



LONDON  
UNDERGROUND



***ENVIRONMENT  
REPORT - 2005***





# LONDON UNDERGROUND ENVIRONMENT REPORT 2005

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# 1

## Managing Director's Statement

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I am pleased to introduce London Underground's Environment Report for the period 2004/05. The report explains the environmental impacts of our organisation and how these are managed in order to achieve continuous environmental improvements.

London Underground (LU) continues to work closely with our private sector Infrastructure companies, Tube Lines and Metronet Rail, to improve the service we provide. It is our aim to ensure these improvements are realised in an environmentally friendly and sustainable way.



Once again, we have made significant progress against the plan we set out in 2004, displaying our ongoing commitment to improving the management of our environmental impacts over time. Our performance in respect of our significant environmental impacts is outlined in the following chapters, with progress against our plan summarised in the tables at the end of the report.

LU received no environmental prosecutions during 2004/5 and there were no significant environmental incidents. Improvements in our environmental performance during the period covered by this report include:

- reductions in energy consumption through energy efficiency at our stations, achieving a 23.7% savings against baseline figures,
- an increase in the proportion of our energy purchased from renewable sources such as wind power,
- Waste recycling figures well above the industry average.

As well as limiting the damage that we do to the environment, we are also preparing for the challenges that we may face from the environment, through our involvement in the work of the London Climate Change Partnership.

LU seeks to be a socially responsible organisation. This report highlights a number of ways in which we support our employees and the community within London and beyond. We have promoted vocational qualifications for our employees and continue to facilitate charity collections on our premises. LU also played a key role in the development of the successful bid for the 2012 Olympics.

We can still do more to control and reduce our impact on the environment and demonstrate corporate social responsibility and have set further objectives for the coming year. I am confident that we will meet future challenges and continue to provide a sustainable transport system with clear environmental benefit.

Tim O'Toole

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## Company Background

The London Underground is the oldest underground rail system in the world. It started its life in 1863 as the Metropolitan Railway Company operating between Paddington and Farringdon Street. In 1933 with the creation of the London Passenger Transport Board, the separate companies operating in central London were brought under a single control. LU now provides a mass transit train and station service seven days a week and is an integral part of the overall transport system for Greater London and parts of Buckinghamshire, Hertfordshire and Essex.



To deliver this service we operate 12 lines which use 865 kilometres of track to link 275 stations. 255 of these stations are owned and operated by LU and we have agreements to utilise 20 owned by Network Rail or other Train Operating Companies (TOCs). At any one time we may have as many as 500 trains running across our network. We employ approximately 13,000 full time staff to provide and support our train and station service. This enables us to move 3 million customers around London each working day.



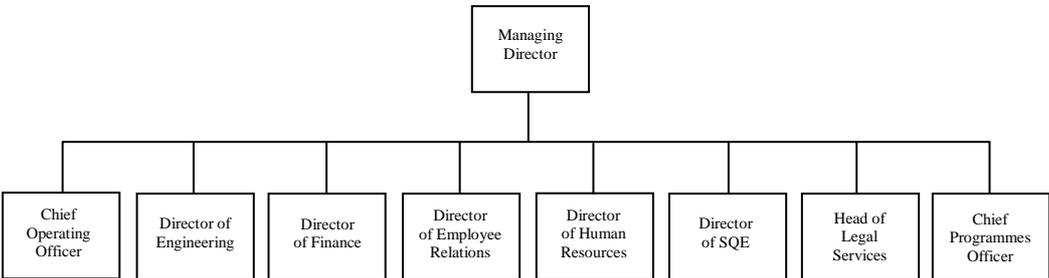
As well as our role as station and train service operator, LU is the infrastructure controller and safety authority for the network. This requires us to control the activities of any railway operator, maintenance organisation, or other supplier on the LU Network. This is achieved through the terms and conditions of various contracts and agreements and our management arrangements that set performance standards through our Health, Safety and Environmental Management System (HSEMS) framework.

We are funded from fare, advertising and property revenue with additional government subsidy where necessary. Although we are cost and value conscious, we seek to maximise "net social benefit", rather than increase our revenue base. Net social benefit can be described as a calculation whereby there is a comparison made of the social benefits that arise from our services and a hypothetical situation where there is no Underground service. This doctrine is one that has been endorsed, shaped and championed by previous and present governments and, along with the aims of our parent bodies, shapes the vision of the organisation to be "A world class Tube for a world class city". Good environmental performance is considered to be integral to the achievement of this vision.

The Public Private Partnership (PPP) has secured long-term sustained levels of investment that the LU network needs and improvements are beginning to be delivered across the network. Metronet Rail is responsible for maintenance and renewal of the Bakerloo, Central, Victoria, Waterloo & City, Circle, Hammersmith and City, District, East London, and Metropolitan lines, whilst Tube Lines is responsible for the maintenance and renewal of the remaining three lines, the Jubilee, Northern and Piccadilly.

In 2003, with the commencement of the PPP, London Underground became part of Transport for London (TfL), the statutory body that is responsible for implementing a transport strategy for London, carrying out the Greater London Assembly's transport duty. The LU Managing Director is a direct report to the TfL Transport Commissioner. As part of TfL, London Underground plays a key role in implementing the Mayor's Transport Strategy for London and makes a significant contribution to implementing the Mayor's Environmental Strategies.

It is through the management structure outlined below that the Managing Director delegates responsibility for the effective day to day management of the Underground.



In addition to the role of the Chief Operating Officer (COO) in minimising the environmental impact of our service, the following Directorates also have environmentally significant roles:

- The Chief Programmes Officer ensures the delivery of the environmental aspects of the PPP and Private Finance Initiative (PFI) contracts and is accountable for procurement and energy management activity within LU.
- The Engineering Directorate provides competent engineering advice and support across LU, ensuring that the environmental impacts of our assets is minimised. This Directorate 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 competent environmental support and advice within LU. SQE provides strategic direction to the company on environmental matters, 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 Director of Finance ensures that sufficient resources are made available for environmental management and improvement.

**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 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.

# 4



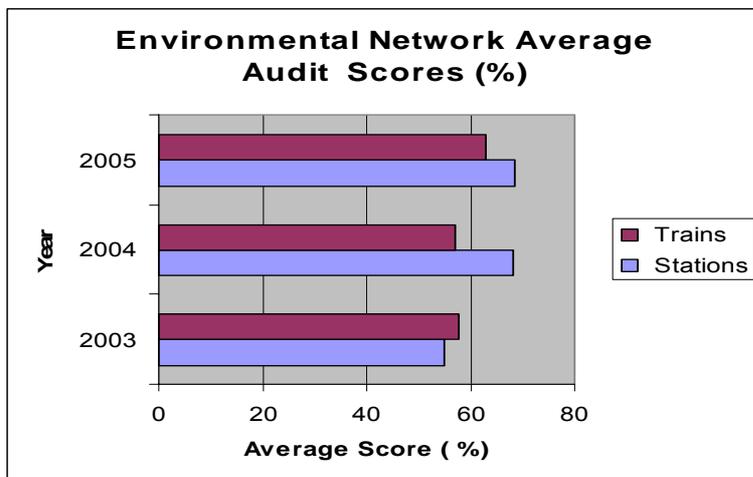
## Environmental Management System

An environmental management system is essential to enable a company to manage its environmental performance and control the potential environmental impacts which may arise from its operations, activities or products. London Underground has a well developed and integrated Health, Safety and Environmental Management System which is reviewed and updated in light of changes to our operations, activities, new legislation or as part of our continuous drive to improve our performance.

### Progress made during 2004/05:

During 2004/05, a greater understanding has been gained of the environmental impacts associated specifically with LU's activities, through a review of our environmental risk assessment. The findings of this assessment confirmed LU's most significant environmental impacts as energy consumption, waste, noise and vibration and resource use. These findings have been used to guide our objectives and targets for 2005/06 and beyond. Our management of these impacts is outlined in Chapter 5.

A review of the environmental requirements contained within LU's company standards has been undertaken as part of the environmental risk assessment, to ensure that sufficient controls exist to prevent or mitigate any environmental impacts that may arise as a result of our operations or activities.



Our audits of station and train operations continue to show a steady and sustained improvement in the awareness and implementation of environmental controls in relation to day-to-day operations. The provision of new and refurbished facilities has contributed to this at some locations through providing more efficient services such as sensor controlled lighting and improved waste storage.

However, the most significant improvements have been apparent through employees taking the initiative to ensure that corporate policies are effectively implemented in areas such as the recycling of paper and printer toner cartridges; the effective segregation, storage and disposal of waste; the control of vermin; monitoring and controlling the use of energy for heating and lighting; and ensuring that controls required to limit noise are effectively implemented. Escalators in stations are turned off in quiet periods to conserve energy where it is safe to do so; and the timings and volume of public address announcements are controlled to minimise their impact on our neighbours. Our main challenge continues to be to build on the enthusiasm and commitment of individuals to achieve the consistent implementation of controls across all operational areas and full compliance with our policies and procedures. This is particularly important where actions such as recycling or effectively managing energy use are not perceived to have a direct impact on train or station operational performance.

The PPP Contract requires our PPP Suppliers to achieve certification to ISO 14001 within three years of the contract start date and to maintain this throughout the course of the contract. Both

Metronet and Tube Lines have successfully achieved certification of their environmental management systems to ISO 14001.

The quality of LU environmental performance reporting has been adversely affected in the past by a lack of robust and consistent data. Much of the reporting has been qualitative, making it difficult to compare performance year on year or benchmark ourselves against other organisations.

The categorisation of environmental complaints has been refined during 2004/05 to enable us to gain a better understanding of the impact of LU operations on our neighbours. These categories are also being used to classify environmental incidents. Reporting against the new categories will commence in 2005/06 which will enable us to identify activities requiring improved environmental management more effectively.

LU has worked with other modes within TfL and our PPP Suppliers to develop a series of company wide Key Performance Indicators (KPI) which address our significant impacts and reflect the requirements of the Mayoral Environmental Strategies. This enables us to monitor our performance year on year and bench mark against other organisations, as well as providing a means of demonstrating performance against Mayoral Strategies. To date, indicators have been developed for: energy management, operational and works related noise management, train and station cleanliness regimes, waste management, extent of biodiversity / habitat surveys, environmental incidents, contaminated land clean up and water usage.

The significant increase in capital works over the coming years means that our total energy consumption, number of noise complaints and amount of waste produced are all projected to increase. In addition, an improved service will demand greater quantities of electricity to power the trains which will accelerate quicker and run more frequently. However LU and its PPP Suppliers are taking active steps to reduce the impact of the operations and activities through our day to day management of operations and our environmental objectives and targets contained in our improvement plans. Where possible, performance indicators are expressed per unit of service or as a percentage to ensure our performance is placed into context with the scale of infrastructure modernisation and renewals currently being under taken as part of the PPP Contract.

Performance data contained within this report is coded to indicate changes in environmental performance. A red bullet indicates a deterioration in performance when compared with the previous year and green indicates an improvement in performance.

Further work will continue this year to embed the reporting of these performance indicators into LU's existing reporting structure. Reporting against these measures will enable the business to assess and communicate changes in the level of environmental performance, and the success of environmental management activities.

 **Objectives for 2005/06:**

- Complete the environmental review of LU's operations and activities in line with the requirements of ISO 14001
- Revise structure and content of the environmental aspects of LU's Intranet pages
- Implement revised classifications for the recording of environmental incidents and complaints

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## 5

### **Significant Environmental Impacts:**

(the sub-sections start from next page)

# 5



## 5.1 Energy & Other Resources

LU accounts for 3.5% of London's total electricity consumption and is the largest single consumer in London. Approximately 90% of this is classed as traction current and is used to power trains, the remaining 10% is used for heating, lighting and powering office equipment at our depots, stations and offices.

Energy consumption is recognised as a significant contributor to climate change. We therefore have a responsibility to ensure that the energy that we use is being used efficiently. Over the next twenty years, LU's energy consumption will increase significantly with the introduction of new fleets of trains with additional features. This has cost as well as environmental implications. Our energy strategy seeks to mitigate this expected increase in consumption firstly through greater energy efficiency and secondly through procuring energy from less environmentally damaging sources.

### Progress made during 2004/05:

LU takes a two pronged approach to reducing the environmental impact of its energy use. Firstly we ensure that we are efficient in our use of energy. This year's Station Energy Challenge has been a resounding success and built upon the success of the previous years. Our target of reducing energy consumption, by 20% against a baseline, was surpassed with a record 23.7% for 2004/05. The table below outlines the trophy winners for 2004/5.



AWARD	Location	Line
LINE WINNER	Bakerloo Line	<b>Bakerloo</b>
GROUP WINNER	Charing Cross Group	<b>Bakerloo</b>
GROUP RUNNER-UP	Wembley Park Group	Jubilee
STATION WINNER	Ealing Broadway	<b>Central</b>
STATION SECOND	Charing Cross	<b>Bakerloo</b>
STATION THIRD	Hillingdon	<b>Metropolitan</b>

Over 40% of LU's train fleet has regenerative braking. This converts energy which would be lost as heat from braking into electricity and feeds it back into the system. All trains on the Central, Northern & Jubilee lines are currently fitted with this technology as will all new trains which are developed through the PPP. LU currently gains approximately 20-25% energy savings from this technology. Further energy efficiency measures include the use of movement sensitive lighting and energy saving light bulbs during office refurbishments and improved efficiency of IT equipment.

TfL Facilities manages London Underground's portfolio of buildings and has overseen significant improvement in our electricity consumption per m<sup>2</sup>. Our office average electricity consumption has fallen from 287 kWh/m<sup>2</sup> to 193 kWh/m<sup>2</sup> in 2004/05, a reduction of 33%. Of particular note is the widespread nature of this improvement, with performance improving at 64% of our buildings.

As well as energy efficiency measures, LU seeks to reduce the environmental impact of the energy that we consume. Where cost effective to do so, our electricity supply is sourced from renewable energy technologies. All of the electricity used to power LU's stations and offices is sourced from renewable energy technologies. The purchase of renewable energy for traction purposes is not currently cost-effective, as energy used for transportation is exempt from the Climate Change Levy. Hence, the additional cost of renewables cannot be offset by the avoided levy in this case. However we will continue to further our use of renewable energy through our targets for 2005/06 and investigate opportunities for stimulating the provision of additional renewable energy supply in London.

Our performance with respect to energy and water consumption is summarised in the table below.

Year	1999/2000	2000/01	2001/02	2002/03	2003/04	2004/05
<b>ENERGY</b>						
Total Electricity supplied (gigawatt hours)	1,101 (a)	1,006	1,017	1,091	1,087	1,148 ●
Energy efficiency (Watt hour/passenger km)	154	135	139	148	160	151 ●
CO <sub>2</sub> (t)	640,421 (b)	643,607 (b)	660,119 (b)	538,723 (b)	410,394	414,719 ●
% Renewable Energy	0	3.79	4.1	10.89	14.19	17.9 ●
<b>WATER USE</b>						
Water Consumed (litres, millions)	661 (c)	899	670	638	658	634 ●

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

(b) includes emissions from LU's Lots Road Power Station which was decommissioned in Nov 2002

(c) not including power station water consumption

Although the total amount of CO<sub>2</sub> produced during the year has increased slightly when compared with last year, the amount of CO<sub>2</sub> produced per passenger kilometre has fallen due to the increase in passenger kilometres. This year 54.52 grams of CO<sub>2</sub> were produced per passenger kilometre, a decrease of 1.38 grams per passenger kilometre or a total reduction of over half a tonne of CO<sub>2</sub>.

LU is committed to the Mayor's Green Procurement Code and supports London Remade, established by the Mayor to stimulate the use of products made from recycled materials. Processes have been established within LU to ensure that the environmental implications of goods and services that we buy are identified and, where practicable and economic, that environmentally friendly options are selected. Notable successes over recent years have included the purchase of renewable energy outlined above and the promotion of environmentally friendly office supplies and equipment such as recycled paper and printers capable of printing double-sided. The sourcing of fleeces worn as part of operational uniforms

has been reviewed in an attempt to procure fleeces which are made from recycled materials. Unfortunately in this case the supplier could not produce enough fleeces to supply our large demand.

Both Metronet and Tube Lines, our PPP Suppliers, continue to replace wooden sleepers with concrete ones which have a longer asset life. Tube Lines have been operating a rag reuse scheme, whereby oily rags from maintenance activities are cleaned and reused – reducing waste and resource consumption.

Reported water consumption has decreased during 2004/05. However, it should be noted that consumption data is not yet included for some sites, as these are only billed bi-annually. During the period, improvements have been made in detection and repair of leakage and the resultant benefits are expected upon formalisation of the final datasets.

#### **Objectives for 2005/06:**

- Introduce a revised league system for Stations Energy Challenge and achieve a minimum of 20% electricity savings.
- Double the number of station visits to increase awareness of the Energy Challenge.
- Target 20 stations with the highest energy use, for energy saving measures.
- Maintain LU office electricity supply from 100% renewable energy.
- Transfer sub100kW sites to 100% renewable energy supply.
- Investigate opportunities for stimulating the provision of additional renewable energy supplies in London.
- Investigate and report on further “green” procurement opportunities within LU.

# 5



## 5.2 Air Quality

London's air quality is an issue of much public interest. Many steps have been taken to improve air quality, through the GLA's air quality strategy and local borough's air quality action plans. LU continues to support improvement of air quality in London by providing a public transport system with no direct negative impact on London's air quality.

The amount and type of dust in the air on the Underground has in the past been an issue of public concern. LU commissioned the Institute of Occupational Medicine (IOM), to undertake a full assessment of all previous monitoring and analysis. The study by the IOM concluded that the dust on the LU network does not pose a health risk to LU employees or customers travelling on our network. LU continues to monitor dust and air quality to ensure that this position continues.

### **Progress made during 2004/05:**

Air quality monitoring for employee exposure to respirable dust was undertaken this year. The level of Train Operator monitoring was increased this year to enable us to gain a better understanding of any likely peak exposures. Station monitoring was undertaken at the following locations: Aldgate East, Baker Street, Elephant and Castle, Euston Square, Hampstead, Oxford Circus, Piccadilly Circus, Tottenham Court Road, Vauxhall. The selection of these sites was based on the results of previous monitoring and consultation with our employees' representatives.

The results of the Train Operator monitoring confirmed that all values are substantially below the recognised standard for exposure to respirable dust which is 4 mg per m<sup>3</sup>. Additionally analysis was undertaken for respirable crystalline silica and results were at or below 0.02 mg per m<sup>3</sup> which is well within the HSE good working practice guideline of 0.1 mg per m<sup>3</sup>.

The shift exposure of Station Staff is more difficult to calculate because of the mobile nature of their work. The average exposure to dust from all the personal samples taken at each station was below 1 mg per m<sup>3</sup> with the exception of the single highest personal exposure which was recorded at Baker Street. This record appeared abnormally high and future monitoring will seek to verify its accuracy.

The monitoring survey will be repeated on an annual basis to enable comparison of dust exposures at selected sites. In addition site specific monitoring will be undertaken as required, for locations subject to elevated levels due to discrete occurrences.

Distribution Services, which is operated by Tube Lines, provides LU and its PPP suppliers a fleet of vehicles for purposes such as distribution of goods, collection of waste and lease cars. The table below shows engine type of the Heavy Goods Vehicles (HGVs) provided by Distribution Services. The engine profile of the LU fleet is improving, with a greater proportion of the fleet utilising more energy efficient engines. In addition to these vehicles Distribution Services provides approximately 145 other vehicles for use by LU, of which 137 meet the Euro III standard.

<b>Engine Status</b>	<b>Number of Vehicles 2003-4</b>	<b>Number of Vehicles 2004-5</b>
Euro I	20	17
Euro II	10	10
Euro II + CRT	7	10
Euro III	1	2
Euro III + CRT	6	8

Continuously Regenerating Traps (CRT) are retrofitted to the exhaust systems of vehicles and remove small particles (PM10) including HC, CO and some NOx

# 5



## 5.3 Land & Water Pollution

LU is committed to identifying any areas of contamination and undertaking remedial action where required. The contamination itself may be due to past LU activities, which are no longer permitted due to changes in legislation and social acceptability or as a result of historic operations and activities on the site prior to LU ownership

LU and its PPP Suppliers are committed to preventing the pollution of controlled waters and sewers. In some instances, certain levels of pollution are acceptable, in such cases agreements are sought with the appropriate regulatory authority.

### **Progress made during 2004/05:**

Both Metronet and Tube Lines are undertaking studies to ensure that they understand the condition of the natural assets that they are managing on behalf of LU through the PPP Contracts. They are responsible for ensuring that appropriate management arrangements are in place to ensure that our assets do not cause harm to the environment.

During 2003/04 Tube Lines undertook a study of all operational land which they are responsible for maintaining to assess the level of contamination. Following the identification one site requiring remediation, the remediation works have been successfully completed by Tube Lines during 2004/5. A further five sites requiring additional monitoring were identified during the 2003/4 study and this additional monitoring is now complete. This showed that the relatively low levels of contamination are stable and do not pose a significant risk to either human health or the environment. Remediation is not required at these sites.

Tube Lines also undertook a drainage study, which identified all the drainage discharge points across the assets that they manage and determined whether they drain to sewer or controlled waters. Analysis of the quality of all discharges to controlled waters and a representative sample of sewer discharges confirmed that high risk areas are generally confined to depot locations where activities requiring the use of chemicals including oils and de-icers are undertaken regularly. Tube Lines are currently developing a programme of works which aims to reduce the likelihood of pollution by either introducing changes to the way activities are undertaken or by installing end of pipe solutions such as interceptors.

Metronet are currently undertaking an assessment of the natural assets that they manage through the PPP Contract. As part of this assessment, any contaminated land will be identified and any remedial action will be recommended. Metronet are also undertaking an assessment of their discharges, including the appropriateness of existing consents to discharge.

# 5



## 5.4 Noise and Vibration

LU identifies noise and vibration as one of our most significant environmental impacts. The main sources of noise and vibration occur from the wheel/rail interface, engineering or construction works, public announcements and train whistles.

LU and our PPP Suppliers take pro-active measures to reduce the noise created by the wheel/rail interface; these activities include rail grinding, track lubrication, track monitoring and replacement of short sections of track with longer, continuously welded, track. Considerable improvements in noise and vibration have been achieved at specific sites where this work has been carried out.

### Progress made during 2004/05:

The refinement of the classification of noise complaints during 2004/05 will enable improved monitoring and environmental performance reporting. Noise complaints are now classified by source of emission e.g. wheel/rail interface, contractor activity, public announcements or train whistle. Many ground borne noise and vibration complaints require complex engineering solutions in order to fully remediate and close the complaints. Work is underway to improve our management of these types of complaints.

The performance data below shows a significant increase in total noise and vibration complaints. A 74% annual increase has been recorded. While an increase is not unexpected in light of the increased level of works delivered by the PPP Contracts, the scale of the increase warrants further investigation. Further analysis of noise complaints will be undertaken to ensure that LU and the PPP Suppliers target their noise management activities appropriately.

	2003/04	2004/05
<b>TRANSPORT NOISE</b>		
Number of noise related complaints	280	488 <span style="color: red;">●</span>

An increase in noise complaints was observed in all but one of the periods, when compared with complaints received in the previous year. The majority of this rise is due to noise generated as a result of the increased construction and maintenance activity associated with the PPP improvement works. However, the number of complaints in the remaining categories (asset related, public address system, train whistle & miscellaneous) have also risen slightly. A seasonal increase in complaints from Period 3 to 5 was observed, which can be attributed to hot weather and the increased likelihood of windows being open.

Tube Lines and Metronet are using noise risk assessments and noise prediction modelling for station works. Site visits and asset plans are used to assess the local topography, the distance of local receptors from the noise source and estimate the number of properties likely to be affected by the works. This information is used to identify sensitive areas and receptors. Noisy tasks within sensitive areas can be identified and from this the timing of works and the site controls required are determined.

Under Section 61 of the Control of Pollution Act, persons carrying out works creating noise may apply in advance for local authority consent to the methods applied during the works. Both Metronet and Tube Lines obtain prior consent for noisy works and ensure that appropriate notification of works is given to local residents and others affected. Similar noise management arrangements are expected for planned maintenance activities.

During 2004/05 the EU funded Control of Vibration from Underground Rail Traffic (CONVURT) Project was concluded. The project developed a number of technologies for the control of vibration. It is proposed to disseminate this knowledge and promote its implementation during 2005/6. In addition to collating information from existing processes, development work will be undertaken to adapt certain tools produced within CONVURT for track condition monitoring.

London Underground's experience in noise and vibration control, has assisted Metronapoli (Naples underground system) to understand noise issues. A series of meetings with London Underground engineers and a track inspection were held to review and discuss noise and vibration causes and mitigation and to help them review and interpret the findings of the CONVURT Project. Metronapoli were particularly interested in some of LU's mitigation techniques notably the Pandrol VANGUARD track support system.

In response to the EU Environmental Noise Directive, the Department of Environment, Food and Rural Affairs (DEFRA) will be undertaking a rail noise mapping exercise similar to that already undertaken for the road network. LU and its PPP Suppliers hold a significant amount of knowledge and data in respect of noise associated with the LU network, which will be provided to DEFRA in accordance with their programme.

#### **Objectives for 2005/06:**

- Obtain funding approval for the progression of outputs from the international benchmarking Community of Metro's (CoMET).
- Collate data for Manual of Best Practice on Ground Borne Noise \*
- Conduct vibration measurements in tunnels to provide specific parameters for condition monitoring processes. \*
- Develop and issue Manual of Best Practice on Ground Borne Noise \*
- Conduct further analysis of the management of noise and vibration.

\* These actions are dependant on the successful bids for funding from LU's internal funding management committee

# 5



## 5.5 Waste Management

London Underground is committed to waste minimisation and explores further opportunities for the recycling of waste. Sources of waste generated by LU and the PPP suppliers includes waste from offices and stations, litter left by customers, waste from maintenance, servicing, repairs, vegetation management, construction and track replacement. Waste arising from maintenance, construction and repairs is expected to increase significantly over the coming years due to planned station refurbishment and track replacements.

### Progress made during 2004/05:

This year LU updated and replaced its uniforms with a new design for over 8,000 front line employees. Due to security implications, these garments can not be sold, reused or provided to charity. As an alternative, LU Clothing Services operates a recycling service where items are collected, shredded and used as stuffing for furniture and cushions. Approximately 500,000 garments have been shredded and recycled in this fashion.

Tube Lines provides the waste management service for the LU network. During 2004/5 they undertook a feasibility study of recycling waste paper at terminus stations, where large amounts of waste paper in the form of newspapers can be collected as trains are cleaned before going back into service. After the successful study, Tube Lines implemented paper recycling scheme at all 7 of the terminus stations which they maintain. This scheme has been extended during the year and now encompasses depots and a number of additional stations. Metronet are also planning a similar feasibility study into paper recycling for the stations which they maintain. The results of this study are expected to be reported by the end of 2005. LU continues to work closely with Tube Lines and Metronet to identify further sites that are cost effective to include in the scheme.

LU has worked to develop a series of waste Key Performance Indicators, which are reported for the first time this year. The historic and current data collected shows that the recycling carried out by LU and its PPP Suppliers is significantly reducing the potential environmental impact associated with waste disposal from the operation, maintenance and renewal of the LU network. The table below shows data for LU's KPIs on waste.

WASTE	2003/04	2004/05
Commercial & Industrial Waste (t)	9,210	10,147 ●
% Commercial & Industrial Waste Recycled	12	20 ●
Hazardous Waste (t)	112	247 ●
Hazardous Waste (litres)	283,267	231,835 ●
% Hazardous Waste Recycled	NA	NA
Construction & Demolition Waste (t)	NA	64,332
% Construction & Demolition Waste Recycled	NA	87.21

The amount of waste produced is expected to increase over the coming years, largely as a result of the increase in infrastructure upgrades and renewals associated with the PPP works programme. Therefore, LU and its PPP Suppliers are working hard to recycle as much of this waste as possible. Metronet and Tube Lines were responsible for recycling over 64,000 tonnes of waste or 87% of all waste associated with their track replacement programme, which is well above the industry average. LU has been working with Tube Lines to build on the good progress made during 2004/05 which saw an 8 percent increase in the amount of station waste recycled. This increase was largely as a result of the station paper recycling programme implemented by Tube Lines.

 **Objectives for 2005/06:**

- Implement a paper recycling scheme for stations.

# 5



## 5.6 Habitats and Biodiversity

London's railway trackside vegetation has been noted for its importance to conservation of biodiversity for many years. It acts as a corridor allowing species to migrate into and out of the city and also acts as a refuge for species in areas where there is little green open space. Less than 20% of Greater London is valuable wildlife habitat.

London's railway network was largely created over 100 years ago on land which was then open countryside. The land surrounding the railway has now predominantly been turned over for commercial or residential usage, a purpose which in turn has raised the importance of railways trackside land as significant areas of wildlife habitat. Due to the diversity of habitat, combined with the restricted public access, trackside land sometimes offer the only significant local refuge for flora and fauna, particularly in inner London.

Over half of the LU network is actually over ground, this equates to 221km or 4,000 hectares of trackside property with the potential for wildlife habitat. LU owns, and manages, almost as much green corridor land as all 33 London Boroughs combined which equates to 10% of all wildlife habitat within the capital. The maintenance of a safe and secure trackside with positive benefits to nature conservation and enhancement will make a significant contribution to London's wildlife and the perception of the organisation by customers and neighbours alike.

### Progress made during 2004/05:

In 1999, LU commissioned a comprehensive system-wide biodiversity survey of trackside property from our future GLA partner, the London Ecology Unit. This established a baseline of the ecological asset present on the network, against which to benchmark our PPP Suppliers stewardship of trackside ecology. During 2004/5, LU has worked with our PPP Suppliers to transfer this data to Greenspace Information for Greater London (GIGL).



GIGL is an open space and biodiversity records centre that collects, manages and makes available detailed information about London's plants, animals, wildlife habitats, statutory and non-statutory wildlife sites and open space. This work is done in partnership with the many individuals and organisations that produce and use this information through their work or leisure activities. The information is already used by many of GIGL's partners and customers to help protect, study and enjoy London's wildlife and open space.

GIGL aims to collate and manage data for all of London's green and brown open spaces and make it more widely accessible. The provision of this data has filled many gaps in GIGL's database, as any previous surveys of LU operational land were carried out visually from the boundary fence.

This year, Metronet started to undertake a reassessment of biodiversity on the land which they are responsible for maintaining. This work is expected to be completed during 05/06 and all data will be shared with GIGL.

LU in conjunction with the GLA, PPP Suppliers and the London Biodiversity Partnership (LBP) has produced the scope for the development of a Biodiversity Action Plan. To ensure that best practice in land management for biodiversity is applied consistently across the network, clear management arrangements are required. The Biodiversity Action Plan will be used to achieve this. The establishment of best practice and action plans will enable LU to focus its assurance activity more accurately and to assess and report the extent to which LU and the PPP Suppliers are contributing to the Mayor's Biodiversity Strategy. This strategy also requires land owners to survey their land and to resurvey every ten years.

#### **Objectives for 2005/06:**

- Work with our PPP Suppliers, LBP & the GLA to develop and implement a Biodiversity Action Plan compatible with LU operations.
- Complete the transfer of survey data to GIGL and establish a service level agreement for future data sharing.
- Metronet will re-survey trackside ecology within the next few years as part of a commitment detailed within the PPP Contract.

# 5



## 5.7 Climate Change

Most climate scientists are in agreement that the earth is getting warmer and that the release of greenhouse gasses is a major contributing factor. The 1990's were the warmest decade in the last 100 years whilst this century has been warmer than any other in the past 1,000 years. The Intergovernmental Panel on Climate Change predicts that by 2100 the average global temperature will have risen by between 1.4 and 5.8 Degrees Celsius.

UK Climate Impacts Programme (UKCIP) predicts that the effects of global climate change on UK weather by the 2050's will lead to wetter warmer winters (up to 20% more precipitation and a 1–2 degree Celsius increase) and hotter dryer summers (up to 40% decrease in precipitation and up to 3.5 degree Celsius increase). If LU does not invest in adaptation strategies and technologies to mitigate against the effects of climate change, possible outcomes may include:

- increasing likelihood of flooding leading to disrupted service,
- a reduction in passenger comfort due to increased temperatures,
- increasing risk of rail buckling,
- increased bridge scour,
- embankment instability through more frequent and heavier rainfall, and
- the increased growing season for vegetation, leading to a requirement for additional vegetation maintenance.

As a result of these predictions, London Underground is assessing the potential impacts of changing climate on our business to ensure that actions are taken now and in the future to mitigate any potential risks and ensure we can continue to deliver a safe and reliable service.

### **Progress made during 2004/05:**

London Underground is a member of the GLA led London Climate Change Partnership (LCCP) and has provided both resources and finances to fund and support a study which assesses the risk of climate change to London's transport system. The study highlights two main risks for LU as a result of expected climate change; increased summer temperature and increased likelihood of flooding.

LU has reviewed the findings of the study and has set up a Steering Group comprised of senior management to address the challenges posed by heat and climate change. £178million has already been allocated through TfL's Investment Programme. Work programmes include:

- a review of fan and ventilation capacity and the opportunity for new ventilation capacity on existing lines.
- the continuation of the project with South Bank University to use ground water to cool the tube. LU has undertaken laboratory tests and has identified a site to trial the technology on the network. The on-site trial is programmed to commence in 2006.
- the design of centrally operated and remotely controlled systems to manage fans and local cooling installations and to monitor temperatures.
- mitigation measures to manage flood risks at key stations.

During 2004/5, we reviewed and updated the quantified risk assessments for Ventilation and Flooding hazards. These models will allow the impact of proposed risk reduction measures to be assessed.

In addition to these work programmes, LU has invested in air-cooled trains due to be delivered from 2009 on the sub-surface lines – Circle, District, Hammersmith & City and Metropolitan, through the PPP Contract.

 **Objectives for 2005/06:**

- Continue to implement LU's investment programme on climate change.

# 6



## Corporate Social Responsibility & Sustainability

A central theme of sustainability is promoting the development of more efficient transport networks and more sustainable modes of transport. The tube provides an environmentally friendly means of transport for all sections of society; providing access to jobs, recreation, services and shopping. Much of our network and our fares are integrated with other sustainable modes of transport, (e.g. walking, cycling, over-ground rail and buses) thus providing our customers with a more socially inclusive and wide reaching transport infrastructure.

The Tube provides an alternative to the car, reducing congestion leading to better business efficiency and economic output, provides more efficient and reliable journey times and a reduction in noise and air pollution for the community as a whole. Improved levels of safety are achieved by moving people from cars to a safer form of transport.

Corporate Social Responsibility (CSR) covers a number of issues but its core principle is that a company should go beyond just ensuring compliance with legislation, to actively giving something back to the society within which it operates. Key themes of CSR include: ensuring suppliers are ethically and environmentally sound, providing equal opportunities and training and development for employees, involvement with the local community and ensuring that any environmental impacts associated with company activities are mitigated.

### Charity collections

LU has over 300 registered charities authorised to collect at our stations. Collection activity is co-ordinated by LU to ensure that the number of collections per week at each location is appropriate. In addition, our employees are often only too keen to lend a hand to a worthy cause. Over 200 employees were involved in collecting on behalf of the Tsunami appeal. Many staff also gave up their own time to collect and announcements were made at stations and trains. The generosity of the public was astonishing: Finsbury Park Station alone collected £35,000 over three days whilst Victoria Station raised over £32,000. In total over £240,000 was collected across the LU network for the appeal.



Just prior to Christmas 2004, LU joined forces with Capital Radio for 'Help A London Child' to raise more than £15,000. The money raised provided Christmas dinners and presents for many children who would otherwise have gone without. Some of LU's employees wore fancy dress while collecting, to bring a smile to the faces of customers. The event finale was a concert held at Waterloo Station with Capital Radio DJs, registered LU buskers and bands all lending a hand. Even some brave customers joined in with some karaoke classics.

## Social Inclusion

Transport is critical for promoting social inclusion. To support ethnic minority groups and foreign tourists visiting the city to use the network, our multilingual employees are wearing badges showing the languages they speak. Ethnic minority groups make up 28 per cent of London's population. LU is working to ensure our workforce reflects this and believes that this initiative strengthens and improves the public perception of LU as an equal opportunity employer.

LU has also trialled "Baby on board" badges for mothers to be to help build their confidence in asking for seats while encouraging other travellers to offer up their seats. The successful trial has led to a full scale London wide launch. Details have been made available in the "well being" magazine and all midwives in M25 area have access to badges.

## Training and Development

London Underground is keen to promote learning amongst employees and ensure they gain recognition of their skills, front line employees have been able to gain NVQ's in Rail Transportation for the past 3 years. To date over 6,900 employees have received qualifications and a further 1,400 are currently on the programme. Building on this success LU have partnered with City & Guilds, Barnet College and 4 Counties Training to explore the options of promoting and delivering more skills initiatives. A ten year strategic partnership has been developed and we will shortly be piloting NVQ's in Customer Service at Level 3.

## Ethical Purchasing

LU places ethical requirements for our suppliers; these requirements also detail their 'duty of care' with regard to sourcing of products and labour. In addition our suppliers are requested to provide LU with a copy of their policy on ethical trading. On new procurement activities, LU is strengthening its ethical demands, by including questions on where suppliers' facilities are located and including requirements for allowing audits of premises. LU has recently replaced uniforms for approximately 10,500 front line employees using its ethical purchasing guidelines.



## Backing the Successful Bid



London beat off fierce competition in its successful bid to host the 2012 Summer Olympics. London Underground demonstrated their support by fitting out two entire trains in publicity material and ensuring the trains were available to collect the visiting IOC members, as they travelled to the future Olympic site at Stratford. Five stations also enjoyed an Olympics makeover, Waterloo, Canary Wharf, London Bridge, Westminster and Stratford. All boasted colourful 2012 branding.

# 7

## Progress Against 2004/05 Targets

	<b>TARGET</b>	<b>ACHIEVED</b>	<b>OWNER</b>	<b>PROGRESS SUMMARY</b>
<b>Environmental Management System</b>	<b>Undertake environmental risk assessment of all LU operations.</b>	✓	LU SQE	All activities undertaken by LU and those activities undertaken by 3 <sup>rd</sup> parties whom LU has some control over, have been assessed and scored for their likelihood to cause environmental impact.
	<b>LU and Metronet to agree the scope of the Environmental Harm Assessment.</b>	✗	LU / METRONET	The full scope of the Assessment of Environmental Harm that Metronet is required to undertake as part of the PPP Contract has still to be agreed in full. However Metronet has begun to undertake some aspects of the scope.
	<b>Revise classification of environmental incidents, complaints and impacts.</b>	✓	LU/ METRONET /T. L.	Revised classifications for the reporting of environmental incidents and complaints have been developed and implemented into the business reporting system. These classifications improve our ability to identify trends, report against them and take mitigating action where required.
	<b>Strengthen our environmental quarterly report to include a series of Key Performance Indicators</b>	✓	LU SQE	A series of environmental KPI's have been developed to strengthen environmental reporting. Performance against these KPI's has been included in this report.
	<b>Metronet and Tube Lines to progress implementation of ISO14001 such that certification is achieved by April 2006.</b>	✓	METRONET /TUBE LINES	Metronet and Tube Lines have achieved company-wide certification to ISO 14001. Further details can be found in their respective annual environment reports.
	<b>Review company standards to ensure they capture environmental requirements</b>	✓	LU SQE	A review of company standards has been completed.

	<b>TARGET</b>	<b>ACHIEVED</b>	<b>OWNER</b>	<b>PROGRESS SUMMARY</b>
<b>Energy</b>	<b>Maintain our stations energy savings target at or above 20% against the baseline figure.</b>	✓	LU CPO	LU's target of achieving a 20% saving of electricity consumption across all LU stations was achieved and surpassed. During 2004 / 05, LU saved 23.7% of electricity consumed, against a baseline.
	<b>Maintain our target of all offices, stations and depots to be powered from 100% renewable energy sources.</b>	✓	LU CPO	All electricity for LU offices, Stations and Depots was procured from renewable energy sources during 2004 / 05.
<b>Water</b>	<b>Meet GLA target of less than 11 cubic metres water consumption per employee per year in offices.</b>	✗	TfL GROUP FACILITIES	Although water consumption at offices reduced by 20% over the year, the loss of one of the more efficient buildings from our property portfolio resulted in our water consumption increasing from 13.9 to 14.7 m <sup>3</sup> per employee per annum.
	<b>Utilise GARDIT modelling predictions to assess the likely future impacts on our network.</b>	✓	LU CED	Using existing research and data commissioned by LU and Thames Water, an LU specific groundwater modelling tool has been developed to help predict "what if" scenarios.
<b>Air Quality</b>	<b>Conduct 04/05 programme of dust monitoring</b>	✓	LU SQE	The 04 / 05 air monitoring programme is complete and results confirm that dust levels on the Tube are substantially below HSE Standards and good working practice guidelines.
	<b>Tube Lines to replace 20% of large goods vehicle fleet with ultra low sulphur diesel Euro III or above standard vehicles.</b>	✓	TUBELINES	All the fleet of large goods vehicles operates on ultra low sulphur diesel.
	<b>Tube Lines aim to source and implement use of sulphur free diesel for Acton based large goods vehicles.</b>	✗	TUBELINES	This activity has been progressed as far as practicable. It is now awaiting government taxation band setting, pending the Government pricing strategy. This activity is ongoing.
	<b>Tube Lines to reduce CO2 emissions from Acton based pool vehicles by 20%.</b>	✓	TUBELINES	Manufacturer's calculations show that this target has been achieved.

	<b>TARGET</b>	<b>ACHIEVED</b>	<b>OWNER</b>	<b>PROGRESS SUMMARY</b>
<b>Air Quality c'td</b>	<b>Tube Lines to work with TfL to meet objectives set in their Environmental Improvement Plan regarding trialling alternative fuelled vehicles and selecting the quietest, alternatively fuelled vehicles of TfL managed fleets.</b>	✓	TUBELINES	This objective was largely achieved, Tube Lines has worked with TfL to fully understand their requirements and have provided a fleet including LPG and hybrid vehicles. Tube Lines Distribution Services have provided financial incentives to encourage staff to downsize in their selection of management cars.
<b>Contaminated Land</b>	<b>Tube Lines to undertake remediation at West Ruislip and continue to monitor 5 sites of potential risk</b>	✓	TUBE LINES	Remediation is completed and monitoring on the remaining 5 sites showed that the relatively low levels of contamination are stable and do not pose a significant risk to either human health or the environment. No remediation is required at these sites.
<b>Noise and Vibration</b>	<b>Complete the publication of the findings from the CONVURT project.</b>	✓	LU CED	All findings and project achievements have been published.
	<b>Produce a programme of options to implement recommendations arising from the CONVURT project.</b>	✓	LU CED	The programme has been completed and the recommendations reviewed. A number of papers to further this work have been developed and are awaiting financial approval.
	<b>Undertake wheel/rail management e.g. rail grinding and track lubrication at noise problematic locations across the network.</b>	✓	LU / METRONET / TUBE LINES	This forms part of the ongoing commitment of our PPP Suppliers to mitigate the effects of noise and vibration generated from the wheel rail interface. A new non-toxic lubricant has been developed by Tube Lines for use across the network. Poor track condition is one potential cause of noise and vibration, Tube Lines have replaced over 19kms of track during 04/05. In addition to their programme of track replacement Metronet are undertaking a programme of rail grinding on the Central and Victoria lines.
<b>Waste Management</b>	<b>Implement pilot project to recycle office paper and newspapers at stations</b>	✓	TUBE LINES / LU	Tube Lines trialled a paper recycling scheme for terminus stations. This successful trial has led to a full implementation at all 7 terminus stations which Tube Lines are responsible for maintaining. Metronet are currently developing a similar scheme at the terminus stations they are responsible for maintaining.

	<b>TARGET</b>	<b>ACHIEVED</b>	<b>OWNER</b>	<b>PROGRESS SUMMARY</b>
<b>Waste Management cont.</b>	<b>Implement a battery recycling scheme at LU office sites by December.</b>	<b>x</b>	TfL	This action has been postponed until after our new waste contract has been tendered. Action to be completed during 2005 / 06.
	<b>Establish costs for a cardboard separation scheme at offices.</b>	<b>x</b>	TfL	This action has been postponed until after our new waste contract has been tendered. Action to be completed during 2005 / 06.
	<b>Tube Lines Distribution Services to continue to work towards a target of 18% recycling of mixed municipal waste by 2005/6.</b>	<b>✓</b>	TUBE LINES	Objective met and surpassed. 20% of all Commercial and Industrial (C&I) waste was recycled during 04 / 05.
<b>Climate Change</b>	<b>Conduct a safety assessment for the cooling scheme resulting from the work with South Bank University.</b>	<b>✓</b>	LU CED	A trial site has been selected and a working trial should be operational during 2006.
	<b>Assess reports on the problems with heat on our system and develop an improvement strategy.</b>	<b>✓</b>	LU CED	Reports have been assessed and £178 million has been allocated through TfL's £10 billion investment programme to address the issues of heat on the Underground. Further details of the extensive programme of works that will be and have already been delivered can be found in the climate change section of this report.
	<b>Identify the implications for LU of the GLA London Climate Change Partnership</b>	<b>✓</b>	LU CED/ SQE	London Underground has part funded a study with the LCCP to assess the implications of climate change to London's transport infrastructure. LU has assessed the implications and developed strategies to tackle the risks of high temperatures and increased flooding on our network that will arise from climate change.

# 8

## Objectives for 2005/06 and beyond

	<b>TARGET</b> (* Subject to available funding)	<b>COMPANY</b>	<b>DEPT.</b>
<b>ENVIRONMENTAL MANAGEMENT SYSTEM</b>	<ul style="list-style-type: none"> <li>Undertake an environmental review of LU's operations and activities in line with the requirements of ISO 14001.</li> <li>Revise structure and content of environmental aspects of LU Intranet pages.</li> <li>Implement revised classifications for the recording of environmental incidents and complaints.</li> </ul>	LU	SQE
		LU	SQE
		LU	SQE
<b>ENERGY AND OTHER RESOURCES</b>	<ul style="list-style-type: none"> <li>Introduce a revised league system for Stations Energy Challenge and achieve a minimum of 20% electricity savings.</li> <li>Double the number of station visits to increase awareness of the Energy Challenge.</li> <li>Target 20 stations with the highest energy use, for energy saving measures.</li> <li>Transfer sub100kW sites to 100% renewable energy supply.</li> <li>Maintain LU office electricity supply from 100% renewable energy.</li> <li>Investigate opportunities for stimulating the provision of additional renewable energy supplies in London.</li> <li>Investigate further "green" procurement opportunities.</li> </ul>	LU	CPO
		LU	SQE
<b>BIODIVERSITY</b>	<ul style="list-style-type: none"> <li>Work with our PPP Suppliers, LBP &amp; the GLA to implement a Biodiversity Action Plan compatible with LU operations.</li> <li>Complete the transfer of survey data to GIGL and establish a service level agreement for future data sharing.</li> <li>Metronet will re-survey trackside ecology within the next few years as part of a commitment detailed within the PPP Contract.</li> </ul>	LU / Tube Lines / Metronet	SQE
		LU	SQE
		Metronet	Metronet
<b>NOISE AND VIBRATION</b>	<ul style="list-style-type: none"> <li>Conduct further analysis of the management of noise and vibration.</li> <li>Seek funding for the progression of outputs from CoMET.</li> <li>Collate data for Manual of Best Practice on Ground Borne Noise *</li> <li>Conduct vibration measurements in tunnels to provide specific parameters for condition monitoring processes. *</li> <li>Develop and Issue Manual of Best Practice on Ground Borne Noise. *</li> </ul>	LU	SQE
		LU	ED
<b>WASTE</b>	<ul style="list-style-type: none"> <li>Implement a paper recycling scheme for stations.</li> </ul>	LU / Tube Lines / Metronet	SQE
<b>CLIMATE CHANGE</b>	<ul style="list-style-type: none"> <li>Continue to implement LU's investment programme on climate change</li> </ul>	LU	ED