheelchairs to be disabled. The majority of the VSAs, seven of fifteen, answered that they interact with disabled patrons at least every other day. Eleven of the fifteen explainers expressed that they interact with disabled people at least once a day. On the other hand, the Front of House staff answers' were distinctly different than the VSAs and explainers. Generally their answers indicated that they deal with disabled patrons less often. A common response stated they dealt with disabled patrons once per week. The difference in the reposes is attributed to the nature of each job.

Although it was the last topic to be discussed, another goal of interviewing staff was to gain more information on training. As mentioned before the Museum holds disability awareness training open to the entire Museum. Between all three groups only ten of the fifty-five people interviewed had attended this training, two of which were VSA managers. Only one person working at the Science Museum for less than two years had received this training. Most members of staff that did have training noted that they had received it several years ago. It is worthy to mention that one member of staff attempted to sign up for training at one point and was not allowed to go as the session was full. With this being said, several explainers had explained that typically their section is not offered the specific disability awareness training, but that their department often runs more specific training sessions throughout the year which covers disabilities. All of them had attended special education training. Of the remainder of the staff, eight had said they have never even heard of the disability awareness training and eleven had only heard if briefly in passing.

When asked about the content of the training, those who attended had only good things to say. They mentioned how they learned good rules of thumb for etiquette when dealing with disabilities. They also talked about how the training made them more sensitive

and aware of people with disabilities' needs. When asked, no one said they would change the content or the way the course was run. Sixteen people said the training should be mandatory for at least the on-floor staff. Eight people went on to say how this training, or something like it, should also be mandatory for everyone in the Museum.

Beyond asking about training, the rest of the questions of the interview were geared towards the recognition of staff of the Museum's accessibility. The first question of content was used to get the staff thinking about disability access by asking them about measures the Museum takes to ease this issue. Generally, when opening up the subject, the staff felt that although the Museum may have its fair share of problems with disability access, there are some excellent measures in place to assist the patrons. Many of the staff were quick to say that their job itself was a measure to help patrons with disabilities. They said their presence in spots throughout the Museum allows visitors to come up to them with problems, even if it is just directions, and they can assist them immediately. Through their answers and enthusiasm it was inferred that the staff generally has a good attitude and willingness to help patrons. Five identified the one-on-one tours available upon request, mainly for blind or severely visually impaired visitors.

After opening up the people to thinking about measures made for visitors with disabilities, issues and problems in the Museum were discussed. Some staff actually started answering with something good the Museum does, like one-on-one touch tours, and continued on their own to discuss its limitations, such as people have to call ahead. This section took up the bulk of the interview and was the other main objective of the interviews. Several different areas were discussed throughout the Museum, with some areas being mentioned by more then one person. The staff cited many issues that are mentioned in the CAE Audit the will need to be considered at high priority. Additionally, they provided some new issues that were not cited in the Audit, such as those involved with training, logistical issues among the VSAs, and other physical problems with the Museum.

Beyond almost everyone mentioning the need for clearer signage throughout the Museum some VSAs quickly recognized two of the three areas in the Museum which are completely inaccessible to patrons in wheelchairs, both the Ship and Flight Mezzanine levels. Four of the VSAs, including one of the managers, identified these areas as extremely problematic for the Museum. One VSA remembered having to tell disabled patrons that they are simply not able to enjoy the exhibits due to this limitation. Along the same line, another issue which attracted the high concern among several VSAs, was that the disabled chair lift

(which runs parallel to the staircase) in the Space Gallery only has one key. Along with this, the key is often difficult to find, forcing the patron to wait while the VSAs look for it. To make matters worse, only a few of the VSAs actually know how to operate this lift.

One of the highest response rates was a problem which usually came hand in hand with a solution. At the time of this report, the Museum was undergoing a stage of renovation at its entrance and East Hall areas. Due to construction and unpredictable lifts often there is no ramped access from the entrance of the Museum. As a result, disabled patrons have been directed to another entrance. The VSA's were obviously frustrated from the shear amount of people who inquired about a level way to enter the Museum, since there is not a sign informing visitors. With this in mind, those visitors with mobility impairments often have to deal with the frustration of entering the Museum only to find out they must leave and return via another entrance. A simple solution cited, by six VSAs and two information desk staff, was placing temporary signage outside the Main Entrance directing these patrons to the accessible entrance.

The VSAs interviewed cited the fourth and fifth floors as areas that were difficult for disabled people. The doors to access these areas from the elevators are difficult to maneuver because of their weight. Also the width of the pathways within the galleries restricted making it difficult to move around. The lack of bathrooms on these floors was also mentioned. Throughout all forty-five interviews these issues were mentioned at least eleven times.

Overall approximately thirty areas were mentioned as problems in the Museum, some of which were mentioned by only one or two of the staff. All were taken with the same amount of consideration, regardless of how many people mentioned them. Although all could not be described in the context of the report, all were recorded in the analysis and documented in the notes taken, refer to CD-ROM.

4.4 Complaint Database

Of the 42 disability complaint feedback forms we received from the Museum, only 19 were complaints filed by disabled patrons. The remaining complaints referred to related physical access issues but were filed by able-bodied patrons. The main issues brought up were accessibility of bathrooms, long wait for lifts, lack of and distance between benches, poor signage, crowdedness, lack of staff, poor map describing disabled access (ramps,

accessible WC's), and lack of concessions for the IMAX. The number of complaints for each heading is shown in Table 5. The most complaints, 5 out of 19, were attributed to a long wait for lifts throughout the Museum. This was attributed to lifts being out of order and able bodied people waiting for lifts instead of using the stairs during busy times. Three of these complaints dealt with people and their baby carriages, not patrons with a disability.

Three complaints concerned the accessibility of bathrooms. The visitors complained about the lack of space in bathrooms and signage indicating them. Responses to these comments reassured that bathrooms 'met the required national standard.' Other complaints included three dealing with lack of signage indicating lifts, ramps, and galleries. Two were concerned about the quality of the map distributed by the Museum. The complaints stated that the map did not clearly indicate points of access of various floors in the Museum and also accessible routes through the Museum. Two were concerned about the lack of staff available for assistance. And the remaining two were divided between the Museum being too crowded in several exhibits and no concessions for IMAX for the deaf. We also received the overall statistics of disability complaints since 2001 in the Museum, see Table 6.

Table 5: Disability Access Complaints since August 2004

Complaint	Number
Bathrooms	3
Wait for Lifts	5
Benches	2
Signs	3
Too Crowded	1
More Staff	2
Map shows Disabled when none	2
Concessions for IMAX	1
Total	19

Table 6: Statistics of Disability Complaints Since 2001

Issue	2001	2002	2003	2004	2005
Access to terminals in Temporary Exhibitions		2	32		
Congestion in Shop		3			
Disabled Access - General			1	7	
Disabled Toilets	1	1	1	1	
Lack of Seating	3	5	4		2
Lifts	2	3		3	
Loop System for IMAX	1		1		
Navigation with Map	8	2	2	4	2
No Wheelchairs available	1	3			3
Poor Signage	7	26	32	9	
Queues Food and Drink	1	2			
Queues Museum	7	40	3	2	
Queues Temporary Exhibitions		4	35		
Safety Issues	2	5	5		
Special Needs	1	2	1		
Temporary Exhibitions too busy		3	77	6	
Museum to busy				1	
Too Noisy in Museum	3	9	1	1	
Too Noisy in Temporary Exhibition		1	6	1	
	2001	**2002**	**2003**	**2004**	**2005**
Disability Complaints	37	111	201	35	7
Complaints	418	591	755	284	82
	2001	**2002**	**2003**	**2004**	**2005**
Disability versus Normal Complaints	9%	19%	27%	12%	9%
	2001	**2002**	**2003**	**2004**	**2005**
Number of Visitors per year	1,352,649	2,724,966	2,886,850	2,169,138	326,904

4.5 Cost Estimating

The cost estimates received were given in approximate ranges or per square meter since quantities are not known. It was found that some of the issues may be addressed using the Museum's budget for building maintenance. For example, changing light bulbs to

increase lighting levels is already considered in the Museum maintenance funds. The Museum also has an allotted amount of money in its budget for painting. Depending on the amount of painting that needs to be done, this work may be covered in the Museums budget.

When meeting with Lyn Modaberi, the Head of Design in the Museum, to discuss the cost of signage she indicated that there was currently a budget in place to replace all the existing signage in the building. A wayfinding expert had been consulted and established navigation points within the Museum. Banner signage will replace the existing signage system and will be located at the identified navigation points. The cost of replacing the signage was equal to the cost updating the existing signage. Thus, the Museum elected to use the 40,000 pounds to implement new, more effective signage. Since the Museum had established a budget to address the signage problem, the cost of signage was not considered in our budget. However, the priority of signage problems was not changed. The Museum should still be aware of the issues raised in the Access Audit and correct them using the signage budget if need be.

Another example of an exception for cost is, the Access Audit recommended that there be a mirror placed in the back wall of the Infill Lift. When meeting with the Estates department it was discovered there are plans to replace these lifts. The issue remained in the action plan so that the Museum would be aware of the problem and make sure it was not repeated in the new lift.

The cost estimates received for the other items in the Audit are given below in Table 7.

Table 7: Approximate Cost Estimates for Work to Meet Recommended Solutions

Item/Area	**Cost (Materials and Labor) in Pounds**
100 lux lighting ceiling/wall surface mounted	In yearly Budget
Vinyl Tile Flooring (per sq. Meter)	25-35
Lift which access all floors of building (7 stories)	150k-250k
Adding a mirror to back wall of elevator	500-600 (lift being replaced in June)
HB Signage	40k throughout entire Museum (plans to be replaced
Circular handrail 40-45mm diameter	50 per meter
Adding a metal or frosted edge (300mm)	50 per meter
Adding risers to stairs	75 per riser
Wheelchair platform stair lift to mezzanine level	20k-25k for 3-4m rise
Automatic door openers at entrance	100 each
Nosing for Stairs 55mm wide on treads and risers	9-20 per meter
New Signage	New signage system = 40k (includes replacement of exsisting)
Brochures	25k for 2 million
Painting per Square Meter (wall and trim)	4 per square meter
Wood Skirting per square meter	12-15
Vinyl skirting per square meter	8
Accessible Water Closets (4th and 5th floor)	50k-100k
Adding a lower portion to existing desks	Unavailable
Desks in Shop	Unavailable
Information desk	Unavailable

4.6 Disability Policy and Disability Awareness Training

Although disability awareness training was part of the Science Museum's employee training program, the organization needed to provide further training for staff to make the Museum fully accessible. According to the Heritage Lottery Fund (HLF) group who

published *Improving your Project for Disabled People*, they felt disability awareness training must be instituted so that staff can have an appreciation of the range of disabilities, the needs of disabled people, and how to address and approach disabled people. With further research of this publication it was found that it is also beneficial to train staff on the operation of auxiliary aids which the Museum provides and training on how to teach visitors how to use the aids. Additionally, it was stated that a training process should include education on sign language, guiding visually impaired patrons, audio-descriptions, as well as other types of special auxiliary services (Improving your Project for Disabled People, 2004, 14). As the goal of the HLF states, these suggestions strive to make an organization a place where "everyone can learn about, have access to, and enjoy their heritage (Improving your Project for Disabled People, 2004, 3)." While keeping in mind these goals we referenced the DDA to review their points on disability awareness training.

In Chapter 3 of the DDA, *The Service Provider's Duty Not to Treat a Disabled Person Less Favorably*, there is section 3.16 entitled *What Steps should a Service Provider Consider*. That section contains a bulleted list of suggestions service providers should consider in order for them to comply with their duties under the Act. Of the eleven suggestions four pertain to training. It strongly suggested that disability awareness and disability etiquette training for all staff in contact with the public. The DDA, more specifically, recommended that all staff dealing with the public should be informed that is it unlawful to discriminate against disabled people. Upon the completion of a policy on disability, staff should be trained to understand the service provider's policy, their legal obligations, and the duty of reasonable adjustments. The legislation also states that training should be revisited in the event that reasonable adjustments are made (Disability Discrimination Act, 2004, 23). Considering HLF's suggestions along with taking into account the DDA's point of view on disability training there was information that suggested the Science Museum's training needed to be amended.

Improving an organizations training program begins with the institution of a disability policy. "An access policy is a top-level document which shows your commitment to the principles of improving access throughout your organization" (Access Plans, 2000, 5). The policy should outline main areas of responsibility, the approach to removing disability barriers, how improving access relates to the organization's goals. Heritage Lottery Fund also felt the policy should cover several areas. They began by stating the need for access to services, facilities, programs, and

products to be addressed in the policy. The policy should also cover the role of the company's training and recruitment process. Finally, they felt it was imperative to include an evaluation and review process of the policy within the policy. (Access Plans, 2000, 5)

The DDA, in a broader manner, agrees with the plans of the HLF. Also contained in Section 3.16 of the DDA are suggestions for a company policy on disability. In this listing the importance of establishing a policy is evident. It states that establishing a positive policy on the provision of services to ensure inclusion of disabled people and communication it to all staff is necessary. The policy must be implemented and also regularly revisited to ensure its effectiveness (Disability Discrimination Act, 2004, 23).

The prior suggestions should be included in a disability policy beyond this, however during the development stage of an disability policy certain principles must be kept in mind. There must be a commitment from the top of the organization on down to keep disability access at high priority. An active consultation with disabled people must be established in order to hear the needs of the individual. Finally, when working to create a safe, fun, and accessible environment a flexible, creative, and imaginative mindset must be used. (Improving your Project for Disabled People, 2000, 5)

Working with the current measures of disability awareness training and considering the aforementioned topics, alterations to the training and the addition of a policy will aid the Museum toward reaching their goal of DDA compliance.

Chapter 5: A Proposed Action Plan

The action plan is organized into two sections, refer to CD-ROM for complete action plan. The first section is a written portion that contains the disability policy recommendations, disability awareness training recommendations, a summary of the pertinent building regulations, a summary of helpful references, a summary of the DDA, a section describing consultation in formulating the action plan, and a section describing how the action plans findings should be implemented within the Museum's organizational structure. The second section is in a tabular format. The column headings in this table are as follows: Priority, Location, CAE ID, Issue, Suggested Solution, Department Responsible, Cost, Picture ID, Reference Documents, CAE Priority, CAE Time, and Status, refer to Figure 8.

Figure 8: Action Plan Column Headings

5.1 Policy and Training Recommendations in Action Plan

The disability policy and disability awareness training are the two most urgent items facing the Museum. Before any changes can be made in the Museum, a policy must be developed. The function of the policy is to establish the Museums commitment to disability awareness and to outline the procedures needed to maintain that level of commitment. Our recommendations for both the Museum's disability policy and improvements to the existing disability awareness training program were based off suggestions given in the DDA and disability rights publications. Similarly, the recommendations for improvements to the existing disability awareness training program were based off of information from the same sources.

There is a strong link between policy and training, as an overview of the training program is typically provided in the policy. The training program that was in place at the time of this project was far below recommended standards. The percentage of staff that was

actually receiving the training was not acceptable. We felt that improving the disability awareness training program would have the greatest impact on the overall accessibility of the Museum. Not only would it guarantee that the staff was using proper disability etiquette, but it would also provide them with the tools to effectively aid disabled guests in overcoming any physical barriers. Thus, it was clear that disability awareness training was the best strategy to comply with the sections of the DDA which deal with discrimination and physical access. The following paragraphs outline our recommendations to the Museum in regards to policy and training. It should be noted that the goal of these recommendations was to provide the Museum with guidance as to what material should be contained in a disability policy and disability awareness training program.

It is recommended that at the beginning of the disability policy a statement appear which outlines the Museums commitment to equality and disability awareness. The policy should also contain a summary of the basic principles of the disability awareness training program. Monitoring the disability program is a critical function of the policy. The Museum should include consultation with disability groups, staff, and patrons in the monitoring process. The review of the program should take place annually. It is also advised that before opening new exhibits, or galleries, disabled people be brought in to review the area. The policy should state and outline disciplinary actions taken if a staff member violates the Museums disability policy.

Additionally, the policy should contain a customer complaint procedure which is easy for disabled people to use. It should be stated in the policy that the Museum will publicize information on the changes it has made to accommodate the disabled. This information should be available online and upon entry to the Museum. Finally, the policy should include a statement that outlines how it will be implemented within the Museum's organizational structure. It is advised that each department manager be made responsible for making sure all members of their staff know and understand the disability policy.

The main principles of the DDA that affect the Museum are disability discrimination and disability access. A disability awareness training program is an effective way to ensure the Museum is complying with these two principles. It is essential that the Museum staff know how to appropriately interact with disabled people. Disability awareness training provides the staff with information on the range of disabilities, needs of the disabled, and how to address and approach disabled people.

Currently, the number of staff who have received disability awareness training is a major problem in the Museum. The frequency of disability awareness training sessions needs to be significantly increased. A maximum of 16 employees may attend a training session. Training sessions are not held according to a schedule, instead they are held upon request, approximately twice a year. The sizes of the sessions are satisfactory considering there is only one instructor. However, the frequency of the sessions needs to be proportional to the number of people working at the Museum. Every new employee, including volunteers, should receive some sort of disability awareness training when beginning work at the Museum. Employees who will be interacting with the public should receive specialized training that provides them with the skills to effectively aid the disabled within the context of their job.

An example of specialized training the staff should receive is that those working at the information desk receive training that provides them with the tools to effectively communicate with a deaf person. Explainers should receive training in how to properly describe exhibits to the visually impaired. The disability training for all staff should include a summary of the Museum's disability policy and the DDA. It must be made clear that all patrons need to be treated the same, as many disabilities are not visually detectable.

In addition to disability awareness training for new staff, current employees should undergo an annual training session. The goal of these training sessions is to make them aware of disability legislation and to provide them with proper disability etiquette.
It is vital that employees responsible for design in the building undergo disability awareness training. In addition to training, designers should utilize disability design aids and building regulations whenever designing for the Museum. Incorporating training and modern disability design aids into the design process can eliminate new problems from arising in the Museum.

It is recommended that there be an annual review of the training policy and procedure. The review process should include staff feedback and consultation with a training specialist outside the Museum. It is important that an outside party be brought in to consult, as they will be able to provide insight into the most effective methods used in disability training.

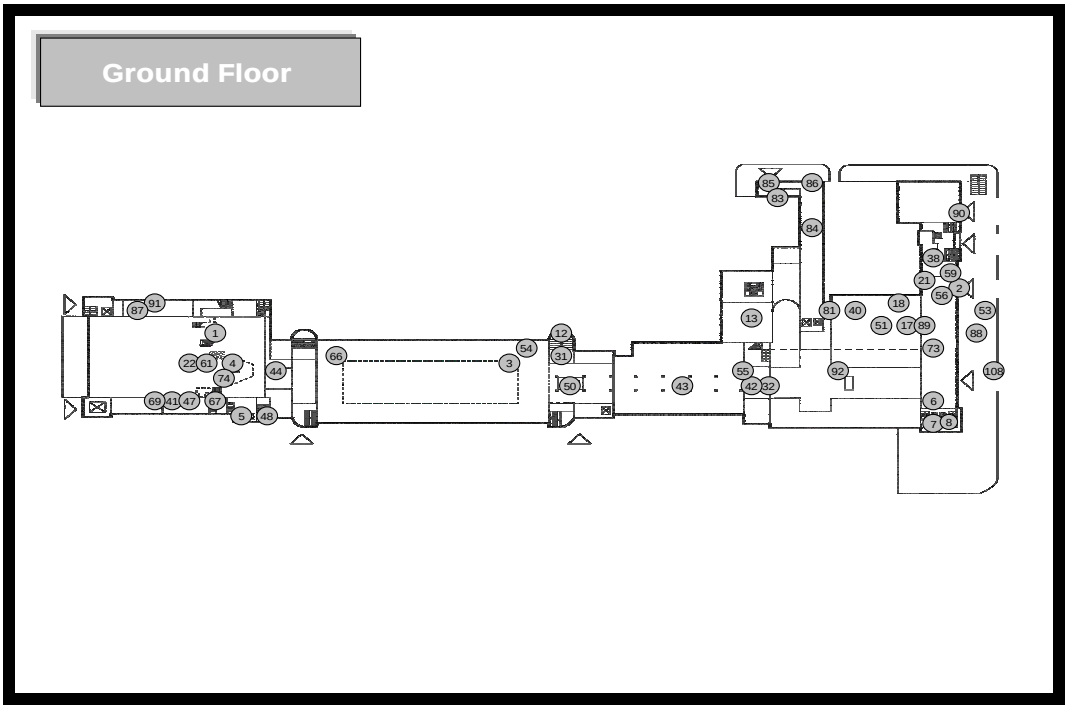
The establishment of a disability coordinator is strongly recommended. This full time position would be responsible for making sure employees adhere to the Museum's disability policy and participate in the disability awareness training program. They would be in charge

of the monitoring of the program, which includes the establishment of contacts with disability groups. This person would also be a resource for staff members to consult with questions regarding disability.

5.2 Tabular Content of Action Plan

The content of the tabular section of the action plan was based on the items identified in the CAE's Access Audit. To demonstrate the link between the action plan and the Access Audit, we included several columns in the action plan that conveyed information given in the Audit. In addition to these columns, several others were added that provide information to help the Museum effectively address their physical access issues. The findings of the Audit were not presented in a user-friendly format. It was difficult to locate the issues in the Museum, understand the technical writing, and identify which issue the priority and time ratings were referring to. To counter these problems, we created a location column and map in the action plan which makes it easy to identify the location of the issues in the building, refer to Figure 9. Our issue and suggested solutions columns were written in a clear manner without technical jargon. The action plan is organized in ascending order according to our ranking.

Figure 9: Ground Floor Map



To help the Museum organize the implementation of physical changes to the building, a department responsible column was created. It will be this department's responsibility for making sure that change is made. The reference documents column was added to help those responsible identify how to correctly make the alteration. The use of reference documents was recommended to ensure that the physical changes would service disabled people properly. The picture identification column is used to indicate any items that were photographed during our detailed walk-through of the Museum. This column is useful as it tells the reader what picture attached to the action plan shows the area identified, refer to the CD-ROM for all pictures. The final status column was added to illustrate the progress of the identified issue. Using a sorting program, addressed later, you can eliminate issues which have been addressed and are no longer present.

A difficult task in making the action plan was including approximate costs of the proposed solutions. Although accurate cost estimates could not be obtained because quantities were not known, including an approximate cost range was essential to the action plan. The importance of identifying the cost of proposed solutions can be seen in the Roads case.

The Roads case was one of the first lawsuits made in the UK which sighted the DDA. Mr. Roads, a wheelchair user, sued Central Trains Limited because the foot bridge to cross over the train tracks at Thetford Station was not wheelchair accessible. He requested that the train service provide him with an accessible taxi that would drive him to the other side of the station so he could travel in the opposite direction. Central Trains Limited suggested that he could continue riding the train in the direction he was heading for an additional 25 miles until he reached the first wheelchair accessible station, allowing him to cross over the tracks. Mr. Roads lost his initial case, in which the cost of an accessible taxi, approximately 45 pounds, was considered in the courts ruling. However, Mr. Roads won in the Court of Appeal. A difference between the initial case and the appeal case was that the solicitors for Central Trains Limited allowed the court to assume that the accessible taxi could have been provided cost free. This concession was clearly a mistake. (Williams & Waugh, 2005, 7)

It cannot be assumed that the change in ruling occurred simply because the cost of the taxi was not taken into account. However, the cost of the proposed solution of the taxi was a major consideration. Thus, the cost of reasonable adjustments is an important element of the DDA. It is for this reason that the cost of making physical changes is a necessary element of the action plan.

The action plan was delivered to the Museum in a database format. The purpose of submitting the action plan in this format was so that the information could be easily sorted, refer to CD-ROM for complete action plan. Although the action plan can be sorted in a variety of manners, a pre-made set of queries were designed and implemented within the database file. The queries are design to retrieve information based on lighting, signage, nosing, manifestation, color contrast, reflective finishes, seating, bathrooms, approaches, and department. These queries organized the action plan according to common issues which were seen repeatedly throughout the Access Audit. One may also organize the action plan by department under which the issues fall, allowing the supervisor of the project to distribute work accordingly. This level of organization makes the action plan much more usable than the Access Audit, as it facilitates analysis and decision making by the Museum personnel.

5.3 Ranking of Action Plan Issues

The purpose of the Access Audit was to identify disability issues within the Science Museum. The intention of the action plan was to present the identified issues in a

straightforward way. Presenting the issues in such a manner required the consideration of many factors which the Audit ignored. We removed the CAE ranking system of the Audit, allowing for all items to be in one database. Our intent was to create a database which contained all items prioritized according to several factors. These factors are ones which influence the decision process in selecting the order of the issues to be addressed. The four criteria which make our ranking system are Urgency for Compliance with the DDA, Cost, The Number of People Affected by the Issue, and Previous Complaint on Issue by Staff Member.

A decision matrix is a tool which contains a formula to aid in the decision-making process. This aid was used to calculate a score for each item. Each items score was translated into the rank of each issue in the action plan. The action plan was sorted by rank, thus those issues with the highest priority according to our criteria are in the beginning.

In a decision matrix each criteria is given a percentage of importance. The breakdown of the scores for individual criteria are explained below and scales are provided in Appendix D. In our matrix we felt urgency for compliance with the DDA was the most important factor in determining when an issue would be address, therefore it was determined it should have a percentage of 45%. The extent to which an issue was breaking the law (DDA) was based on the ranking of the Access Audit. As stated in a prior chapter items given an “A” priority were deemed essential, while a “B” was considered desirable, and a “C” was best practice. On a scale from one to ten items which were given an “A” were in the 10 to 8 range, those with a “B” were in the 7 to 5 scale, and anything given a “C” was in the 3 to 1 range. The fluctuation within each range was determined by our ratings assigned on our detailed walk-through. If we felt the item was urgent based on our knowledge from this project it was given a “+”, equally as important was labeled with “=”, and not as urgent was “-“. A plus was given the highest number in the range for the letter, an equal sign was given the middle number, and a minus was given the lowest number on the scale for the letter. This range system allowed for a greater differentiation between scores and rankings.

The second criterion in our matrix was cost with a percentage of 30%. As we have mentioned, the Science Museum is a government run organization which is pleased to offer free admissions. With little income the budget allotted for this project during the 2005 financial year was 37,000 pounds. The limited budget places a constraint on how much the Museum is capable of addressing during that financial year. Additionally, when requesting a larger budget to address the remaining issues, it is helpful to have an approximate cost and

urgency time frame for each item. The range for cost was again from one to ten, one being the most expensive issue to renovate.

The number of people who are affected by the problem is our third criterion, given 15%. We felt addressing items which more people would benefit from should be of higher priority. The information used was determined through our disability demographics research. The research produced the total number of disable people living in Europe and the number of people with each disability. With these numbers we were able to calculate the percent of people affected by each issue. Those items that would make the Museum more accessible to everyone, including disabled and able body patrons, were given a ten.

Lastly, identification of issues by staff members were the final factor in determining the score of each item. Although the Museum may value the opinion of its staff we felt it was not as important as the other criteria, thus it was given a percentage of 5%. The complaints or issues identified by staff as reoccurring were discovered during staff interviews. The analysis of the staff interviews enabled us to determine which items were mentioned most frequently, these issues were given a ten. However, the scale for complaints by staff members is slightly different than the prior criteria. There are 266 issues in the action plan and only 45 staff interviews were conducted, we did not expect nor wish for every item to be mentioned in the interviews. Those items which were not addressed were given a zero. Refer to the Figure 10 below for examples of the decision matrix equation.

Figure 10: Examples of the Decision Matrix Equation

$$(10*45)+(10*35)+((250/25)*15)+((0/8)*5) = 950$$

$$(9*45)+(5*35)+((41/25)*15)+((0/8)*5) = 604.6$$

$$(2*45)+(2*35)+((3/25)*15)+((0/8)*5) = 161.8$$

Not every issue identified in the Access Audit was included in the action plan. As part of our detailed walk-through we listed items which were already fixed or currently under construction, such as items located in the East Hall. These items were not included in the action plan. The original Audit contained roughly 300 identified issues, the action plan

contains 266 issues. Every item in the action plan was given a rank for each criterion. Through simple addition and multiplication a score was calculated for each item. The possible scores ranged from 95 to 1000. The scores were then sorted in descending order and given a corresponding number from one to 266. The item with the highest priority according to our decision matrix had a rank of one, and then so on. By changing the percentage numbers in the formula the Museum can easily alter the influence each column has in the final ranking.

Chapter 6: Conclusions and Recommendations

6.1 Conclusions

The final action plan contains all remaining issues from the Access Audit which have not yet been addressed in the Museum. Each issue was ranked according to a score which was calculated with the use of a decision matrix. The issues are in descending order, those of the highest priority are first. Every item contains a recommended solution, a department responsible, an estimated cost, picture of the problem, and the priority rank for the item given by the CAE. Although we produced the best product within our capabilities, the action does have weakness due to limiting factors.

Prior to our work the CAE's Access Audit was conducted. This was a formal document performed by a private organization paid for by the NMSI. It would have been a waste of the Museum's money if we re-identified the disability problems throughout the Museum. Thus we were limited to the previous work done by the CAE. Undoubtedly the CAE did their job well, however their work was completed in September of 2004. Since this time several renovations have and will continue to take place. Although we had the ability to delete items which have been addressed we did not add issues that arose due to the changes.

Due to time constraints and lack of knowledge, we did not change the recommended solutions from the CAE. With a limited amount of time available for us to acquire a substantial amount of information on the subject of our project, we focused our time on areas which we felt the Access Audit needed improvement on. Had more time been allotted to this project, it is possible that we could have gathered important data on construction methods to make suggestions in addition to the CAE's solutions. Although we were unable to gather information on renovation procedures of a Victorian building to change the suggestions by the CAE, we did however edit the solutions. The original state of the solutions contained unnecessary technical jargon. Changing this terminology is another example of the measures taken to make the action plan a user-friendly document.

During the research phase of this project, it was found that consultation with the disabled is strongly recommended. There was every intention to conduct a focus group, the methods of which were described in the recommendations chapter, however due to difficulties in assembling participants we were unable to do so. Consulting the disabled would present valuable information on possible solutions to access issues. This lack of

contact forced us to use documented findings of their perspectives. The British Standard BS8300:2001 consulted numerous disability groups and organizations in the construction of their publication. This publication is used as a reference document for many of the issues in the action plan. Thus, indirectly the opinions of the disabled were taken into consideration. However this reference is not recommended as a substitute it is strongly suggested that a personal contact is made in the near future.

It is inevitable that a document of this caliber will contain some areas of limitations. However a successful project is one where the strengths of the document overshadow these problem sections, the action plan achieved this. A key objective of this project was to create a usable, user-friendly document, which adapted to the needs of the user. Among all the pertinent information in the action plan, the flexibility of the document in Microsoft Access is its greatest attribute.

As previously discussed the pre-made queries will allow for easy sorting with the touch of a button. Although the program is easy to use, a "How To" guide was created for the users so they may create extra sorting functions as they see fit. See Appendix E for guide. Additionally as brought up in a prior section, the way in which we ranked the issues was beneficial. The Access Audit sectioned the items according to location in the Museum. Our system, based on the decision matrix, ranked the items according to urgency for compliance, cost, the amount of people affected by the problem, and previous complaints. This system gave the Museum a more concrete idea as to which problems needed to be addressed first and left little room for interpretation. However much like the other aspects of the action plan, the decision matrix is adaptable to contain other criteria.

The Access Audit excelled in highlighting the issues in the Museum and presenting solutions, however in its state it was not usable. The addition of columns addressing who should take responsibility, cost, and documents to reference gave the Museum necessary initial information. Using the action plan and all of its attributes as a guide, the Museum may begin to conquer the enormous task of achieving DDA compliance.

6.2 Recommendations

An operational guide for the action plan has been developed to ensure proper use by the Museum in the future, see Appendix E. Beyond the action plan, we have several recommendations that will help the Museum become more accessible for disabled people.

These recommendations are to be used in conjunction with the physical changes advised in the action plan. The contents of this section are suggestions for how the Museum can affectively institute change that will make the building more accessible.

6.2.1 Protocol Development

There are several recommendations concerning design that appear frequently in the Access Audit. We recommend to eliminate the presence of such problems the Museum develop procedures for design. The addition of a protocol would be helpful, as it would ensure that the needs of disabled guests are always considered. Considering the needs of disabled people at the design stage would help eliminate future problems from occurring. The use of disability design aids should be part of the procedure.

The Access Audit consulted several design aids as part of its criteria for assessing the Museum. It is recommended that the Museum use the design aids used in the Access Audit when designing physical facilities or signage. When making physical changes to the Museum, Approved Document M, included in Part M of the Building Regulations, should be considered. The use of this document is not required, however, it is noteworthy that a description of its contents is given in the DDA. In addition to the Approved Document M, the CAE used the British Standard BS8300:2100, *Design of buildings and their approaches to meet the needs of disabled people- Code of practice,* in its assessment. The function of the BS8300:2100 is very much the same as Approved Document M, as it provides dimensional design information. Designing for Accessibility, a design aid published by the CAE, is based off the data in Approved Document M and BS8300:2100. The Museum has acquired this document and it is recommended that it be the main reference used when designing a physical change.

Problems with signage may be solved with the implementation of a design procedure that consults disability design aids. In the Access Audit the development of a "clear consistent wayfinding system" is a common recommendation. The CAE defines a clear "wayfinding system" as a logical system which directs guests through the Museum using clear signage, auxiliary aids, maps, models, and guides. When examining past Museum complaints it is apparent that the CAE's comments are accurate in stating that it is difficult to navigate through the building. According to the Museum's complaint database since 2001 signage complaints have made up 19% of the total disability complaints. We recommend that

the Museum consult the general outlines given in *Designing for Accessibility*, page 54, in developing a clear consistent directory system. Additionally, when designing signage, the CAE's *Sign Design Guide* should be referred to. The development of effective design procedures which consult disability design guides will cure the problems with the Museums current directory system.

6.2.2 Consultation

At the time of this project, the disability awareness training program did not involve the consultation of any disability groups. It is recommended that the Museum establish long term contacts with disability groups for training purposes. Interaction with various disabilities is the best way for employees to learn about how to properly handle disabled patrons. It is recommended that the groups be brought in and allowed to explore the Museum with the staff assistance. This would allow disabled patrons the opportunity to experience the Science Museum while providing staff with valuable experience. By establishing long term contacts, the Museum may be able to hold such sessions on a schedule, increasing the number of staff that will be able to receive the training.

It is advised that consultation with specific disability groups in an interactive training session be part of the specialized training that certain staff receives. For example, members of staff working at information desks would benefit from interacting with people who have hearing or sight impairments. It was found in our staff interviews that the explainers undergo such sessions with children who have learning disabilities. It is advised that they also interact with disabled people who suffer from visual impairments, as they may have to describe an object or exhibit to them. It is advised that the disabled patrons provide feedback for the Museum on their experiences with the staff. The information provided can be used to evaluate the effectiveness of the disability awareness training. The job of deciding what kind of specialized training staff members receive would fall on the head of the disability awareness training program. An understanding of each department's interaction with patrons should be considered in this decision.

It is recommended that disabled people be consulted when opening new exhibits or new areas of the building. This consultation should occur prior to opening of the area. There should be a way for the disabled people to document their experience. Getting disabled peoples feed back prior to opening an area may help uncover unforeseen problems.

A possible method of consultation is to conduct a focus group. The main goal of conducting focus groups, in the context of our project, was to better understand the experience and difficulties of people with disabilities in a public setting. If the Museum decides to conduct such a focus group to research the aforementioned topics, a methodology has already been developed and is contained in Appendix F.

6.2.3 Disability Discussions

It is recommended that the Museum use daily team briefs to discuss disability issues. Within each department there are daily team briefs which are held to inform staff on happenings in the Museum and to make them aware of issues brought up in the department. It is advised that once a week the leader of the brief hold a discussion about disabilities. This time would be used to update the staff on work being done in the Museum for the disabled and to provide them with a forum to discuss any issues they have had with disabled patrons. A key function of this discussion is to keep disability awareness fresh in the employees minds and to stress its importance to the Museum. It also acts as a way to ensure that the staff is familiar with the building and what measures have been taken to accommodate the disabled. The discussion provides a way for staff members to be informed of any information that has emerged regarding the DDA. Since precedent for the DDA is being set in the courts, this discussion can be used to update staff on how the courts are interpreting the legislation. It also acts as way for employees to learn from each others experiences.

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Appendix A: Museum Mission and Project Proposal

The Science Museum in London is a free admission, non-profit, government run organization. The Museum was founded with the objective of offering and encouraging education in science and technology to the public of London. They offer several floors of exhibits on a variety of subjects concerning the role of technology in society, many of which are interactive. (The National Museum of Science and Industry, 1998, 1/24/2005)

The origins of the Science Museum derive from the Great Exhibition of 1851 organized by Prince Albert to promote science and technology in Britain. The revenue generated from this was used to establish the Science Museum, Victoria & Albert Museum, and the Natural History Museum in 1857.

As years progressed, the museum's collections grew more extensive. In 1909 the Victoria & Albert Museum was formally separated from the Science Museum due to their rapid growth. The Science Museum was given a new building in 1928. In 2000, the museum opened the Wellcome Wing; a four-story addition to the museum that included an IMAX Cinema as well as exhibitions dedicated to modern and future technologies.

A Board of Trustees runs the Museum with members appointed by the Prime Minister. This was due to the National Heritage Act of 1983, which transferred it from a government department to its current state and organization, refer to exhibit B.

Since the museum is both free to the public and non-profit, there are major constraints on the budget allotted to it by the government. The Museum also has a division in its organization known as its trade sector. This sector deals with other means of increasing revenue for the museum. Such means include the museum's shops, catalogues, cafés, and exhibits and events that patrons have to pay admission fees for (such as the IMAX cinema, and motion simulators).

In addition to the main facility, the Science Museum's ground is also home to the Dana Centre. The Dana Centre is a building dedicated to public meetings, lectures, and discussions about technology and science. Throughout the year, the Dana Centre hosts several of these sessions.

WPI London Centre Project Proposal Form

Paul Davis, Dean, Interdisciplinary and Global Studies Division
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1 508 831 5212 (office), 5485 (fax), pwdavis@wpi.edu

The following information will assist us in serving you. Please feel free to alter the format or take more space as needed.

Date 11 January 2005

Organisation name and address

Science Museum
Exhibition Road
London
SW7 2DD

Proposer's name and contact information

Jo Quinton-Tulloch
Head of Exhibitions & Galleries

Jo.quinton-tulloch@nmsi.ac.uk
Tel: 0207 942 4810

Background

www.sciencemuseum.org.uk

Problem statement and objectives[1]

The Science Museum has recently commissioned an Access Audit of the Museum and visitor approaches. This was in order to meet the legal obligations required by the Disability Discrimination Act 1996 and specifically the requirements of Part 111 of the Act in regard to public access, which came into force on 1 October 2004.

The Audit was carried out by the *Centre for Accessible Environments*. A report was produced which contains a general narrative of the findings for the Science Museum and

[1] What are the core issues? What outcomes you seek? If you favour particular approaches, please identify them. Note that careful problem definition and selection of methodologies or approaches are key steps in the preparation phase in the US. You will be consulted regularly when that work begins.

a list of specific recommendations, each with a priority rating. These documents are attached to this proposal.

The brief for this proposal is to take the information contained in the report and develop it into a usable Action Plan that can then be implemented by the Museum (over both short- and long-term periods). The main outcome we require is an Action Plan based on the recommendations. Possible additional outcomes could include:

- Overall summary of objectives (of the Access Audit) and outcomes – to be used as a briefing document/presentation when delivering the actions within the Museum
- Assimilation of the reference material, books etc. that are referred to in the document and cross referencing when appropriate
- Development of achievable Action Plan that can then be administered by the Museum. NB there is not currently a member of staff dedicated to this task. It must therefore be rolled out within different departments as an addition to current work programmes, or must be included in future work programmes
- The issue of implementing cultural change within a large organisation must also be considered
- There is a small budget (tbc) to begin the implementation of this work. Cost priorities must be specified
- Recommendations of what future budgets might be needed to continue the implementation of the Action Plan in future years must be made. These will inform the Museum for future Business Planning

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Exhibit A: Project proposal letter from sponsor outlining project and purpose it intends to serve (Jan 11, 2005)

The Science Museum has been committed to delivering the public a variety of experiences and exhibits to promote science throughout the years. Its facility is admission free in its belief that everyone should have access to view and enjoy these activities and exhibits. This project involves taking measures that the museum will be accessible to those with disabilities so that they too have full access to all of these exhibits, refer to exhibit A above.

In terms of disability access, the Science Museum already has an outstanding reputation and excellent measures already in place to assist disabled patrons. This includes exhibition explainers who assist people with certain impairments so they get the fullest experience out of the museum as these people explain in depth what the people are experiencing at each exhibit. Additionally, the Museum has a training program for their 'front-of-house' staff that deals with disabled patrons most often.

The objective of this project is to analyze an access audit carried out by the Centre for Accessible Environments (CAE) and put it into a more user friendly and properly prioritized format. The Science Museum wants to ensure the maximum enjoyment, safety, and convenience for its disabled patrons. With the passing of the Disability Discrimination Act of 1995 (DDA), it is even more imperative that the Science Museum be as well prepared and equipped as possible for disability access and potential problems.

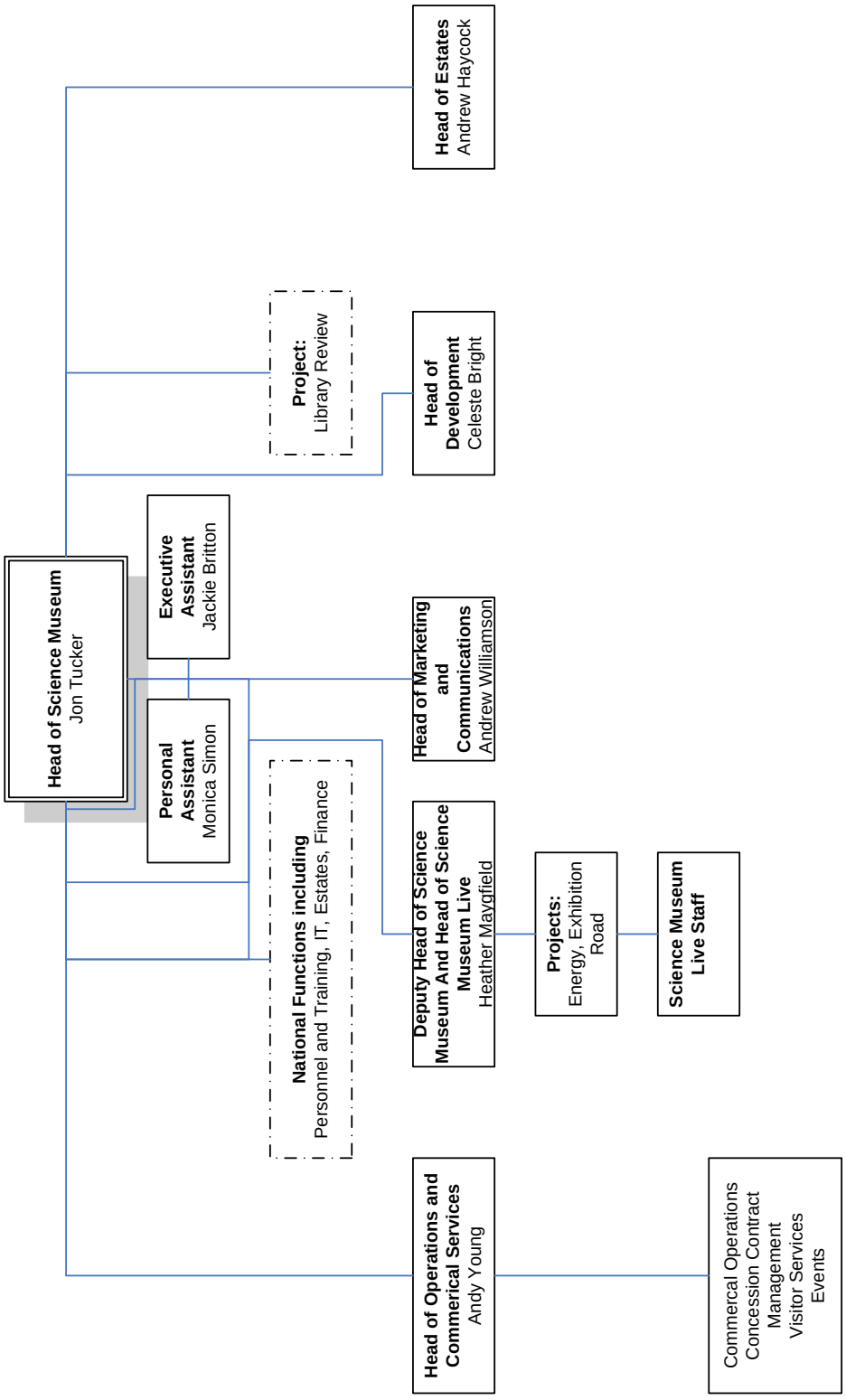


Exhibit B: Museum's Organizational Chart

Appendix B: Access Audit Summary

[Taken directly from the CAE, 2004, 13]

Auditing and the recommendations have been undertaken with reference to the Science Museum future plan. This plan is proposed in two phases for 2007 and 2015. Both phases aim to increase access to the Science Museum collections. Changes planned for 2007 focus on entrances and routes through the East Hall with some major gallery changes in the East Hall and central galleries with minor updates in other areas.

- A significant improvement can be achieved through the proposals to address entrances and concourse spaces in 2007.
- Orientation and information is key to a successful visit therefore it is recommended that is considered in 2007 changes rather than only as pat of the 2015 future plan.
- A design appraisal of new schemes is strongly recommended to ensure best practice for access is incorporated into in the design
- Consultation with disabled visitors is recommended during the process of development and implementation of the 2007 and 2015 plans.

Approaches, parking and entrance

Parking for disabled visitors is limited around the museum and identified by staff as problematic. The Museum of the Future proposals includes redevelopment of the South Kensington estate in 2015. Public transport includes buses and underground with stepped routes.

- Short term an indication of options, length and accessibility of each approach route can be included as part of a consistent wayfinding system and visitor information, also provided in alternative formats.
- It is important to include improved parking provision for disabled visitors is included in 2007 medium as well as 2015 long term future plans with designated parking at a short distance from main entrances.

Entrances are not easily identified on approach along the west pavement of Exhibition Road. Detail, such as contrasting framed edge, does not meet best practice. The south door does not

currently have level access. The 2007 plan aims to increase access from Exhibition Road with North and South doors open.

There is no orientation point at the point of entry where visitors may need to orientate and plan their visit.

- A clear indication of where each door leads is important to communicate in information and wayfinding.
- It is recommended to address detail of doors and lobby as indicated in the report.
- It is important to address visitor orientation at the entrance in the short term as well as for 2007 and 2015 plans. Disabled visitors and others would benefit from information about the museum before travelling a distance into the museum to find a desk or information point. Consider additional orientation such as a wayfinding directory with tactile information and additional staff trained in disability awareness.

Circulation

The Science Museum is an extensive site. There are long routes to get from the main entrances, at the east, to the Welcome Wing at the west. Routes are on several levels and through some complex gallery areas. Facilities such as WCs and rest/refreshment are important, particularly for disabled people. Seats are mostly not well contrasted and without arms or back.

- It is important to consider logical, clearly signed, routes through the museum with short distances between facilities such as WCs, rest points or refreshments. This is an important consideration for 2007 as well as the 2015 plan.
- Seats that are contrasted in luminance and colour to other finishes, with backs and arms are recommended short term as well as for the 2007 and as indicated in the 2015 plan.

Stairs and steps are reasonably distributed across the site. However, detail varies and does not meet Part M or best practice at top floors, mezzanines and walkways.

- Medium to long term it is important to upgrade stairs where recommended as well as provide alternative route such as lift or ramp in the same area. This is important for routes to the mezzanine for café development and other areas detailed in the report.

Lifts are distributed across the site. However, these are not always located to start and finish as the same place as stairs and can be difficult to locate or are not evident as option. Lifts do not consistently serve all floors. Size and detail varies, but for the most part detail does not meet best practice for access. Controls are inconsistent and there are poor contrasts.

- Short term it is recommended to review lift provision and upgrade controls, voice announcement and finishes where feasible as indicated in the report and consistently across the site.
- Meanwhile identify exact location of lifts and floors they serve on directory plan, with alternative formats and colour coding.
- Further detail is identified in the report for luminance and colour contrast.

Some areas are ramped and an extensive ramped area is proposed in future plans.

- In future plans ensure ramps meet Part M and best practice (as detailed in the report recommendations).
- Also provide steps with handrails, this is preferred by some ambulant disabled people and others who find ramps difficult.

Glazing and lighting effects cause light reflections and glare in many areas. There is also special effect and low lighting in many galleries. It is understood that low light levels may be required for conservation. This can be difficult for visually impaired visitors as well as those with epilepsy and others.

- Short term warn visitors of lighting effect and where possible project only onto secondary not major routes.
- It is recommended to increase light where feasible to a minimum of 100 lux on main routes.
- Transitory lighting in areas between different light levels is recommended rather than sudden change from light to dark.

Finishes, especially on floors, change frequently without following any apparent logic and can be confusing throughout. Contrasts are often limited and patterns used with lighting effects.

- It is recommended to use flush change to floor finishes where there is change to a physical feature such as start to ramp or approach to cases.
- An increase of colour and luminance contrast would improve clarity.
- Large geometric patterns and reflective surfaces are not recommended as this can create visual confusion.

Acoustics are difficult with open spaces, hard finishes and the generation of noise by displays and acitivities.

- Short and long term introduction of softer finishes and contained areas for noisy displays or activities should improve acoustic quality of the spaces.

Open circulation through most areas is helpful. Where there are doors there is inconsistency in position and type of door handles, vision panels are higher than best practice and hinge covers reduce door widths. Some doors such as those onto stairs have limited definition and visual manifestation, also are heavy to open.

- Short term it is recommended to investigate adjustment to hinges and safety covers to increase clear open width, but without compromise to safety.
- Adjustment to door opening device may reduce door opening pressure for ease of opening.
- Short term an increase to luminance and colour contrast of door frames plus additional visual manifestation would benefit visually impaired people.
- Longer term and where doors are to be replaced in future plans Part M and DfA sets out guidance for vision panels.

Reception and information services

The Science Museum is a complex site with many levels. Provision and presentation of information varies. Vertical texts are used such as location signs. Signs are often hung high and location/ identification signs for galleries limited. The information and ticket desks are not clearly identified and the style is not easily accessible for wheelchair users. No induction loop available.

- Adjustment to information and ticket desks is high priority to meet best practice guidance for access.
- It would be helpful to provide more information about routes and provide this in alternative formats such as a large print and tactile plan.
- Location signs for galleries are an important part of Wayfinding as well as heights considered for wheelchair users and detail to follow Sign Design Guide.

Gallery staff are generally helpful. Training is currently provided in Special Educational Needs and general access awareness. However, this is not consistently evident amongst staff in the galleries.

- It is recommended to implement disability awareness and access equality for all staff to cover week-day and week-end staff at all levels.
- Training in specialist skills may be appropriate such as deaf awareness and communication or picture description for interpreters and staff at information or ticket desks.

Retail and catering

Retail and catering facilities are available throughout the gallery. Acoustics, lighting and limited variety of seating are key concerns. Information such as menus is presented as text.

- A variety of seats with backs and arms contrasting to other finishes is recommended. Also ensure space allowance incudes room for wheelchair users to sit with others.
- It is important to address lighting levels and type.
- Consider menus in alternative formats such as large print and Braille.

Auditoriums

The auditoriums appear to be well managed to include consideration for disabled visitors. There is access to auditoriums for wheelchair users. However there is limited choice for seating position. There is a hearing enhancement in the Imax auditorium. Colour contrast is limited.

- Short term and long it is recommended staff receive access equality and disability awareness training.
- Short term it is important to keep the area outside the Theatre doors clear of obstructions.
- A hearing enhancement system with notice and staff training is recommended for the Theatre.
- Medium and long term it is recommended to differentiate floor form skirting with luminance and colour contrast.

WCs

WCs are well distributed across the museum but very difficult to find. The male, female and unisex do not meet best practice for finishes, fittings or space allowances.

- Address wayfinding through clear plans and signage in a variety of formats.
- Short term include information about accessibility of WCs in each area and nearest alternative.
- Increase luminance and colour contrast between fittings and finishes.
- It is recommended to make a cubicle in each area more accessible for ambulant disabled people with door opening out and rails.
- Review provision of wheelchair accessible WCs and baby change to increase available space and address detail to follow Part M as a minimum standard.

General Access to galleries

Gallery style varies with target audiences and with resources, materials or technologies available at the time of installation. Often no clear indication is given on how to use the galleries. Routes around displays are often complex and confusing.
Temporary information obstructs routes or access to interpretation

- It is recommended in future gallery development and refurbishment to create clear routes with a logical layout, avoid dead-ends and the need to return on a route.
- Also avoid unnecessary changes to levels. In 2007 future plans steps up, changes of level, mezzanine levels can be reduced

Exhibition displays

CAE checklists identify issues of access to the display and exhibition areas. Key concerns include lighting levels that vary and are often below levels required for conservation with pooling and shadow. This is combined with limited luminance/colour contrast. Case bases, dioramas and displays are often high too for wheelchair users to view comfortably. Cases in older galleries are overfilled with small objects positioned high.

- Careful lighting design, to avoid shadow and glare, combined with increased use of luminance/colour contrast would improve clarity of displays.
- Lower case bases, dioramas and clear space under cases is recommended as detailed in the audit reports and checklists.
- Careful arrangement within cases with small detail objects positioned low will increase access to objects.

Interpretation

Design guidelines set by the in-house Design Department for 2D and 3D dimensions and a variety of access guidance is followed and appears to result in varying text sizes and approaches to interpretation from one display area to another. It is appreciated that the character of each display varies to reflect the subject. Typeface varies with limited provision of alternative formats. There is extensive use of backlit text which can be tiring.

- It is important that overall strategy and agreed design criteria are established in the immediate future to include adequate standards for access.
- Review of current standards and guidance along with CAE audit recommendations and guidance can be a part of this. It is important to present interpretation to meet minimum and consistent best practice guidance.
- A hierarchy of text, simple writing style and manageable quantity of words with use of simple images would benefit disabled people and others.

There is limited naming and identification of galleries. Also a lack of introduction in how to use the galleries, the content and purpose. Interpretation style is limited in older galleries with information mostly text based. Interpretation addresses different learning styles in childrens galleries but not science based displays. Live interpreters are used in the galleries.

- It is recommended to present name, an indication of content and information and how to best use the galleries.
- Also introduction of more aural, tactile and alternative formats as used in newer educational style galleries would benefit visitors with visual impairments, learning difficulties and others.
- Description and subtitles or BSL is important for any AV interpretation.
- Disability awareness and access equality training is recommended for interpreters. Also training in specialist skills such as deaf communication and audio description would be helpful for interpreters to assist visitors with hearing loss and deaf people and visually impaired visitors.

There are initiatives underway to investigate further what objects can be handled to benefit visually impaired visitors and different learning styles.

- It is recommended to implement handling objects and tactile interpretation in all displays in addition to those aimed at younger audiences.
- Consider offering touch-tours with picture description, by trained staff, to interpret exhibits for visually impaired visitors

Interactive exhibits

Acoustics are difficult where areas are open such as East Hall, exacerbated by hard finishes and glazing where there are also interactive exhibits. Some areas where acoustics are difficult are part of the 2007 and 2015 plans.

- Short term introduce soft finishes and establish quiet areas screened off from areas of interactive displays.
- Medium term it is recommended to contain areas where sound/AV is part of interpretation. Also ensure that appropriate acoustic materials are specified.
- An increase to colour and contrast of controls combined with easy operation buttons or levers would improve usability.

Motion ride simulators

There are many aspects of the approach and entry to the motion ride simulators and other moving interactive experiences do not meet best practice. The rides are not accessible for wheelchair users and some people with limited mobility. The experiences, by their very nature, are not accessible and may present risk for some disabled people. However, there is still improvement that could make them more accessible for people with visual impairments, deaf people and others. Currently concern for health and safety of visitors is priority over access for the Science Museum.

- It is important that a procedure is in place and risk assessment undertaken to consider disabled people.
- It is recommended to provide other experiences with level entry and safer motion.
- It is important to provide visitors with information about the ride to inform their choice whether to use the ride.

Egress

The managed emergency egress plan includes use of refuge areas and evacuation chairs on upper levels.

- It is strongly recommended to consider disabled visitors in the evacuation plan, to include deaf visitors, visually impaired visitors, people with limited mobility, wheelchair users and others.
- Staff training in disability awareness is important for implementation of an evacuation plan.
- The evacuation plan and other options such as the proposal for a fire safe lift from the Imax auditorium should be undertaken in liaison with the local fire officer.

Appendix C: Staff Interview Analysis

Question 2: How Often	VSA	Info. Desk	IMAX/SimEX	Explainers	Managers	Total	
every day	4	1	5	11		21	
every other day	3	1	1	2		7	
1/week	2		4			6	
2/month			2	1		3	
1/month	2			1		3	
few/year		1	1	1	2	5	
Question 3: Measures Taken							
East Hall Construction			1		1	2	
Audioguides	1		1			2	
Directions (part of Job)	4	1	4			9	
Disabled Map	1	1			1	3	
Individual Tours	5		1		1	7	
Lifts and Ramps	6		3		1	10	
Staff Very Good	1				1	2	
Wheelchairs	1	2				3	
Signage	1		1			2	
Simulator			4			4	
Training	2				1	3	
Nursing Chairs				3		3	
Hand Extender				2		2	
SEN Training				2		2	
Space for Wheelchairs				2		2	
SEN Days				6		6	
Aprons (Garden)				1		1	
Disabled Costumes				1		1	
Job				1		1	
Touch Screen in Energy				2		2	
Garden Toys (VI)				1		1	
Accomodations in Shows				2		2	

Questions 4: Issues	VSA	Info. Desk	IMAX/SimEX	Explainers	Managers	Total	
Access to WW from Flight	2					2	
Audioguides	2	1	1	1		5	
Can't Help if Don't Call Ahead	3	1				4	
Communication w/in Museum	1					1	
Direction to School's Entrance	4		3			7	
Doors 4th and 5th floors	2		1		1	4	
Evacuation Chair 2nd Floor WW	1					1	
Events on 3rd Floor	1					1	
Flight Mezzanine	2				1	3	
Induction Loops in IMAX	1					1	
Lack of Braille Signage	6	1		1		8	
Launch Pad					1	1	
Lift in MMW (difficult)	1					1	
Lifts Going Out	3			1		4	
Lighting (entire museum)	1			2		3	
Paths 5th floor	1		1		1	3	
Poor Signage (throughout)	2		2			4	
Ships Mezzanine	2				1	3	
Sign Language	1					1	
Simulator Rides	1		6			7	
Space Mezzanine	2				1	3	
WC's 4th and 5th floors	2		1		1	4	
Paths throughout for Wheelchairs				2		2	
Louder Interactives				1		1	
Lip at School's Entrance				1		1	
Launch Pad Ramp				1		1	
Question 4: Solutions							

Add MMW lift to Mezzs.	1					1	
Disability Officer	1				1	2	
Disabled Map	2	2		5		9	
More Touch Exhibits			1		2	3	
Temporary Signage to School's	6	2				8	
Sign Showing What's Available				1		1	
Induction Loop Theatre				2		2	
Provide Accessibility Info. Online							
Fixed Through Clearer Signage							
Question 5: Training	VSA	Info. Desk	IMAX/ SimEX	Explainers	Managers	Total	
Attended Once	2	2	2		1	7	
Attended Twice	2				1	3	
Haven't Heard of It	3		6			9	
Heard of It	4	1	5			10	
Mandatory All (yes)	3	1	1		1	6	
Mandatory On-Floor (yes)	8	2	8		2	20	
Helpful/Effective	5	1			1	7	
Should Teach Etiquette	7	3	6			16	
Concerned	2	1			1	4	
Not Well Advertised	1					1	
	<3 months	<6 months	<1 year	<2 years	<3 years	>3 years	Total
Attended Once		1			3	3	7
Attended Twice						3	3
Haven't Heard of It		3	1	2	1	1	8
Heard of It Vaguely		2	3	2	2	2	11

Appendix D: Decision Matrix

The following charts explain the values assigned for the different criteria in the decision matrix.

Urgency Ratings (45%)

CAE Rank	Our Rating	Score
A	**+**	**10**
A	**=**	**9**
A	**-**	**8**
B	**+**	**7**
B	**=**	**6**
B	**-**	**5**
C	**+**	**3**
C	**=**	**2**
C	**-**	**1**

Cost (35%)

Area	Cost (Materials and Labor) in Pounds	Score
100 lux lighting ceiling/wall surface mounted	**In yearly Budget**	**10**
Vinyl Tile Flooring (per sq. Meter)	**25-35**	**7**
Lift which access all floors of building (7 stories)	**150k-250k**	**1**
Adding a mirror to back wall of elevator	**500-600 (lift being replaced in June)**	**10**
Circular handrail 40-45mm diameter	**50 per meter**	**6**
Adding a metal or frosted edge (300mm)	**50 per meter**	**6**
Adding risers to stairs in MMW	**75 per riser**	**5**
Wheelchair platform stairlift to mezzaine level	**20k-25k for 3-4m rise**	**3**
Automatic door openers at entrance	**100 each**	**7**
Nosing for Stairs 55mm wide on treads and risers	**9-20 per meter**	**5**
New Signage	**New signage system = 40k (includes replacement of exsisting)**	**7**
Brochures	**25k for 2 million**	**8**
Painting per Square Meter (wall and trim)	**4 per square meter**	**9**
Wood Skirting per square meter	**12-15**	**9**
Vinyl skirting per square meter	**8**	**9**
Accessible Water Closetes (4th and 5th floor)	**50k-100k**	**2**

Cost (35%)

Area	Cost (Materials and Labor) in Pounds	Score
General Estimate	**100-1k**	**7**
General Estimate	**1k-5k**	**5**
General Estimate	**5k-25k**	**4**
General Estimate	**25k-50k**	**3**
General Estimate	**50k-100k**	**2**
General Estimate	**100k-200k**	**1**

People Affected (15%)

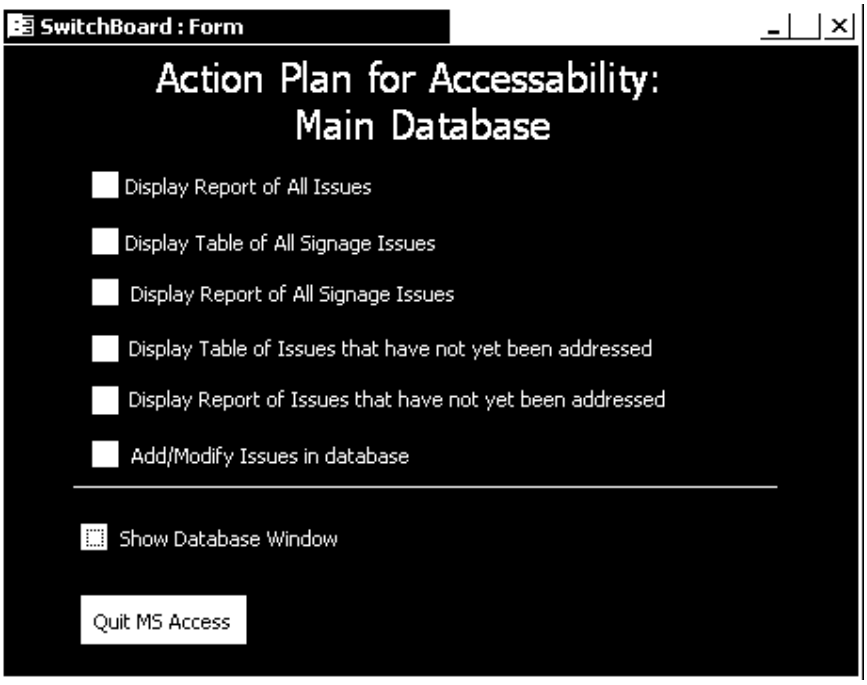
Disability	Million	Score
Everyone	**250**	**10**
All disabilities	**238**	**9.52**
Hearing Impairment	**80**	**3.2**
Elderly	**80**	**3.2**
Mobility Impairment	**45**	**1.8**
Learning Disabled	**30**	**1.2**
Dyslexia	**25**	**1**
Reduced Strength	**22**	**0.88**
Vision Impairment	**11**	**0.44**
Wheelchairs	**3**	**0.12**

Staff Identified Issue (5%)

# Identified	Score
8	**10**
7	**8.75**
6	**7.5**
5	**6.25**
4	**5**
3	**3.75**
2	**2.5**
1	**1.25**

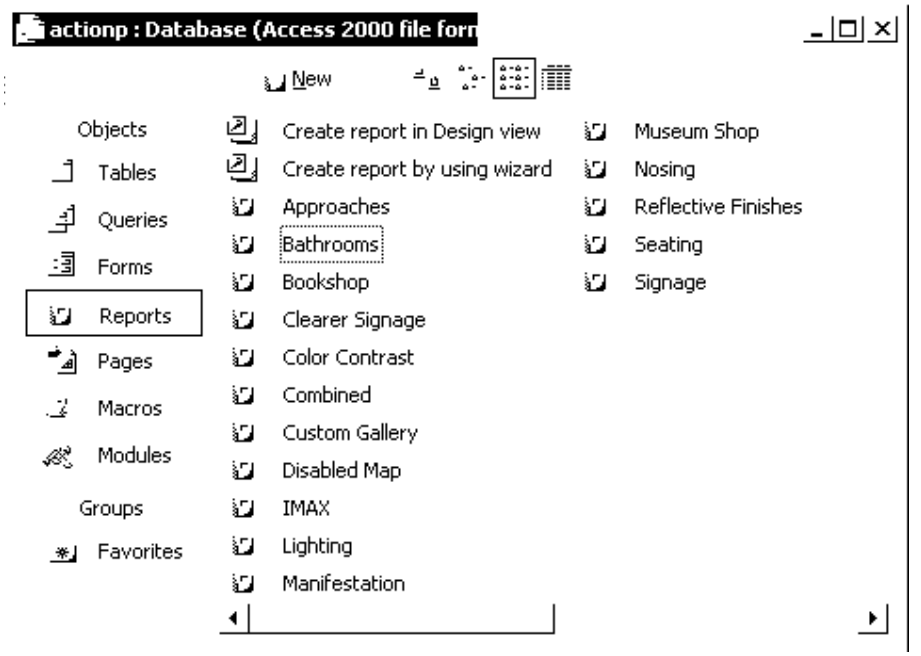
Appendix E: Instructional Guide for Database

When the database is launched, it automatically comes to a central switchboard from which you can perform basic tasks off of. It looks like this:

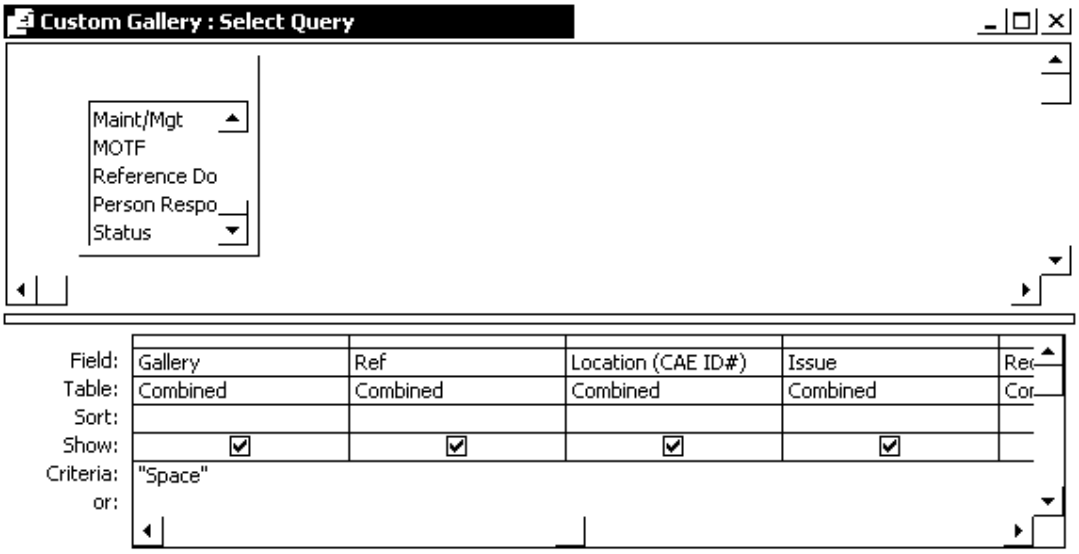


- "Display Report of All Issues": Displays each issue on a separate page in report form
- "Display Table of All Signage Issues": Displays a table of all signage issues
- "Display Report of All Signage Issues": Displays each signage issue on a separate page in report form
- "Display Table of issues that have not yet been addressed" Displays a table of all issues where the "status" column is blank
- "Display Report of issues that have not yet been addressed" Displays a report of all issues where the "status" column is blank
- "Add/Modify Issues in database": Opens up the modification from which allows the user to add or modify issues in the database
- "Show Database Window": Closes the Switchboard and displays the database window

From the database window, numerous queries and reports can be selected (by pressing the respective button on the left hand side of the window). Queries are simple table forms of the information requested. Each query has a report to go along with it (as seen below):

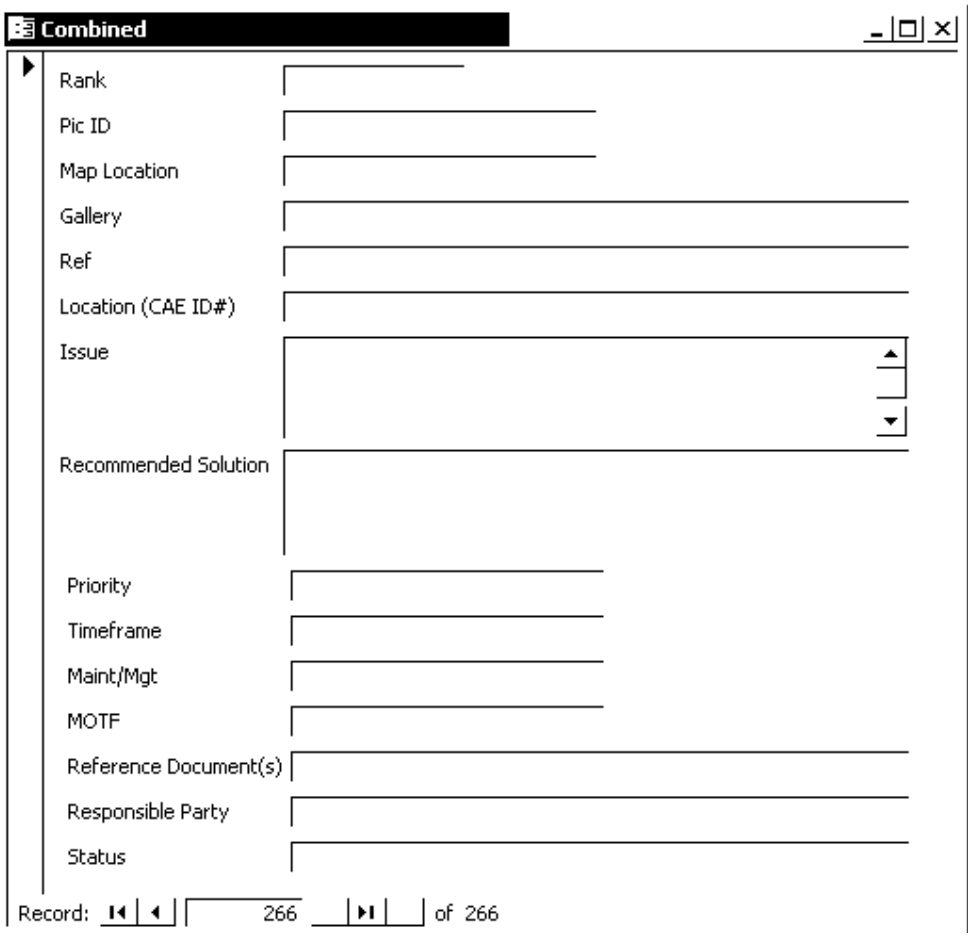


There is also an item called "Custom Gallery" which allows the user to run a report on a gallery that does not yet have its own report. To select which gallery you wish go to the query window. Highlight (single click) the "Custom Gallery" query and click the "Design" button on the top of the database window. You will arrive at this screen:



From here, scroll over to the "gallery" field (as seen above). You can then type the name of the gallery that you wish to filter by here in the "Criteria" field. After you have typed in the gallery you wish to filter by, click the datasheet button at the top left hand corner (underneath the file button) to display the results. The "Custom Gallery" report will also contain these items now.

Additionally, you can modify the content of the records, or generate your own. This is done by clicking the "Add/Modify Issues in database" button on the initial switchboard. From here, you will be moved to this form:



Data from previous records is displayed in the different text boxes in the form. You can modify or erase fields in each record as you wish. Additionally, if you proceed to the last record by using the navigation buttons at the bottom of the form, it will give you a blank from (as above). From the blank form, you can write your own record by typing data into the different fields.

Appendix F: Methodology for Focus Groups

The set up of the focus groups was such that it was going to be conducted in two succeeding sessions. The first half of the focus group will be conducted in a meeting room within the Museum and be concerned with the general difficulties people have in public places, their main concerns, and priorities. To begin the participants will be asked to discuss provided questions. The potential questions for discussion can be seen below in Table 8. As moderators we planned to observe and keep the participants from getting off topic.

Table 8: Focus Group Outline

Setup:

Moderator and participants are seated around a table. Each is asked to write their name on a tag in front of them so everyone can refer to each other by first name basis.

Icebreaker:

- What is your name, where are you from, a little about your family, any other things you would like to mention
- What is your favourite museum that you have visited and why?

Part 1:

- Tell us about some typical issues that you have found in accessing public areas.
  - Which of these are most bothersome to you?
  - Have you ever encountered any situations where access simply was not available? Can you tell us about that?
- As far as museums go, have you experienced any recurring issues or problems?
  - Which museums have you found to be well equipped and why?
  - Which museums have you found to be poorly equipped and why?
- -Have you ever had to seek assistance from staff whilst in a Museum
    - (If no) Is there anything else you use for assistance in a Museum, apart from staff?
  - Have you had any outstanding staff experiences?
  - Have you had any 'horror stories' in dealing with staff
- When you visit public venues, what items concern you the most about access
  - In general, do you find most venues well equipped to deal with the issues you mentioned? Maybe write down an extra q for if they answer No to this question.
    - (If no) What would you change to overcome these problems?
  - Are there any amenities that you simply can't do without during a visit to a Museum or public place

Part 2:

- What did you think about the galleries you just visited?
- Tell us about what you did during the time you spent in the galleries?
- Tell us about any issues you experienced in trying to access any of the exhibits we brought you to?
  - Did you find the layout of the exhibition to be clear and easy to follow?
- What did you think of the access to the exhibits you were just looking at?
- What did you think of the layout in the exhibition?
- What in particular did you find helpful in the areas you visited?
  - Are these typically found in most public areas? Museums?
- What suggestions would you make to the museum in terms of improving access to disabled patrons?

Each question tells us something different. For example, the first question sets out to determine what problems the participants encounter repeatedly in public. This will be used to help address which issues were given a high priority. Other questions will provide a list of items that disabled patrons are concerned about when they decide to visit public areas. These

items are important as they could determine whether or not these participants will or will not visit a location if they do not satisfy their concerns. The last question will give participants the opportunity to give us suggestions for the project and key ideas and concerns to keep in mind while we prioritize issues.

After that discussion the focus group will switch directions. The second half focuses on problematic areas and exhibits previously defined by the Access Audit. It is not assumed that the participants had recently visited and examined the Science Museum. The focus group can not be a discussion of exhibits with specific questions. It has to allow for a brief browsing of areas of the Museum. This will then be followed by a sit down discussion about the problems identified in that area.

The second half of the focus group will be centered on not simply the acknowledgement and individual sense of priority of the problem but also any recommended solutions to these areas. This will help to determine helpful practices in regards to general problems defined throughout the Museum. This will be helpful since best practices are often referred to in design but never directly specified because it is impossible to have specific and objective best practices which can be applied to all contexts, especially within a unique Museum and particular exhibits.

The main issues will be determined from general recurring cited problems in the Access Audit which were given either an A or B priority rating by the CAE. The main reoccurring issues set out by the Audit are listed in Table 9 below:

Table 9: A Portion of the Issues Listed in Summary of Audit

1. It is important to consider logical, clearly signed routes through the Museum with short distances between facilities… Seats are mostly not well contrasted and without arms or back… Seats that are contrasted in luminance and colour to other finishes, with backs and arms are recommended short term as well as for the 2007 and as indicated in the 2015 plan.
2. Stairs and steps are reasonably distributed across the site. However, detail varies and does not meet Part M or best practice at top floors, mezzanines and walkways.
    - Medium to long term it is important to upgrade stairs where recommended as well as provide alternative route such as lift or ramp in the same area.
3. Glazing and lighting effects cause light reflections and glare in many areas. There is also special effect and low lighting in many galleries. It is understood that low light may be required for conservation. This can be difficult for visually impaired visitors as well as those with epilepsy and others.
    - Short term warn visitors of lighting effect and where possible project only onto secondary not major routes.
    - It is recommended to increase light where feasible to a minimum of 100 lux on main routes.
    - Transitory lighting in areas between different light levels is is recommended rather than sudden change from light to dark.
4. There is limited naming and identification of galleries. Also a lack of introduction in how to use the galleries, the content and purpose. Interpretation style is limited in older galleries with information mostly text based…
    - It is recommended to present name, and indication of content and information and how to best use the galleries.

[Adapted from Centre for Accessible Environments, 2004, 13]

Due to the limited amount of time and consequently the number of focus groups that were feasible, the entire Museum can not be covered in the focus groups. As a result, only two exhibits have been chosen for examination under the second portion. The two galleries of Space and Dreams of Flight contain similar issues and incorporate the main concerns summarized in Table 9 above. Both have fairly dark light levels throughout along with little to no contrast between edges and frames of exhibits, walls, and floors. Both galleries contain mezzanine levels accessible by stairs, with only the Space gallery offering an alternative method to reach the higher placed exhibits. The Flight gallery has benches incorporated throughout, although they have no arms, and are not well contrasted or advertised. The

pathways throughout the Flight gallery are sometimes obstructed by sudden projections which are not made known.

Since most of the problems in these areas were already spelled out in the Audit the second discussion portion of the focus group only briefly touched on the participants acknowledgements of the problems. This will be used to see how outwardly apparent and the degree of concern which the individual participants find these issues. After this the discussion will be led to consider possible comfortable solutions to the issues. This section will be up to the brainstorming of participants and their feelings on what solutions would work best for them. One issue to be touched upon, if not brought up initially, will be the participants' opinions on the chair lift in the Space gallery. This will be based around how they felt about using it to reach the mezzanine level. Comments on this are of importance because this may be a solution for other areas of the Museum.

After this, depending upon the time left, the entrance lobby and signage in that area may be discussed. This is an important issue because it is the initial orientation point in the Museum and provides initial feelings on the Museum as a whole. For this reason, discussion may be based around what patrons expect to see when they come into the lobby of a museum. Participants should be allowed to view the handout of the map and talk about their comments.

The focus group will be held with 6-12 individuals. The group should include people with disabilities and those who have an expertise or work closely with those with disabilities will be invited. Although the term disabled covers a wide range of people and handicaps, due to both the brevity of time and resources and the nature of the majority of issues discussed in the Access Audit our contacts have been narrowed to include people with mobility impairments, vision impairments, learning disabilities, and elderly.

Appendix G: Notes from Meeting with Val Fish

3.29.2005

Meeting with Val Fish (Management Development Consultant)
11:00 AM – 11:35 AM

We discussed the training process that the Science Museum has in place for disability training today with Val Fish. Val is in charge of the overall disability training programs throughout NMSI. The sources for the training come from best practices, information published by disability rights groups, as well as DDA Legislation.

The actual session that is run for the museum employees take about half a working day. Groups are typically around twelve people (no fewer than six, no more than fourteen). It begins with a quiz given to the staff members in the training session to help determine their knowledge of certain disabilities and disability access in general. This is followed by a presentation and 'Q & A' session. After this, the staff members are split into pairs and explore parts of the museum while experiencing a certain disability (such as sight, hearing, or mobility impairment). This is done by placing trainees in wheelchairs, placing glasses the limit vision, or wearing earplugs. This list is not exclusive. This gives them hands-on experience as to what obstacles and issues arise for disabled patrons. Afterwards, the staff members come back and make suggestions as to what would have helped them in their journey around the museum. The training session is finished off with a discussion on etiquette and a final quiz to measure the progress of the trainees.

Val had many concerns herself about the program. She felt that it would be beneficial if more people had training aside from the front of house personnel. Design teams and estates staffs do not have such training and she felt as a result exhibits and facilities are not always designed with disabled patrons in mind. She also stressed the importance of holding an actual disability training policy for the museum. Another point of interest is that there is no communication between the Museum's visitor research group and Val on matters of disability access complaints. As a result, the program cannot be adjusted or shifted as complaints vary or increase in certain directions. Ideally she wishes to see everyone have basic disability awareness training. When asked if this could be done during new employee orientations, she said this was a strong possibility.

Appendix H: Detailed Walk-through Database

Area Identified	*Description*	*Priority*	*Time*	*Our Rating*	*Pic ID*
10.13		A	s	-	101-0258
10.14	Sign	A	s	*-	101-0259
10.14	Stairway	A	s	-	101-0260
10.15	sign/voice	A	s	*-	101-0261
10.15	want signs next to lift/dark walls	A	s	*-	101-0262
10.17		A	s	*-	101-0263
10.17	sign indicating help	A	s	*-	101-0264
10.2	there is voice	A	s	-	101-0281-2
10.4	part of construction	A	s		
10.6		A	s	-	101-0266
10.6		A	s	-	101-0267
10.12	3F Imax ramp, sign needs to be apparent	B	m	-	410
10.12	switch tire with sign	B	s	=	412
10.13	Ground Floor MMW	B	s	=	413
10.13	East corner MMW - clearer signage	B	s	*=	414-15
10.13	MMW Signage - East stairs for risers	B	s	=	416
10.14	1F Wel. Wing - show flooring path	B	m	-	417
10.14	WW stairs/ metal between walls/ lighting	B	m	=	418
10.15	WW Lift/ lighting	B	m	=	419
10.15	WW Lift/ contrast (looks fine)	B	m	-	419
10.2	GF SE Lifts sign next to stairs (lift talks)	B	s	=	421
10.2	Move cow	B	s	-	422
10.2	Nosing is not sufficient	B	s	-	423
10.3		A	m	-	101-0286
10.4	Construction	A	m		
10.5	2007 plan	A	m	*	
10.7		A	s	*-	101-0265/71
10.7	Central lifts / finishing	B	s	-	426
10.7	Central lifts / contrast & button layout	C	m	=	427
10.7	Central lifts / contrast of rail	C	m	-	427
10.9		A	s		101-

					0272
10.9		A	s		101-0273
10.9		B	m	-	428
11.1	can't enter	A	s		
11.1	Entrance and stairs area (mid)	B	s	-	429-30
11.2	can't enter	A	s		
11.2	Exit doors to IMAX + Double doors	C	l	=	431 & 435
12.10		A	s		101-0268
12.11	no door	A	s		101-0269
12.13	closed at this time	A	s		
12.14	closed at this time	A	s		
12.15		A	s	=	101-0274
12.15		A	s		101-0275
12.15	Menus + Waiting Area	B	s	=	436-7
12.16		A	s	=	101-0276
12.16	1F picnic area / colour changing	B	s	-	438
12.17	Basement shop	B	s	-	439
12.18	closed at this time	A	s		
12.3	Gift Shop	B	m	-	
12.3		A	s	-	101-0280
12.4		A	s	-	101-0278
12.4	Gift Shop Entrance	B	m	-	
12.4		A	s	-	101-0279
12.6		A	s	-	101-0277
12.7	closed at this time	A	s		
12.8	closed at this time	A	s		
12.9		A	s	*-	101-0270
13.1	refer to sheet	A	m		
13.2	Orange on door, frame, and wall: difficult to distinguish	A	s	=	72
13.5		A	m		101-0287
16.2		A	l	-	101-0285
16.3		A	m	-	101-0284

16.6	Simulator: fixed by signage	A	s	=	64
2.5	bus stops	A	s	*=	
2.7	sign outside	A	s	*+	3-4
2.7	disabled parking/no curb incline	A	s		5-7
2.8	door edges	A	s	+	8-9
3.1	light boxes	A	s	-	10
3.1	Loose mats at entrance	C	m	+	3
3.1	reflective floor + reflective lighting	C	m	=	1-2
3.2	no signage in lobby to indicate directions	A	s	+	
3.20	East hall to space: signs are difficult to focus on	B	s	*=	
3.24	lowering ticket desk	A	s	+	12
3.25	Space signage	A	s	*=	14
3.3	Staff desk: quick changes in floor coloring. Even surface	B	m	=	6
3.30	induction loop/lighting "$"	A	s	-	18
3.31	Wellcome wing seating (no backs)	A	s	=	19
3.4	ticket desk	A	s	+	12
3.5	tix machine: hidden in corner, no signage	B	m	*=	4
3.6	Imax counter: low contrast signs, no orientation in lobby	B	s	*=	
3.6	Yellow directory signs are hidden	B	s	*=	7
3.7	info desk too high	A	s	+	13
4.1	1F lifts: No map, no banners	B	s	*=	
4.2	Materials' : cannot find banners	B	s		
4.3	glass walk way/change in ramp material	A	s	=	42-45
4.3	Glass walk: ridges show no contrast '$'	B	s	-	13-14
4.3	no indication of where ramp goes. Only stairs on other side	B	s	*+	12
4.3	Glass walk: video screens to not match sound.	C	s		17
4.3	Glass walk: steel rail provides no contrast with wall	C	s	-	17
4.3	Landing at ramp: info touch screen = no sound	C	s	-	16
4.3	exhibit in middle of ramp	C	s	=	15
4.8	route through agri.	A	s	*+	33
4.8	wood benched blend with floor	A	s	-	34-35
4.8	Agriculture: low light for pass through	B	m	+	
4.9	Watch cases: move to allow lower viewing	B	s	=	19
4.9	Watch cases: no signs indicating time measurement	B	s	*=	
5.2	2F floor from NE Stairs: cannot find problem	B	s		
5.3	hist of computers: cases alternate bright colours.	B	m	=	20
5.3	hist of computers: glass tops hang over base	B	m	=	
5.3	underside of cases are dark	B	s	-	21
5.4	to the right of the lift, flooring make compass (possible conf.)	B	m	=	22
5.4	drastic changes in flooring should be explained	B	m	=	22
5.5	Ships: no general signs in plain sight	A	s	*=	20-21, 24-25
5.6	stairs are narrow. No alt. Routes '$'	A	s	+	26-27
5.6	displays are high off ground	A	s	=	29

5.7	obstacles won't be seen by cane users / benches stick out	A	s	-	48-57
6.1	4F Colour contrast is too low	B	s	-	27
6.1	column contrast	B	s	-	26
6.5	interactive area: extremely loud	B	s	-	
6.6	no sings indicating flight lab entrance	B	s	*=	31
6.6	differences in light as one walks through	B	s	=	32
6.6	glass produces glare	B	m	=	33
6.6	dark cases (engines) are backed against windows	B	m	=	34
6.6	dark blue frame of cases blends with floor	B	m	+	35
6.6	paths of main routes have sudden projections	B	m	+	36
6.7	all glass cases go to the floor w/o transition '$'	A	s	-	58-60
6.7	small text in cases	A	s	=	61
6.8	Health Matters is very dark	B	m	=	28
6.8	abrupt changes to floor finishes	B	m	=	29
6.8	make exhibit on level route	B	m	-	30
6.9	low light levels	B	m		
7.2	Exhibits only accessible by staircase	A	s	-	62

Appendix I: Interactive Map PowerPoint

In helping to present the action plan to members of the Museum staff, an interactive map was developed using Microsoft PowerPoint. With this map, people can look at the different issues sited in the action plan via a point in click interface using floor maps of the museum. Green circles are placed on the map at locations where issues were sited. When the green circles are clicked on, a picture and description of the issue is shown. This map presentation is available for viewing on the enclosed CD-ROM.

Appendix J: Files Included on CD-ROM:

1. *Staff Interviews – Analysis and Tallies.xls*
   Database used for analysis of the staff interviews. Indicates the number of people who mentioned specific issues and solutions in the Museum. Also includes responses to questions on received training.

2. *Staff Interviews – Notes from Interviews.doc*
   This document has the notes taken during the 45 interviews conducted with the VSAs, explainers, and Front of House staff.

3. *Interactive Map.ppt*
   This is the Interactive Map used at the end of the final presentation to the Science Museum. It allows one to browse different floors of the Museum and see a picture of the issues documented for each area, along with the written description of the issue, recommended solution, and other information presented in the Action Plan.

4. *Science Museum Final Presentation.ppt*
   PowerPoint document presented to the Science Museum on April 28, 2005. The presentation is an overview of the work completed at the Museum. It covers research, work on the Action Plan, and an overview of the final product.

5. *Science Museum Action Plan.doc*
   Electronic copy of the Action Plan. This document contains all the written files associated with the Action Plan. This portion includes written recommendations for training and policy. It also contains an appendix where problems and comments relayed from the staff interviews which were not a part of the Audit are contained.

6. *Science Museum Action Plan.xls*
   The database contains all of the information used to create the tabular portion of the Action Plan. This database was used as the foundation for the Access files. All information used for the Action Plan, queries, and decision matrix is recorded. The detailed walkthrough notes are given as a tab in the action plan.

7. *Detailed Walkthrough Pictures (Folder)*
   This folder contains all of the pictures taken of issues from the Access Audit. Pictures were taken for as many of the issues as possible. They are referenced in the Action Plan by their respective file names. Pictures are also used in the Interactive Map.

8. *Meeting with Val Fish - Notes.doc*
   Summary notes of the meeting with Val Fish. It explains the Museum's current training policies.

9. *Action Plan Database\actionp.mdb*
   This is the version of the Action Plan in MS Access format. From here, queries, reports, and additions to the action plan can be made with ease.

10. *Database of Reorganized Audit\Audit2.mdb*

This is the version of the CAE Access Audit in MS Access format. From here, queries and reports of the audit can be made with ease.