



## LONDON UNDERGROUND

# Environment Report 2006



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# 1: Managing Director's Statement

It is with pleasure that I introduce our Annual Environmental Performance Report for the 2005/06 financial year. For me, good environmental performance is integral to the realisation of our vision to provide 'A World Class Tube for a World Class City'.

We make a significant contribution to improving the quality of the urban environment through better resource use, reduced road congestion and reduced pollution. However, our activities also give rise to a variety of environmental impacts. As a result, we have made commitments to manage these impacts appropriately and ensure that we continuously seek opportunities to improve our environmental performance.



London Underground and the PPP Suppliers have made significant progress towards an improved environment for London. This report details activities that have been undertaken during 2005/06 in order to improve our environmental performance with respect to each key impact area.

We completed all planned programmes relating to the enhancement of our environmental management system and achieved our targets for energy saving and recycling. Significant progress was also made with respect to actions associated with waste and resource use, and these will be concluded during 2006/07.

To continue our contribution to the improved environmental performance of London, we have set challenging targets for 2006/07. I am confident that we will meet our future challenges as we continue to provide a public service with clear environmental and sustainability benefits.

**Tim O'Toole**

## 2: Environment Policy



### Environment and Energy

**London Underground will continually improve its contribution to improving the quality of the urban environment by promoting use of the Underground and by managing its impact on the environment in ways that are economically and socially justified, within the resources available.**

We care about good environmental performance and, as a public transport operator, we make a significant contribution to improving the quality of the urban environment. We will continually improve this contribution by promoting use of the Underground and by managing our impact on the environment in ways that are economically and socially justified, within the resources available to us.

**We are committed to achieve this by:**

- Complying with all applicable environmental and energy legislation.
- Seeking to identify and manage our environmental impacts.
- Applying industry best practice to improve our environmental performance and reduce our negative impacts.
- Consideration of energy efficiency, whole life costs and the principles of sustainability to be included in the planning, design, operation and decommissioning of all our services and operations.
- Assessing environmental impacts prior to making major investment decisions.
- Setting clear targets for the purchase of renewable energy and the levels of energy use.
- Using environmentally responsible procurement and disposal arrangements for the goods and services we buy and consume.
- Monitoring, protecting and enhancing wildlife habitats.
- Developing relationships with our partners and stakeholders, informing them of our environmental and energy management performance, and seeking their help in achieving our objectives where appropriate.
- Acting sensitively to the needs and concerns of neighbouring communities.
- Setting clear objectives and targets, and developing management systems, which prevent pollution and promote continuous improvement in environmental performance.
- Ensuring that instruction, guidance and training are in place to raise staff awareness and to enable all our staff to contribute towards caring for the environment.
- Playing a key role in the delivery of the Greater London Authority's environmental strategies, and applying the Mayor's energy and waste hierarchies to our operations.
- Regularly monitoring, auditing and reviewing the effectiveness of the environmental management regime and this policy; and undertaking improvement actions where necessary.
- Reporting on our performance on an annual basis.

**June 2003**

# 3: Introduction

## Company Background

London Underground (LU) is the oldest underground rail system in the world. It began in 1863 as the Metropolitan Railway Company operating between Paddington and Farringdon Street, and has expanded to become the network we know today.

LU operates seven days a week and covers most of London, as well as parts of Buckinghamshire, Hertfordshire and Essex. We own and operate 254 stations, with our trains running across 408 kilometres of track on 12 different lines. We also have agreements to use another 20 stations owned by Network Rail or other Train Operating Companies (TOCs). In order to provide a vital service to London, we employ approximately 13,000 full time staff. This enables us to move 3 million passengers around the capital each working day.

A Public Private Partnership (PPP) commenced in 2003, to secure long-term and sustained levels of investment across the LU network. Under the PPP, we remain a publicly owned operating company, while most maintenance and renewal works are undertaken by our PPP Suppliers - Metronet Rail BCV, Metronet Rail SSL and Tube Lines. We also have other major suppliers of specific services and Private Finance Initiatives (PFI) in place.

In the same year, LU became part of Transport for London (TfL), a public body responsible for managing all modes of transport in London and implementing the Mayor of London's Transport Strategy. The business is largely run with funds from fares, advertising, property revenue and additional government subsidies.



- High Street Kensington Station in the early years
- 1938 Rolling stock
- Canary Wharf Station

## Management Structure

The Health, Safety and Environment Committee (HSEC) of the London Underground Board has overall accountability for our environmental performance. In order to ensure that the PPP Suppliers are aware of our environmental management proposals and that their plans are compatible with ours, they participate in this committee as well as specific partnership meetings.

London Underground is operated through eight Directorates, some of which have environmentally significant roles:

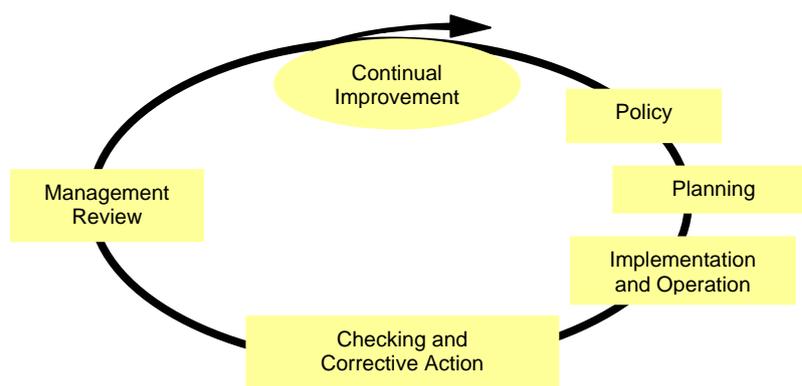
- The Chief Operating Officer, who plays a significant role in minimising the environmental impact of our service;

- The Chief Programmes Officer, who ensures the delivery of the environmental aspects of the PPP and PFI contracts, and is accountable for procurement and energy management activities within LU;
- The Engineering Directorate provides competent engineering advice and support across LU, ensuring that the environmental impacts of our assets are minimised. The Directorate also establishes Standards in relation to our assets and seeks assurance that our assets are designed, constructed, installed and maintained in accordance with those standards;
- The Safety, Quality and Environment (SQE) Directorate provides support, advice and strategic direction on environmental matters within LU. The directorate also sets environmental management standards to be met by LU and its suppliers; and provides day-to-day advice to operational managers responsible for controlling environmental risk;
- The Finance Directorate ensures that sufficient resources are made available for environmental management and improvement.

As a public transport provider, the daily service we provide has had great environmental and social benefits, reducing the need for private vehicles which results in reduced pollution and congestion. However, our activities also have negative impacts on the environment; and our stakeholders expect us to minimise these. In order to maintain our environmental advantage, we seek to achieve and maintain good environmental performance which delivers legislative compliance and reflects best practice.

## 4: Environmental Management System

To manage environmental performance and control environmental impacts which may arise from our activities, it is essential to have an effective environmental management system. London Underground has a well developed and integrated Health Safety and Environmental Management System (HSEMS). Our Environment and Energy Policy is the foundation of the environmental element of the HSEMS. As part of our continuous drive to improve our performance, the system is regularly reviewed to take into account changes in business activities, responsibilities and legislation.



**Structure of HSEMS**

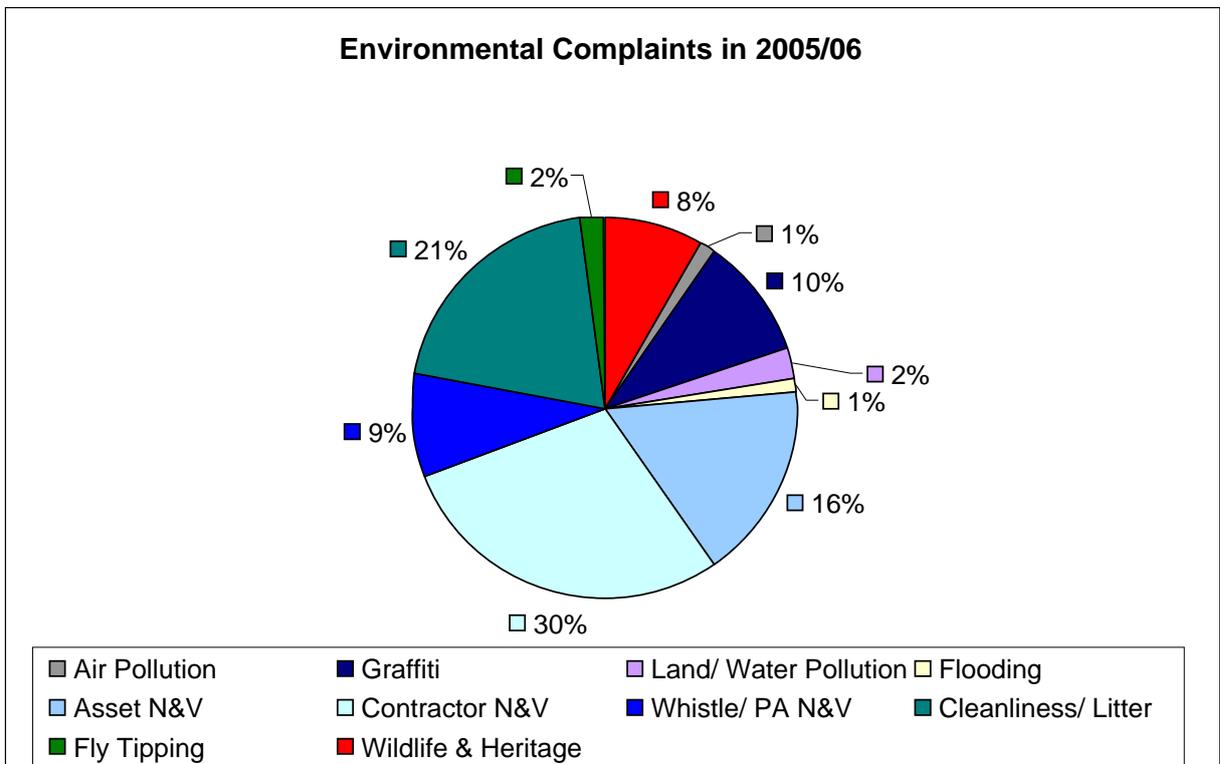
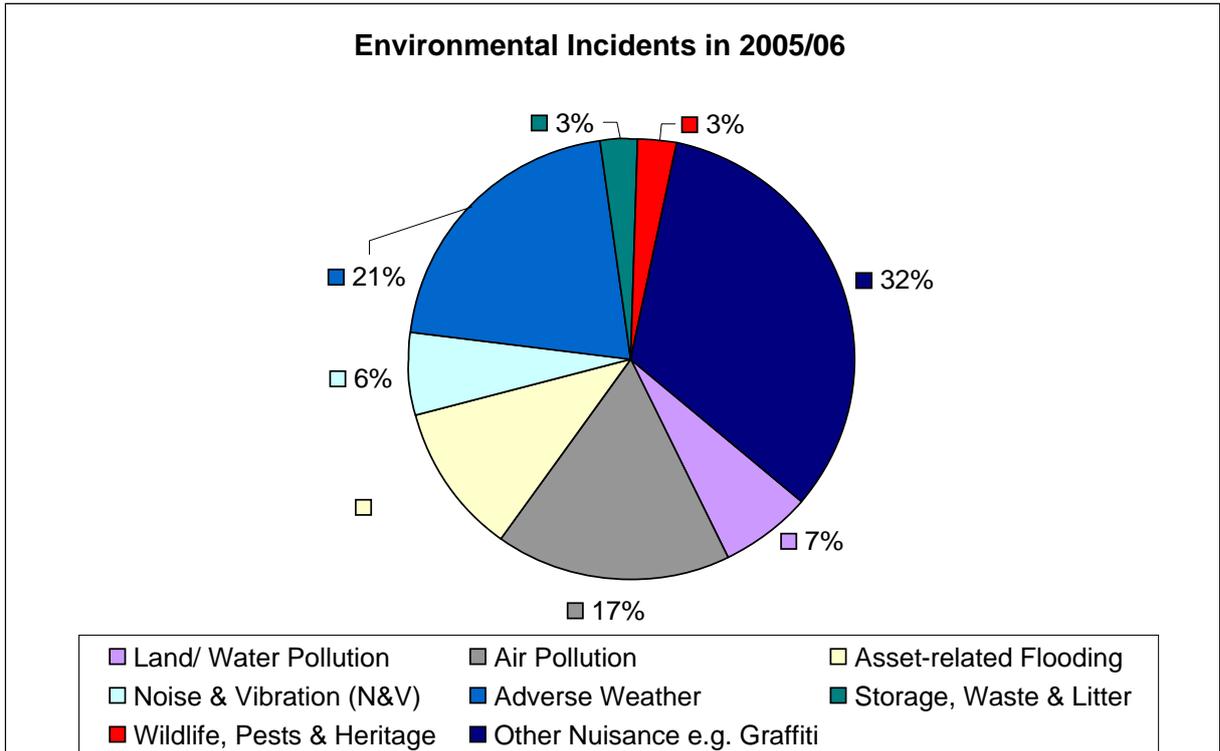
### Performance during 2005/06

During 2005/06, work was undertaken on some of the environmental elements of the HSEMS in order to improve the communication and benchmarking of environmental performance. A key activity was the implementation of environmental Key Performance Indicators (KPIs). These KPIs enable us to assess our yearly performance and benchmark us against other organisations, as well as to communicate changes in environmental performance. They will also provide a means of demonstrating performance against Mayoral Strategies.

Other activities carried out during 2005/06 include a revision of how we classify environmental incidents and complaints; and an expansion of the environmental content of LU's Intranet site. These have enhanced our communication arrangements for environmental matters. The incident classifications now ensure that we capture LU's impacts on the environment as well as the environment's impact on LU, such as service disruptions due to adverse weather.

During 2005/06, no environmental notices were received from any regulatory authority, and there were no major environmental incidents resulting from LU's operations or activities undertaken by our contractors. However, the total number of environmental incidents increased by 30% compared with 2004/05. This increase was expected due to improvements in the classification of incidents and improved environmental reporting by our PPP Suppliers.

The number of environmental complaints had been increasing since the commencement of the major renewal and upgrade works under the PPP. However, the total number of environmental complaints received during 2005/06 was 11% lower than 2004/05, despite an increase in contractor activity and the number of train kilometres operated. During the year, LU and the PPP Suppliers received and replied to 886 environmental complaints.



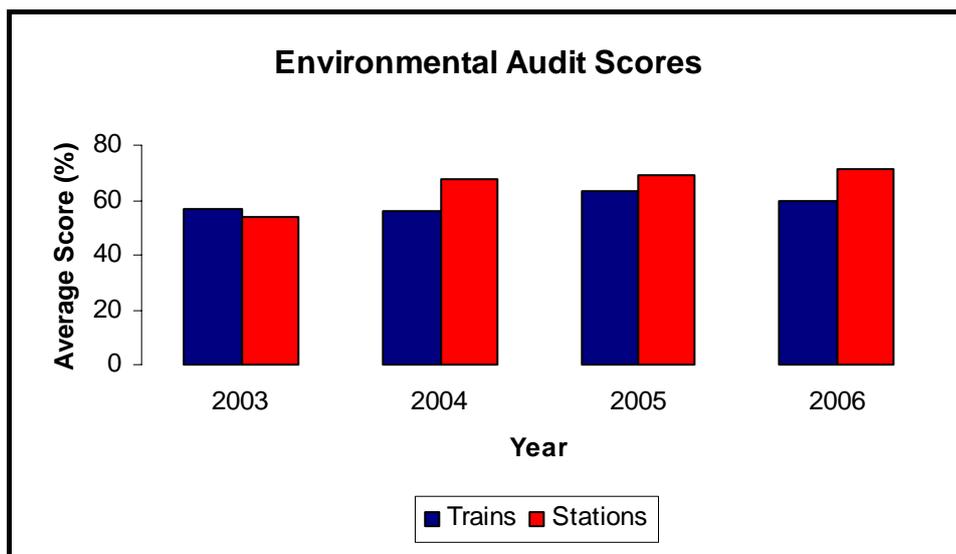
A full review of LU's environmental arrangements against ISO14001 (the international standard for environmental management systems) was conducted during the year, in order to establish further areas for improvement. The review concluded that LU has all the key

processes and documented procedures in place to meet the requirements of ISO 14001. However, further work is required to refine a number of the processes within the environmental management system.

Since the commencement of the PPP, the PPP Suppliers have been responsible for improving environmental performance, while carrying out their maintenance and renewal activities. As required under the PPP Contract, both Tube Lines and Metronet successfully gained ISO 14001 accreditation before the April 2006 deadline. As part of their commitment to continuous environmental improvement, apart from regular reporting to us on their progress, both Tube Lines and Metronet are producing annual environmental performance reports.

LU and the PPP Suppliers use Quality, Environment, Safety and Health (QUENSH) contract conditions as a means of managing contractors on and around our premises and network. This ensures that all goods and services are procured, and contracts managed in a safe and environmentally sensitive manner. Our QUENSH Manual contains requirements for the assessment of environmental impacts, the production of an environmental plan indicating how these impacts will be managed (where appropriate), and clear requirements for environmental management. The PPP Suppliers carry out audits, as well as planned inspections of their contractors' activities, in order to establish their environmental performance against legal and contractual requirements.

LU auditors carry out audits of all our train and station operations. The audits include an environmental element as part of the overall scoring system, to provide assurance in respect of the implementation of environmental controls on a day-to-day basis. The audits help managers to identify, control and reduce negative environmental impacts and provide important trend information. A total of 121 stations and 10 train operation locations were audited in 2005/06. The majority of locations have been found to be broadly compliant with environmental requirements, and improvements in environmental performance have been achieved. The audits have shown that energy management and recycling arrangements are proving effective in raising the profile of environmental issues within operational areas. The majority of stations now participate in the Stations Energy Challenge and an increasing number of stations are participating in the paper recycling scheme.



Although broad compliance has been achieved, the audits highlight that much of the performance improvement continues to stem from the activity of committed individuals, rather than systematic compliance with corporate requirements. Hence, further efforts are required

to develop robust inspection arrangements to monitor environmental performance, including energy saving measures in Central Services areas.

**Objectives for 2006/07:**

- Conduct the 3-yearly review of LU Environment and Energy Policy
- Update our standard for Environmental Risk Assessment with the revised methodology for undertaking environmental risk assessments as part of the 3-yearly review of HSEMS
- Update HR guidance to ensure that key environmental requirements are captured in job descriptions where appropriate
- Amend SQE departmental documentation to:
  - Ensure the capture of non-statutory requirements applicable to the organisations activities and services
  - Document the sources of information and calculations supporting the environmental - KPIs to ensure consistency over time
  - Include the management of the environmental aspects of the core activities undertaken within the scope of Central Services SQE Audits.

# 5: Significant Environmental Impacts

## 5.1 Energy

London Underground is the largest consumer of electricity in London and rates amongst the top 10 electricity consumers in the UK. The national grid supplies our electricity, of which 90% is used to power trains in the form of traction current. In the event of a national grid failure, we have a back-up facility which can be powered up in 15 minutes to act as our emergency power source. This allows safe evacuation of the network, but does not provide power to run train services.

Energy consumption is recognised as a significant contributor to climate change. We therefore have a responsibility to ensure that we use energy efficiently. We expect that our energy consumption will increase significantly over the next twenty years as a result of the introduction of new trains (with additional features) and the operation of an improved timetable. In order to mitigate the expected increase in consumption, we have put a strategy in place to ensure more efficient use of energy and procurement of energy from less environmentally damaging sources.

### Performance during 2005/06

The Stations Energy Challenge initiative, which began in April 2001, continues to deliver our target savings. Changes have been made to the competition to make it more competitive by splitting into 4 leagues – Division 1, Division 2, the Championship and the Premiership. This makes provision for stations that have just begun energy saving activities, and provides an ongoing incentive for longstanding participants. Our target for 2005/06 was for each station to reduce its energy consumption by 20% against its base year.

All stations in the Premiership, Championship and Division 1 leagues met the 20% saving target. Stations in the Premiership league saved over 40% on average. Although average saving for Division 2 stations was below target, a third of the stations achieved the target. Overall, the competition exceeded its target, and has now delivered a saving of 14% in real terms since 2000/01. The London Underground Energy challenge for 2005/06 was won by South Wimbledon station. The Line Award was won by the Bakerloo line. The Group Station Award was won by the Charing Cross group. The Greenford group was runner-up.

We also focused on increasing the number of visits made to stations to promote the competition and succeeded in visiting a total of 117 stations during the year. A particular focus on the Top 20 energy consuming stations resulted in a further 3% reduction in energy consumption at those stations, compared with 2004/05.



As part of our energy management activities, electricity used to power LU offices has been sourced from renewable energy technologies for a number of years. During the year, we transferred the sub-100kW sites to renewable energy sources, resulting in 16.77% of our operational electricity supply coming from renewable sources. In addition to this figure, we also maintained 100% renewable energy supply for all our head offices.

While this shows a decline from 2004/05, it should be noted that the 2004/05 data did not include energy supplied by Network Rail on the District and Bakerloo Lines. The 2005/06 data includes these additional supplies, which were not obtained from renewable sources. This accounts for the decrease in the proportion of our electricity supply from renewable sources.

Our electricity usage and increased mileage operation in 2005/06 have resulted in an increase in total CO<sub>2</sub> emissions, with CO<sub>2</sub> emissions per passenger km being 56.3 grams.

**Table 1: Annual Comparison of Energy Usage**

Energy	1999/2000	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06
Total Energy Consumption (gigawatt hours)	1,101 (a)	1,006	1,017	1,091	1,087	1,148	1,173
Energy efficiency (Watt hour/passenger km)	154	135	139	148	160	151	155
CO <sub>2</sub> (tonnes)	640,421(b)	643,607(b)	660,119(b)	538,723(b)	410,394	414,719	431,280
CO <sub>2</sub> (grams/passenger km)	n/a	n/a	n/a	n/a	55.90	54.52	56.30
% Renewable Energy	0	3.79	4.1	10.89	14.19	17.9	16.77

(a) Figure includes electricity used for testing on the extended Jubilee Line prior to opening

(b) Figures include emissions from Lots Road Power Station (decommissioned in Nov 2002)

Tube Lines conducted a successful trial of Light Emitting Diodes (LEDs) and long life lamps at Westminster and London Bridge Stations. Following the trial, LU has approved the use of these for lighting across our network. Another trial to reduce energy loss from conductor rails was carried out. Following its success by achieving 5% energy saving, aluminium conductor rail can now be used by our PPP Suppliers. This is expected to decrease heat output from rails in tunnels.

To ensure that we continue to improve our environmental performance with regards to energy use, discussions have been held with the London Climate Change Agency to assist in the development of an appropriate energy strategy for LU. To further inform the strategy, we commissioned ERM Consultants to carry out a review of the options available to LU to further increase our use of renewable energy and stimulate the provision of additional renewable energy supply in London.

The review identified various opportunities and constraints that LU faces in expanding its use of renewable energy. These include LU's need for reliable electricity supply and the limited opportunity for large-scale generation of renewable energy in London. Identified renewable electricity options for LU are wind, solar photovoltaic (PV) and the biomass combined heat and power (CHP) system. Following the review, we will carry out further work concentrating on developing practical options located at specific sites.



- Escalators at Canary Wharf Station
- Lighting in Westminster Station ticket hall
- Energy Challenge Prize Winners

### **Objectives for 2006/07:**

- Prize giving for 2005/6 Stations Energy Challenge.
- Maintain 100% renewable energy supplies for offices, stations, sub 100kW sites.
- Conduct target number of station visits to promote the Stations Energy Challenge and increase savings achieved.
- Develop a renewable energy strategy including targets and implementation dates in respect of sustainable energy procurement, to support Mayoral strategies and associated TfL and LU policies.

## 5.2 Air Quality

Air pollution occurs from the emission of contaminating substances such as particulate matter, Nitrogen oxides, Carbon oxides and Sulphur oxides to the air that we breathe. A major source of these pollutants is the transport sector, keeping London's air quality as an issue of public interest.

Steps have been taken to improve air quality through the Government's National Air Quality Strategy, Mayor's Air Quality Strategy and local boroughs' Air Quality Action Plans. A vital role LU plays in the air quality strategies is encouraging a modal shift from cars to the tube, by improving our services to maximise our potential for carrying people. As a business, we have continued to contribute to air quality improvement in the capital by providing a mode of public transport with no direct negative effects on air quality.

We do, however, contribute to the total air pollution in London through the use of our back-up power station and fleet of support vehicles provided by Tube Lines for the entire network. These support vehicles include engineers' vehicles and refuse collection trucks.

Another source of possible air pollution on our system is airborne dust. Dust is created by a number of sources including the passage of trains over rails, use of the system by customers, engineering works in tunnels, and the operation of machinery such as lifts and escalators.

### Performance during 2005/06

EDF Energy Powerlink Limited has a 30-year Private Finance Initiative (PFI) contract to operate, maintain, finance and renew London Underground's power distribution system. They are responsible for the distribution of high-voltage electricity supplies to LU's stations and track. They also maintain and operate our back-up power station. Pollutant emissions from the power station are outlined in the following table.



**Table 2: Annual Comparison of Pollutant Emissions from the LU Power Station**

Air Quality	2003/04	2004/05	2005/06
NO <sub>x</sub> (tonnes)	19.78	10.50	13.08
SO <sub>2</sub> (tonnes)	1.05	1.05	1.31
CO <sub>2</sub> (tonnes)	10436	5944	7402

To reduce emissions from our road vehicles, Tube Lines has made improvements to the route planning of our road vehicles in order to reduce unnecessary mileage. A larger proportion of fleet movements are now carried out at night, when there is less road congestion. A green specification for fleet vehicles has been developed by:

- Providing alternative fuelling (ultra low sulphur diesel/ gas) for 5% of the fleet vehicles supporting LU.
- Introducing Euro IV compliant commercial vehicles ahead of the required deadline and specifying all new vehicles as Euro IV, making the majority of pool cars Euro IV compliant.
- Providing 2 hybrid vehicles.
- Continuing the programme of fitting Continuously Regenerating Traps (CRT) and other technologies to our fleet of vehicles. These are retrofitted to the exhaust systems of vehicles and remove small particles such as Particulate matter, Carbon monoxide and Nitrogen oxides.

**Table 3: 2005/06 Fleet Emissions Data and Sources**

Fleet Data	PPP Suppliers	LU	Total
Total number of vehicles	914	131	1045
Total Distance (kilometres per annum)	14848620	2,311,341	17159961
Fuel consumed (Litres)	1565574	227,182	1792756
NO <sub>x</sub> (tonnes)	14.689	1.564	16.253
Pm <sub>10</sub> (tonnes)	0.971	0.092	1.063
CO <sub>2</sub> (tonnes)	3919	559	4478

We also began work on a Staff Travel Plan in order to promote:

- A shift to more sustainable modes of transport in order to cut carbon emissions;
- Best practice, as TfL is in a prime position to promote environmentally friendly practice amongst London businesses; and
- Better health, by encouraging walking and cycling.

Air quality monitoring for respirable dust carried out on a sample of operational staff in 2005 indicated that dust levels are well below the Workplace Exposure Limit of 4mg/m<sup>3</sup> set by the Health and Safety Executive, and are highly unlikely to cause serious damage to the health of London Underground workers and the travelling public. Measures taken to reduce dust generation include regular cleaning of trains and tunnels to prevent dust build-up, and fitting improved braking systems on our rolling stock.

#### Objectives for 2006/ 07:

- Publish first draft of the Staff Sustainable Travel Plan.
- Continue to work with our fleet supplier to reduce the emissions associated with road vehicles used to support the LU network.

### 5.3 Climate Change Adaptation

Climate change refers to the changes in weather patterns and average temperature on a global scale. Climate change is occurring as a result of natural occurrences as well as human activity, such as the burning of fossil fuels and land filling of wastes. These human activities emit greenhouse gases, which contribute to global warming.

CO<sub>2</sub> emissions from energy use are a major contributing factor to climate change. We have therefore taken proactive measures to reduce the contribution of our operations to climate change through energy management activities (as outlined in Section 5.1).

However, we recognise that while LU operations may impact on the environment, the environment can impact on LU's operations and ability to provide an efficient service. Predicted climate change effects in London include hotter summers and wetter, milder winters. We will need to adapt our operations to cope with the impact that this has on our assets.

#### Performance during 2005/06

During 2005/06, the London Climate Change Partnership published the findings of its study into the likely effects of climate change on London's Transport Network. The findings of this study and additional research commissioned by LU have been reviewed, and actions developed to ensure that we prepare for the effects of climate change. These include actions for dealing with flooding and excess heat on the Tube.

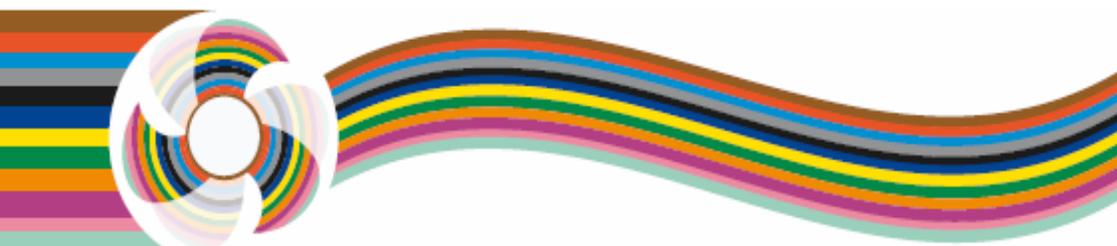
We have been liaising with the Environment Agency and Thames Water on the delivery of the Tunnel Cooling Programme. The programme has been instigated to provide solutions to deal with the unsatisfactory temperatures on the London Underground network. Current heat levels and expected future increases are as a result of:

- Exhaustion of the geological capacity around deep level tunnels to "soak up" heat
- Inadequacy of the existing ventilation equipment
- Growth in service levels and the consequent higher energy consumption
- Changing weather patterns, with more 'hot' days each year.

Our approach is to control temperatures by:

- Finding the most energy efficient ways to operate our trains; and
- Finding better ways to extract heat energy from stations and tunnels.

Trains typically use their motors to help them slow down when braking. While older trains on the network release this energy into the tunnels and stations as waste heat, modern trains have the ability to put a large percentage of this energy back into the power network for reuse by other trains. Trains on the Northern, Jubilee and Central Lines already recycle energy in this way, and all new trains delivered to LU will do the same. Methods to improve the amount of energy that can be reused are being investigated by the programme team, as this saves energy and reduces the amount of heat that warms up the Underground.



Our approach to extracting heat from the network is to seek methods that are sustainable, where we can. For example, we do not plan to install large amounts of energy-hungry refrigeration-style chillers. We have installed a trial cooling system in a small area at Victoria Station, and we hope to extend this approach to other locations. The system uses naturally cool water drawn from, and returned to, the local drainage system,

We are also installing a trial system that will use naturally cooled water from the chalk aquifer deep below London. This water will be returned to the aquifer after use. We are also investigating the potential to use waste heat from local electricity generating plants to chill water that can then be piped around tunnels and stations. The process involved is known as Absorption Cooling, and uses heat that would otherwise 'go up the chimney'.

In addition, we will be constructing more shafts to improve air flow to and from some parts of the deep tube lines, and fitting stronger fans in some existing shafts. Ideally, some of the shafts will be used to feed cool air across the warm motors of trains at stations, and to draw the heated air direct to the surface, where it can be vented without further heating the Underground.

Studies have shown that the Underground is vulnerable to flooding from the River Thames. Incident data for LU indicates that flooding and adverse weather conditions accounted for 32% of environmental incidents in 2005/06. The increased likelihood of flooding may lead to service disruptions and considerable damage to our infrastructure. In future, our infrastructure will have to be able to cope with changes in the number and nature of flooding incidents. We are therefore working on mitigation measures to enable us to manage the risk of flooding at key stations, protect our infrastructure from damage, and provide a safe and reliable transport system for London. One measure currently underway is the upgrade of the drainage systems on the Jubilee, Northern and Piccadilly lines by Tube Lines.

#### Objectives for 2006/ 07:

- Deliver the 2006/7 aspects of the Tunnel Cooling Project
- Utilise LU models to predict the impact of various climate change scenarios on LU infrastructure.
- Support the London Climate Change Partnership's (LCCP) development of a transport work programme.
- Provide the LCCP with progress reports on LU's preparation for climate change



- Cupboard & flood boards at station entrance/exit
- Customer Campaign Poster
- Floodgate in partially opened position

## 5.4 Water Consumption

Water is a natural resource that is essential for life – humans and wildlife alike. Water conservation has, however, become a necessity in London, following low rainfalls in South East England since November 2004. This means that less water has filtered through the ground to replenish underground water sources which feed the boreholes and rivers that we rely on. Londoners use an average of 165 litres of water every day. This is higher than the national average of 150 litres. Increasing demands on water supply are a result of climate change, population growth and lifestyle changes.

### Performance during 2005/06

LU's Head Office facilities are part of the Transport for London (TfL) portfolio. During 2005/06, the occupancy of our head office buildings increased by 20%. However, water consumption increased by only 9%, resulting in a decrease in the amount of water consumed per employee from 18m<sup>3</sup> to 16m<sup>3</sup>. This figure remains above our target of 11m<sup>3</sup> per office employee.

**Table 4: Annual Comparison of Water Consumption**

Water Use	1999/2000	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06
Annual water consumption at operational locations (million litres)	661(a)	899(b)	670	638	658	634	634
Average water consumption at office locations (cubic metres/ employee)				15.7	13.9	18(c)	16(c)

- (a) Does not include power station water consumption  
 (b) Figure affected by major water leak at Hainault Depot  
 (c) Figures represent only Head Office buildings

Our primary use of water is for cleaning and catering at our offices and operational sites (stations, workshops and depots). The current water shortage presents a challenge to reduce the volume of water consumed by our business. We and our PPP Suppliers have been working to adopt industry best practice regarding the conservation of water on our premises. For example, a number of Tube Lines' and Metronet's depots have water-efficient train washing facilities. As a company, we will continue to take necessary action to better manage our water consumption, so that we can avoid shortages and more mandatory restrictions in the future.



## 5.5 Land and Water Pollution

London Underground has established systems to prevent potential pollutants from contaminating the environment. LU standards set out requirements for the safe and environmentally sound use and storage of materials on our network. We and our PPP suppliers monitor the control of pollutants during construction and maintenance activities, through site inspections.

Our PPP Suppliers have begun to identify any areas of contamination and to undertake remedial action where required. Contamination may be due to past LU activities which are no longer permitted due to changes in legislation or social acceptance, or from historic operations and activities on the site prior to LU ownership.

Across the LU Network, there are locations where we are permitted to discharge small quantities of effluents. Our PPP suppliers are responsible for ensuring that all appropriate measures are in place to ensure that our assets comply with the terms of the consents under which these discharges are permitted.

### Performance during 2005/06

As a result of underground water seepage into our tunnel system, over 30 million litres of water is pumped from the system daily. This is achieved by the use of a network of pumps at various locations. Water testing is carried out at the points where water is pumped into sewers and the tests reveal very little contamination. Specialist teams have been employed to maintain the pumps and drainage system through regular cleaning, emptying and 'scraping' of gullies and drains.

During 2005/06, there were no land or water pollution incidents for which regulatory action was taken. Two fuel spill incidents were notified to the Environment Agency as a matter of courtesy, and they were content with the action taken in response to these incidents.



Our PPP Suppliers have carried out detailed studies at various locations to establish the presence and level of contamination. The studies will aid the determination of sites requiring remediation and the appropriate remedial actions to be taken. Contaminants found are being assessed for their potential to cause harm to the environment and human health. The 5 sites that were identified during the 2004/05 study as requiring ongoing monitoring, have shown relatively low levels of contamination; however, monitoring continues. These sites do not pose risk to human health.

Our PPP Suppliers carried out drainage surveys in order to identify all drainage discharge points. A risk-based programme of works has been developed by Tube Lines in order to reduce the likelihood of pollution. This includes the introduction of changes to how activities are undertaken, the installation of end-of-pipe solutions such as interceptors, and tool box talks on 'Pollution Prevention' for site operatives. Other actions that have been taken in order to prevent/ reduce pollution include the use of biodegradable lubricants by Metronet on our sub-surface lines, and the specification of biodegradable oils for all new track engineering vehicles supplied by Transplant (part of Tube Lines).



- Secondary bunded oil storage at Tube Lines site
- Oil interceptor
- Secondary bunded oil storage

## 5.6 Noise and Vibration

London Underground and the PPP Suppliers have been taking proactive measures to reduce the level of noise generated from their activities. We recognise that noise and vibration can be a nuisance to people living or working near our railway lines, stations or depots. Noise is generated from sources such as the wheel-rail interface, engineering works, public announcements, train whistles and distribution vehicles; and is transmitted to adjacent properties via air or structures. Maintenance and renewal works create noise and vibration outside normal operating hours.

### Performance during 2005/06

The increase in engineering and construction activities as part of the PPP contract has been responsible for an increase in noise complaints. Noise and vibration complaints continue to be the most significant contributor to environmental complaints, representing 54% of all environmental complaints received in 2005/06. Slightly over half of the complaints were due to contractor activity. During the year, LU and the PPP Suppliers received and replied to 479 complaints (Refer to Appendices). This figure is 2% less than the 2004/05 figure; and 6% better than the target set for the year. The decrease has been achieved during a year which has seen an increase in contractor activity and train kilometres operated. In the coming years, there will continue to be a large amount of engineering activity taking place on and around our network.

Our PPP Suppliers have established noise assessment processes for project works. They also apply best industry practice to the prediction and control of noise. This includes notifying nearby residents of planned project works that may affect them, better management of contractors on site, and informing relevant Local Authorities of planned work programmes, expected noise levels and mitigation measures being put in place, in order to obtain consent in line with Section 61 the Control of Pollution Act 1974.



Ultimately, these maintenance and renewal works will result in lower noise and vibration levels during operation. Following Extended Track Replacement works, both Metronet and Tube Lines have measured a 10dB reduction in peak and average noise levels when compared to pre-work noise levels. Other works currently being taken by our PPP Suppliers to reduce noise and vibration associated with LU's operations include rail grinding (to restore rail profile), track lubrication (to reduce friction), track monitoring, installation of continuously welded track (to reduce the number of rail joints across the network thereby making a significant contribution to noise reduction), and the installation of noise and vibration blankets (to reduce the transmission of wheel noise to adjacent domestic properties). We will continue to monitor the complaints received to ensure that all practicable measures are taken to reduce the disturbance that such works cause to our neighbours.

In 2004/05, the EU-funded Control of Vibration from Underground Rail Traffic (CONVURT) Project was concluded. The project developed a number of potential technologies for the control of vibration. The CONVURT Project Team has communicated details of the findings and the technologies developed to interested parties world-wide. Within LU, our PPP, PFI and other contractors have been informed of the findings and are now applying them in all relevant, new projects.



- Rail grinding machine
- Noise screen
- Digital noise meter

### Objectives for 2006/07

- Analyse noise and vibration complaints and report on the level of assurance in respect of the PPP suppliers' noise management activities.
- Ensure continued compliance of relevant, new projects with CONVURT findings.

## 5.7 Waste Management

London Underground and the PPP suppliers generate large quantities of waste materials from their operations. Waste is generated from our offices, stations, depots and satellite locations. Other sources of waste include maintenance work (servicing, repairs, vegetation clearance and litter picking on trains) and major project works (construction work, track replacement) from where we remove large consignments of ballast, rail and other bulky materials.

### Performance during 2005/06

Waste minimisation is important to achieving good waste management. We are therefore committed to waste minimisation, alongside the exploration of further opportunities for waste recycling. We present all our Board and Committee reports as double sided documents. In our drive for a paperless office, our employees are encouraged to avoid unnecessary printing where possible, as most processes can now be carried out electronically. We are currently looking into opportunities to reduce the quantity of paper used to communicate real-time information to our station employees.

Tube Lines collect waste from all our stations and depots and some of our offices. They also collect small amounts of engineering waste from PPP project locations. Waste from large-scale track replacement works is disposed of under contract to Metronet. Tube Lines and Metronet have a significant role in the achievement of our goals and have worked to bring about significant improvements.

Both Metronet and Tube Lines continue to replace wooden sleepers with concrete ones which have a longer asset life, thereby reducing waste. At depots and sidings, containers are provided for the separate collection of hazardous materials, such as fluorescent tubes and waste oils. Toner cartridges, office paper and newspapers are also collected for recycling. Our PPP suppliers also operate a rag recycling scheme at depots, whereby oily rags from maintenance activities are sent away for recycling – reducing waste and resource consumption.



During 2005/06 we began detailed reporting of our levels of waste and recycling. At the start of the year, a challenging target was set, to achieve a 25% recycling rate for Commercial and Industrial waste. This target has been exceeded due to the introduction of the dedicated paper recycling service by Tube Lines at a number of stations and depots, resulting in an annual recycling figure of about 27%. The original stations paper recycling pilot was expanded during the year to cover all terminus stations maintained by Tube Lines and a number of the stations and depots within close proximity, a total of 26 stations. Further locations have been added during the first half of 2006/7 bringing the number of locations covered to 48 by August 2006. Metronet have also put plans in place for trials at some of their terminus stations - Walthamstow Central, Edgware Road and Queens Park.

An alternative scheme will be operated at the remaining stations until the dedicated service can be expanded across the network. The scheme will have paper for recycling placed in special bags and extracted from other waste at the waste transfer station. While this is unlikely to yield the high recycling rates delivered by a dedicated collection scheme, it does establish the working practices and waste segregation necessary to deliver future recycling schemes.

Higher than expected quantities of contaminated ballast have significantly increased the level of hazardous waste produced during 2005/06. While track waste and sleepers are relatively easy to recycle and/or reuse, contaminated materials must be disposed of as hazardous waste.

Problems have also been encountered with a new method for classifying hazardous waste. This resulted in large quantities of 'difficult waste' which is contaminated, but not to the extent where it is classified as hazardous waste. Such waste is difficult to recycle and has therefore had a knock-on effect on the percentage of Construction and Demolition waste which has been recycled.

As a result, we did not meet our year end target of 90% recycling. However, we did achieve an 85% recycling rate for all track-related waste, and this remains above the industry average for the second year running. Based on experience and lessons learnt during the year, work will be undertaken during 2006/07 to develop a better methodology for predicting future trends in order to help improve construction, demolition and hazardous waste recycling.

**Table 5: Comparative Annual Waste Management Data**

Waste	2003/04	2004/05	2005/6	Target
Commercial & Industrial Waste (tonnes)	9210	10147	9052	10266
% Commercial & Industrial Waste Recycled	12	20	26.75	25
Hazardous Waste (tonnes)	112	247	2,306	253
Hazardous Waste (litres)	283,267	231,835	83,315	240,000
% Hazardous Waste Recycled	n/a	n/a	Negligible	n/a
Construction & Demolition Waste (tonnes)	n/a	64,332	134,204	74,000
% Construction & Demolition Waste Recycled	n/a	87	85	90

Metronet and Tube Lines have now produced a Used Ballast Risk Assessment Protocol which will be applied to waste from track works. The protocol maximises the recycling potential of ballast and minimises waste management costs. Metronet has also carried out a laboratory trial for the bioremediation of waste ballast. An operational trial site is being sought.

Smaller scale waste management initiatives include the shredding of staff uniforms returned by operational staff leaving LU employment. These are used as stuffing for furniture and cushions.



- Wood collected for recycling
- Installation of holdfast walkboards (made from recycled rubber tyres) in the wash roads at Stonebridge Park Depot
- LU station staff involved in paper recycling programme

### Objectives for 2006/07

- Establish a methodology for target setting for construction, demolition and hazardous waste.
- Support the expansion of the Tube Lines paper recycling scheme for stations.
- Support the replication of the Tube Lines paper recycling scheme at Metronet-maintained terminus stations.
- Work with Metronet and Tube Lines to establish recycling arrangements at locations not covered by the dedicated paper collection service.
- Promote the range of recycling schemes available to LU employees.
- Review Metronet's and Tube Lines' programmes for the network-wide introduction of a dedicated paper recycling scheme.

## 5.8 Heritage and Biodiversity

London Underground is one of the largest land owners in London, and has an extensive portfolio of operational, disused and non-operational property. We own and manage a diverse range of habitats, species and rich heritage. With 55% of our network being above ground, we know that trackside vegetation is a valuable haven for plants and animals. LU track is one of the most important green corridors linking the capital's open spaces and helping wildlife to move around. Trackside land sometimes offers the only significant local refuge for flora and fauna, particularly in inner London, because of its habitat diversity and restricted public access.

Most of our line-side habitats are 'Semi-natural' and range from ancient woodlands to open grasslands and tall herbs. Some of over 500 recorded species include great-crested newts, foxes, badgers, bats, slow-worms, frogs, toads, wryneck and bluebells. Plants and trees present on embankments help to maintain their stability and screen neighbouring properties from the railway.

Some of our buildings are listed because of their special architectural or historic interest and importance. We have a total of 49 buildings, including our head office at 55 Broadway, that have been listed as Grade II buildings. Some others have been identified by LU as having particular design or historic merit, being locally listed or located in conservation areas. We also have 12 of our stations situated in conservation areas.

Metronet and Tube Lines maintain our buildings and trackside habitat. In order to ensure that character and appearance is protected and enhanced, we have clear standards set out for the management of our heritage and habitat. Trackside standards ensure that all native trees, shrubs and flowers planted are compatible with the operation of the railway, encourage species diversity, and enhance the landscape. It also ensures that plant species should be those that will reduce the need for excessive maintenance and that will minimise potential safety issues, such as leaves on the tracks and overhanging branches.

### Performance during 2005/06

During 2005/06, LU and the PPP Suppliers worked with Greenspaces Information for Greater London (GIGL) to ensure the successful transfer of our ecological data to the London-wide data set held by GIGL. This filled a significant gap that had existed within their data. A service level agreement has been established for GIGL – they will analyse biodiversity data on behalf of LU while our PPP suppliers will provide data from future ecological surveys to them.



During 2005/06, Metronet conducted Phase 1 surveys of the trackside, depots and sidings across its network to reassess biodiversity. It has now commenced phase 2 surveys. All data obtained from this exercise will be shared with GIGL. In 2006/07, Tube Lines will commence Phase 1 surveys of the depots and siding areas that were not covered by the 1999 London Ecology Unit (LEU) survey, and continue to survey work sites in project planning stages. Information obtained from these will help to alleviate challenges such as scheduling significant maintenance and project works to avoid sensitive times in relevant species' life cycles, for example, in the breeding season.

In collaboration with the GLA, Tube Lines, Metronet and the London Biodiversity Partnership (LBP), we commissioned the development of a Biodiversity Action Plan (BAP) and supporting guidelines for our network. These will help to ensure that best practice in trackside management for biodiversity is applied consistently across the network. It will also aid our contributions to the Mayor's Biodiversity Strategy. Significant progress has been made on the development of the BAP and it will be published in 2006/07.

Our PPP Suppliers continue to protect the natural environment and to promote biodiversity. Tube Lines is installing a new control centre at Highgate. Tube Lines has ensured that the design of the new control centre is sympathetic to the nearby Highgate Woods through the incorporation of a "green roof" into the building design. The green roof will be installed in 2006/07.

Metronet received a Civil Engineering Environmental Quality Assessment and Award Scheme (CEEQUAL) award for the Snaresbrook Embankment Stabilisation Project. The project team showed commitment to environmental protection from the start, as other solutions which would have involved extensive tree removal and night-time working were rejected. Comprehensive ecological surveys were conducted to identify any protected flora and fauna. When nesting birds were discovered earlier than anticipated in the initial survey, the whole project was postponed by over six months. Wherever possible, existing trees were retained, with both the construction scaffolding platforms and the final structure re-designed to maximise tree retention. A replanting programme is now underway to reduce the visual impact of the repair works.

### Objectives for 2006/07

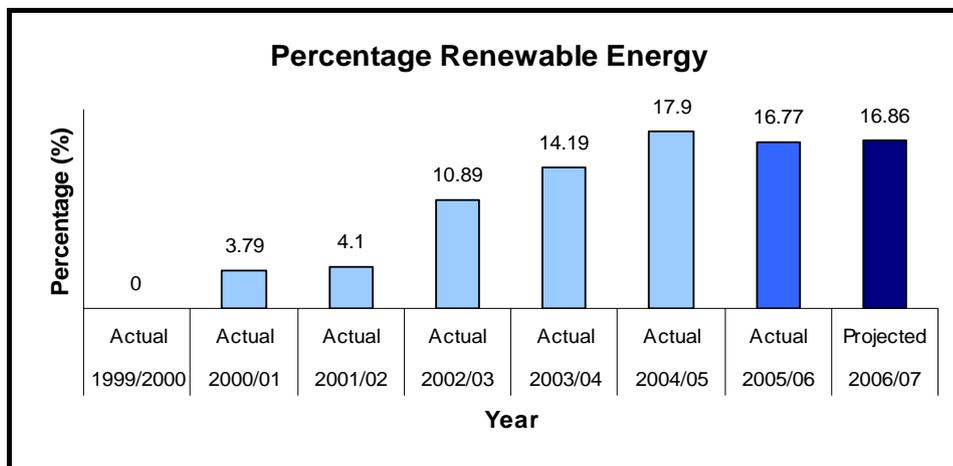
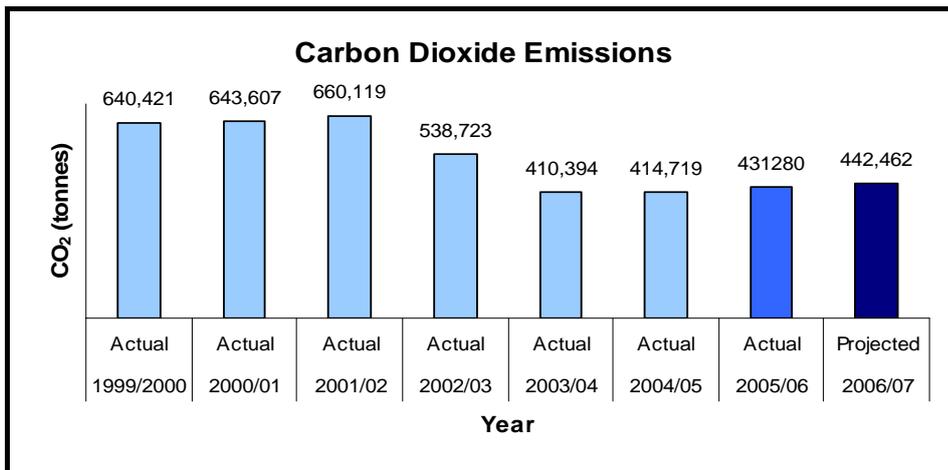
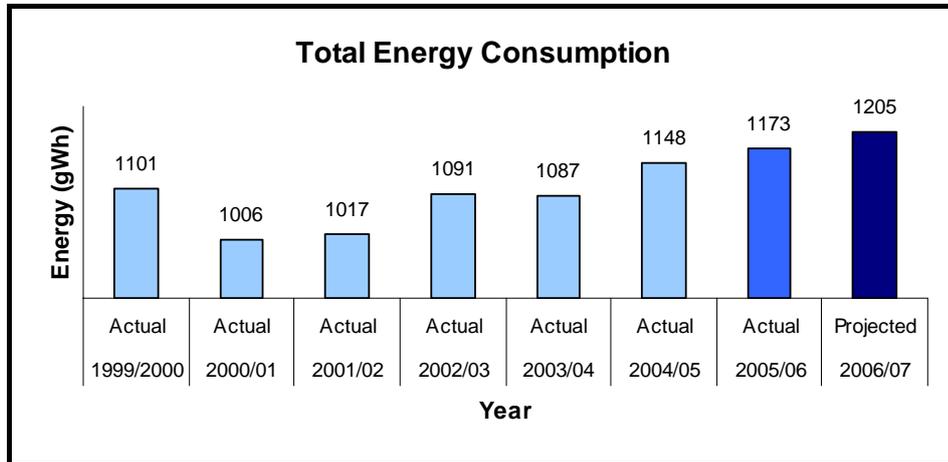
- Publish the Biodiversity Action Plan for the LU Network
- Issue biodiversity guidance to the PPP Suppliers
- Develop a technical briefing on concrete and concrete repairs.
- Issue a Manual of Good Practice for heritage matters.

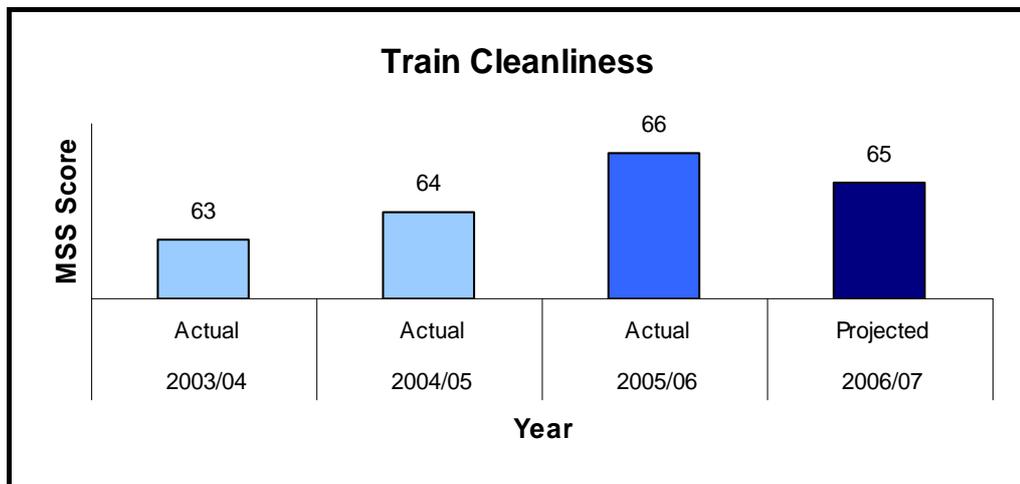
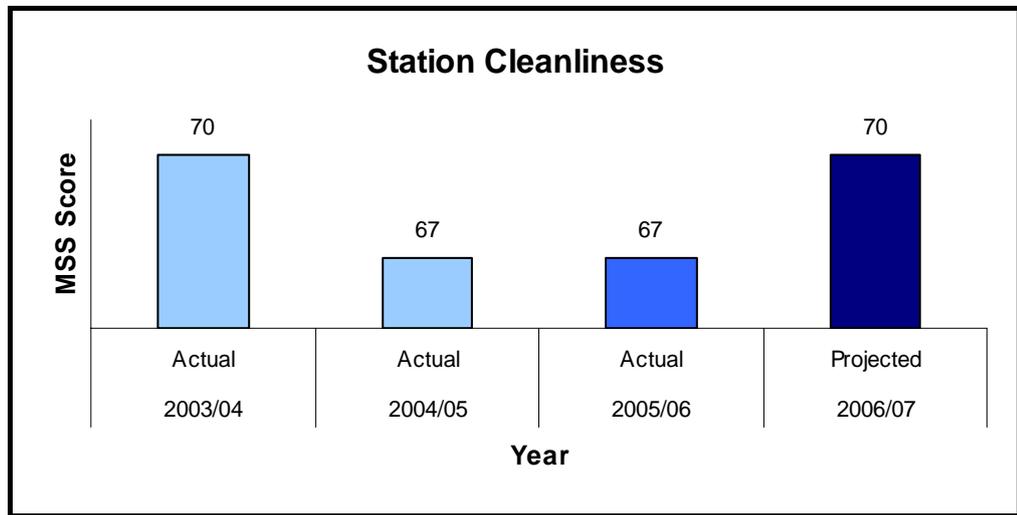
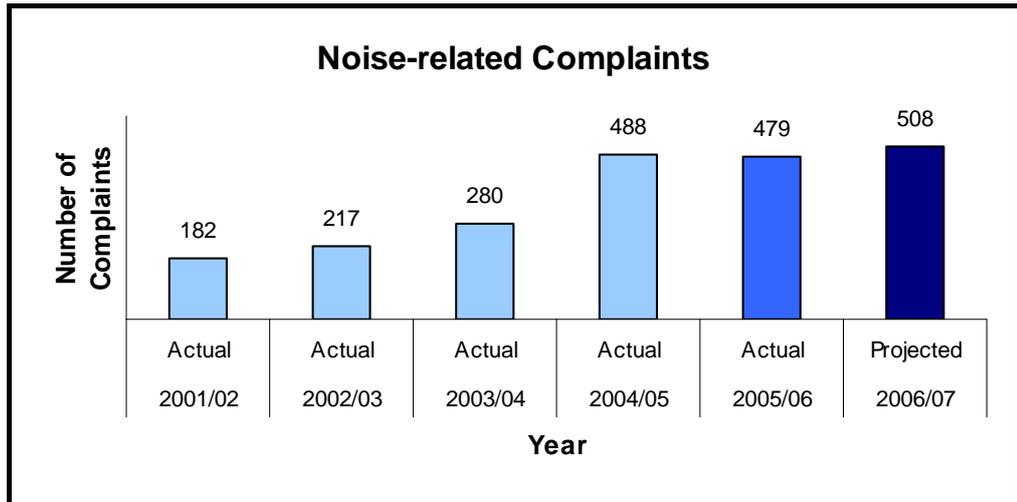


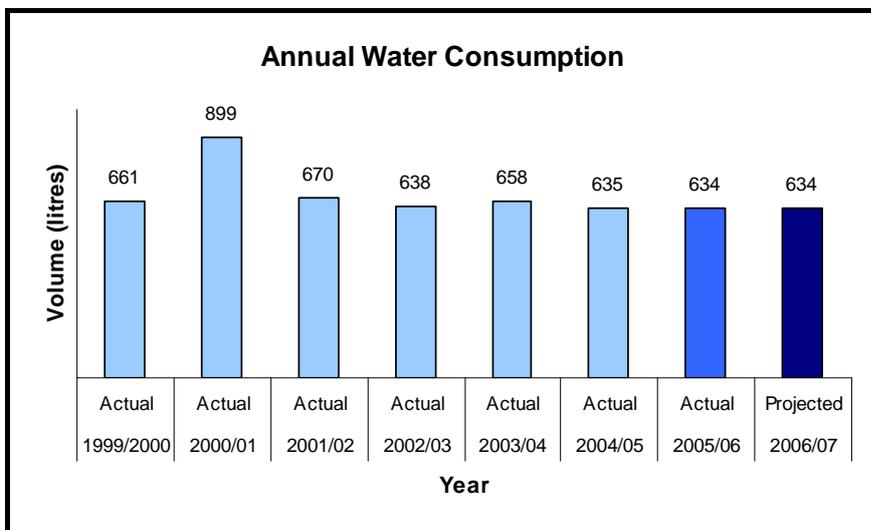
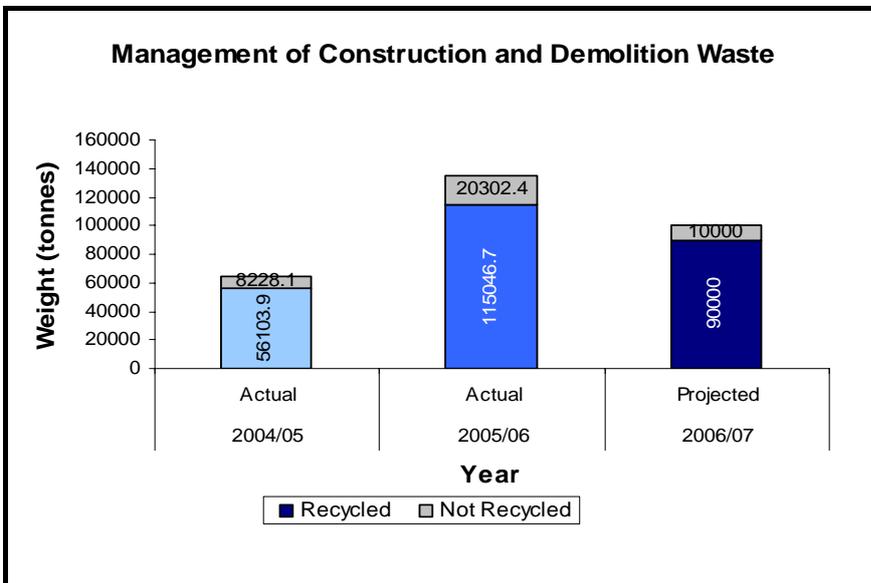
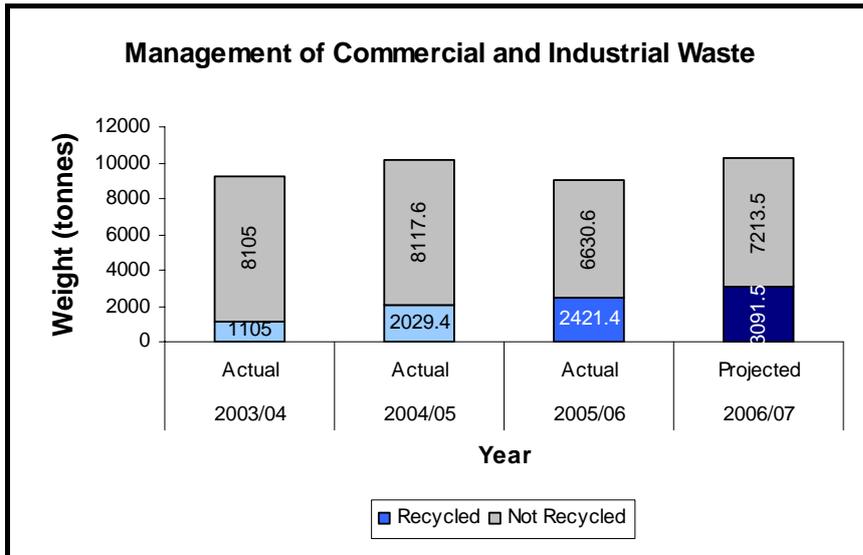
- Construction of green roof at Highgate by Tube Lines
- Embankment stabilization at Snaresbrook by Metronet
- Listed Station

## 6: Appendices

### 6.1 Summary of Environmental Performance in Previous Years and Key Performance Indicator for 2006/07







## 6.2 Progress Against 2005/06 Targets

Target/ Milestone	Status	Progress Summary
<b>Complete Environmental Review of LU activities</b>		
Review LU's arrangements and practice for environmental planning against ISO 14001	Complete	Review completed and reported to Board as part of the 3-yearly review of LU's HSEMS
Review LU's arrangements and practice for the implementation and operation of environmental management against ISO 14001	Complete	Review completed and reported to Board as part of the 3-yearly review of LU's HSEMS
Review LU's arrangements and practice for monitoring and corrective action against ISO 14001	Complete	Review completed and reported to Board as part of the 3-yearly review of LU's HSEMS
Review LU's arrangements and practice for the management review of environmental arrangements against ISO 14001	Complete	Review completed and reported to Board as part of the 3-yearly review of LU's HSEMS
Develop a programme to eliminate any gaps highlighted in the review.	Complete	Programme developed and being progressed as part of the response to LU's 3-year review of its HSEMS.
<b>Implement Revised Classifications for Environmental Complaints and Incidents</b>		
Brief COO Customer Service Centre on revised classifications for environmental complaints	Complete	New reporting classifications for environmental incidents and complaints have been introduced.
Report against revised complaints classification in quarterly SQE Performance Report	Complete	New reporting classifications for environmental incidents and complaints have been introduced.
Brief SQE Analysis and Assessment Team on revised classifications for environmental complaints	Complete	New reporting classifications for environmental incidents and complaints have been introduced.
Report against revised incident classifications in quarterly SQE Performance Report.	Complete	Revised report now captures LU's impacts on the environment, as well as the environment's impact on LU
<b>Enhance LU Environmental Communication</b>		
Gather data against TfL Environmental Performance indicators	Complete	Reporting has commenced against the TfL performance indicators.
Report against TfL Environmental Performance indicators in quarterly SQE Performance Report	Complete	Reporting has commenced against the TfL performance indicators.
Report against TfL Environmental Performance indicators in LU Environment Report	Complete	Reporting has commenced against the TfL performance indicators.

Target/ Milestone	Status	Progress Summary
Review role of LU Environment Report in light of improvements in TfL and PPP Suppliers reporting	Complete	The LU Health Safety and Environment Committee wished to produce a report for 2005/6, to provide a single overview of the environmental performance of the network.
Benchmark environmental content of LU website against other organisations	Complete	A review of rail, transport & other industry leaders' internet sites to find examples of best practice, demonstrated LU's site better than most.
Revise structure and content of environmental aspects of LU website in light of benchmarking.	Complete	The current environmental content of the LU Intranet site has been reviewed. Updates have been made to the waste management section, to reflect new legislation and recycling activities.
<b>Energy</b>		
Introduce a revised league system for Stations Energy Challenge	Complete	The Stations Energy Challenge now operates in 4 leagues to encourage participation of locations new to the energy saving and those who have participated for a number of years.
Prize-giving for 2004/05 Stations Energy Challenge	Complete	Held at the Museum of London (Lord Mayor's Gallery) on October 14th 2005.
Double the number of station visits to increase the number of stations participating in the Energy Challenge.	Significant progress	126 out of the programmed 156 station visits were completed. A shortage of resources prevented the full completion of the programme.
Target 20 top energy users for energy saving measures	Complete	This focus delivered 3% reduction in energy consumption at these sites.
Transfer sub 100kW sites to 100% renewable energy supply	Complete	All sub-100kW sites have been transferred to 100% renewable supply.
Maintain LU office supply from 100% renewable energy	Complete	All LU office supplies sourced from 100% renewable technologies.
Investigate opportunities for stimulating the provision of additional renewable energy supplies in London	Complete	ERM Consultants was commissioned to carry out a review of available renewable energy options for LU. A report has been produced following the study, with a focus on stimulating additional generating capacity.

Target/ Milestone	Status	Progress Summary
<b>Waste</b>		
Implement a paper recycling scheme for stations	Significant progress	The proposed network-wide recycling scheme has not yet been fully implemented network-wide. However, significant progress has been made towards this by Tube Lines, resulting in the meeting of the targets set for the recycling of waste from stations. HSEC endorsed an approach to deliver limited recycling capability to all stations in the short term, prior to the delivery of the dedicated scheme by Metronet and Tube Lines. The dedicated collection service was operational at 26 locations at the end of 2005/6. All other locations may segregate waste paper for recycling in green sacks, for extraction for at the waste transfer station.
<b>Noise and Vibration</b>		
Analyse noise and vibration complaints and reports on the level of assurance in respect of the PPP suppliers noise management activities	Significant progress	Metronet and Tube Lines have implemented noise risk assessments for site works, to improve their management of noisy activities such that nuisance is minimised. Preliminary work undertaken to examine the management of noise and vibration issues by Metronet and Tube Lines will be revisited during 2006/7 to focus on the adequacy of the current approach.
Obtain funding approval for the progression of outputs from CoMET	Closed	The CONVURT Project Team has communicated details of the findings and the technologies developed to interested parties world-wide. Within LU, our PPP, PFI and other contractors have been informed of the findings and are now applying them in all relevant, new projects. This action has therefore not been required.
Collect data for Manual of Best Practice on Ground-borne Noise	Closed	
Conduct vibration measurements in tunnels to provide specific parameters for condition monitoring processes	Closed	
Agree draft format for Manual of Best Practice on Ground-borne Noise	Closed	
Adapt processes developed through CONVURT to enable their application to condition monitoring	Closed	
Issue Manual of Best Practice on Ground-borne Noise	Closed	
Provide information as required by DEFRA Railway Noise	Outstanding	DEFRA has not commenced the Railway Noise Mapping

Target/ Milestone	Status	Progress Summary
Mapping Study.		Study.
<b>Resource Use</b>		
Investigate and report on further 'green' procurement opportunities within LU	Complete	The Green Procurement agenda is now being progressed at a group level within TfL. LU employees are active in this work stream and sharing our experience and systems with other modes.
<b>Climate Change</b>		
Present the findings of the London Climate Change Partnership study to the Safety and Standards Partnership Group.	Complete	Findings reviewed by the Safety and Standards Board in May 2006
Review the findings of LU-commissioned research into the operational impact of flooding and increases in ambient temperature.	Complete	The London Climate Change Partnership's study of the effects of climate change on London's transport system has been reviewed by LU management. The Tunnel Cooling Steering Group comprising LU senior managers is progressing LU's response to the study.
Develop programme to address findings of the LCCP study and other related research.	Complete	The findings of the study are being addressed through the Tunnel Cooling Project and other Engineering Directorate work programmes that improve our understanding of the effects of flooding on the LU network.

### 6.3 Objectives for 2006/ 07 and beyond

These objectives are complemented by those of our PPP Suppliers – Metronet and Tube Lines.

Aspect	Target	Department
Environmental Management System	Conduct the 3-yearly review of LU Environment and Energy Policy	Safety Quality & Environment
	Update our standard for Environmental Risk Assessment with the revised methodology for undertaking environmental risk assessments as part of the 3-yearly review of HSEMS	Safety Quality & Environment
	Update HR guidance to ensure that key environmental requirements are captured in job descriptions where appropriate.	Human Resources
	Amend SQE departmental documentation to: <ul style="list-style-type: none"> <li>• Ensure the capture of non-statutory requirements applicable to the organisations activities and services.</li> <li>• Document the sources of information and calculations supporting the environmental KPIs to ensure consistency over time.</li> <li>• Include the management of the environmental aspects of the core activities undertaken within the scope of Central Services SQE Audits.</li> </ul>	Safety Quality & Environment
Energy	Prize-giving for 2005/6 Stations Energy Challenge.	Chief Programmes Office
	Conduct target number of station visits to promote the Stations Energy challenge and increase savings achieved.	Chief Programmes Office
	Maintain 100% renewable energy supplies for offices, stations, sub 100kW sites.	Chief Programmes Office
	Evaluate the findings of the LU study into the stimulation of additional renewable energy supplies in London.	Chief Programmes Office
	Develop a renewable energy strategy including targets and implementation dates in respect of sustainable energy procurement to support Mayoral strategies and associated TfL and LUL policies.	Chief Programmes Office
	Develop and evaluate further initiatives that will increase LU's use of renewable energy, specifically in respect of reducing carbon emissions.	Chief Programmes Office
Waste	Establish a methodology for target setting for construction, demolition and hazardous waste.	Safety Quality & Environment
	Support the expansion of the Tube Lines paper recycling scheme for stations.	Safety Quality & Environment
	Support the replication of the Tube Lines paper recycling scheme at Metronet	Safety Quality & Environment

Aspect	Target	Department
	maintained terminus stations.	
	Work with Metronet and Tube Lines to establish recycling arrangements at locations not covered by the dedicated paper collection service.	Safety Quality & Environment
	Promote the range of recycling schemes available to LU employees.	Safety Quality & Environment
	Review Metronet and Tube Lines programmes for the network-wide introduction of a dedicated paper recycling scheme.	Safety Quality & Environment
Noise and Vibration	Analyse noise and vibration complaints and report on the level of assurance in respect of the PPP suppliers noise management activities.	Safety Quality & Environment
	Ensure continued compliance of relevant, new projects with CONVURT findings.	Engineering
Resource Use	Amend LU's procurement arrangements to: <ul style="list-style-type: none"> <li>• Provide guidance for "maintaining and where possible enhancing the quality of London's built environment".</li> <li>• Reflect the recommendations arising from the TfL review of HS&amp;E in procurement practices as appropriate</li> </ul>	Procurement
	Work with TfL to incorporate best practice in environmental procurement by LU into the procurement practices of all modes.	Procurement
Climate Change	Deliver the 2006/7 aspects of the Tunnel Cooling Project	Engineering
	Utilise LU models to predict the impact of various climate change scenarios on LU infrastructure.	Engineering
	Support the London Climate Change Partnership's (LCCP) development of a transport work programme.	Engineering
	Provide the LCCP with progress reports on LU's preparation for climate change	Engineering
Biodiversity	Publish the Biodiversity Action Plan for the LU Network	Safety Quality & Environment
	Issue biodiversity guidance to the PPP Suppliers.	Safety Quality & Environment
Heritage / Built Environment	Develop a technical briefing on concrete and concrete repairs.	Strategy and Service Development
	Issue a Manual of Good Practice for heritage matters.	Strategy and Service Development

## 7: Acronyms

BAP – Biodiversity Action Plan  
BCV – Bakerloo, Central and Victoria Lines  
CEEQUAL – Civil Engineering Environmental Quality Assessment and Award Scheme  
CHP – Combined Heat and Power  
CO<sub>2</sub> – Carbon Dioxide  
CONVURT – Control of Vibration from Underground Rail Traffic  
CRS – Corporate Social Responsibility  
CRT – Continuously Regenerating Traps  
DSM – Distribution Services Management Limited  
EMS – Environmental Management Systems  
ERM – Environment Resources Management Limited  
GIGL – Greenspaces Information for Greater London  
GLA – Greater London Authority  
HSEC – LU's Health, Safety Environment Committee  
HSEMS – Health Safety and Environment Management Systems  
HSQE – Health, Safety, Quality and Environment Directorate, TLL  
ISO 14001 – International Standards Organisation for EMS  
JNP – Jubilee, Northern and Piccadilly Lines  
KPI – Key Performance Indicators  
LCCP – London Climate Change Partnership  
LED – Light Emitting Diode  
LEU – London Ecology Unit  
LUL – London Underground Limited  
MSS – Mystery Shoppers Survey  
NO<sub>x</sub> – Nitrogen Oxides  
PGI – Planned General Inspection  
PM<sub>10</sub> – Particulate Matter  
PPP – Public Private Partnership  
QUENSH – Quality, Environment, Safety and Health Standard  
SO<sub>x</sub> – Sulphur Oxides  
SSL – Sub surface Lines  
TfL – Transport for London  
TLL – Tube Lines Limited  
TOC – Train Operating Companies

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- Page 11 Photo of wind turbine courtesy of DOE/NREL.