



LONDON UNDERGROUND



***ENVIRONMENT
REPORT 2004***





LONDON UNDERGROUND ENVIRONMENT REPORT 2004

Contents

	<u>Page</u>
1. Managing Director's Statement.....	3
2. Company Background	4
3. Environment and Energy Policy	5
4. Environmental Management System	6
5. Significant Environmental Impacts.....	8
5.1 Energy	8
5.2 Water.....	9
5.3 Air Quality.....	10
5.4 Contaminated Land.....	11
5.5 Noise and Vibration.....	12
5.6 Waste Management.....	13
5.7 Habitats and biodiversity	14
5.8 Climate Change	15
6. Social Responsibility & Sustainability.....	16
7. Progress On 2003/4 Targets	18
8. Objectives for 2004/5 and beyond.....	24

1. Managing Director's Statement



I am pleased to introduce London Underground's Environment Report for the period 2003/04. The report explains the environmental impacts of our organisation and how these are managed in order to achieve continuous environmental improvements.

This report comes at the end of the first full year with the Public Private Partnership (PPP) contract in place. LU have been working closely with the three private sector Infrastructure companies, Tube Lines, Metronet Rail SSL and Metronet Rail BCV, to improve the reliability of our services and the ambience of our stations and trains. It is our aim to ensure these improvements are realised in an environmentally friendly and sustainable way.

We have made significant progress against the plans we set out in 2003, displaying our commitment to improving the management of our environmental impacts over time. This progress is summarised in the tables at the end of the report. One of the major achievements for this year has been the launch of Oyster cards, which has cut down considerably the number of paper tickets issued to Tube users and reduced waste.

Another key success is the improvement of energy efficiency in our stations. We continue to increase our energy savings year on year, this year exceeding our target by saving 20.9% against baseline figures.

A significant amount of electricity is consumed whilst operating our underground rail service. The total amount of electricity consumed has risen again this year and is expected to continue to rise over the next few years. Increased electricity consumption is essential in order for us to continue to improve our business and provide a world class tube for London. To reduce the environmental impact of this increased consumption, we have increased the percentage of electricity purchased from renewable sources.

There is much more work to be done to control and reduce our impact on the environment, and we continue to set ourselves stretching objectives for the coming year. I am confident that we will meet future challenges and continue to provide a transport system with clear environmental and sustainable benefits.

2. 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 operates seven days a week and now covers most of London (primarily north of the Thames) and parts of Buckinghamshire, Hertfordshire and Essex.

We own and operate 255 stations and have agreements to utilise another 20 owned by Network Rail or other Train Operating Companies (TOC's). At any one time we may have as many as 500 trains running across our 856 kilometres of track on 12 different lines. Currently we employ approximately 13,000 full time staff. If we were to include the staff employed by our main contractors and partners, this figure would rise to approximately 28,000. All this enables us to move 3 million passengers around London on a daily basis.

The LU network has been constrained by an investment backlog that has built up over many years. The Public Private Partnership (PPP) has been established to secure long-term sustained levels of investment that the LU network needs. The last of three PPP contracts was signed in April 2003. Under the PPP we remain a publicly owned operating company, but the maintenance and renewal work has been transferred to three Infrastructure companies: Metronet Rail BCV, Metronet Rail SSL and Tube Lines. Metronet Rail BCV is responsible for maintenance and renewal of the Bakerloo, Central, Victoria and Waterloo & City lines. Metronet Rail SSL is responsible for the maintenance and renewal of the 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.

On completion of the PPP contracts, LU moved under the control of Transport for London (TfL). TfL is a public body responsible for managing all modes of transport and implementing the Mayor's Transport Strategy for London.

In April 2004 TfL produced their annual environmental report for the London Assembly Environment Committee. For the first time LU was a contributor to this report which outlines TfL's contribution to implementing the Mayor's Environmental Strategies.

3. Environment and Energy Policy

London Undergrounds environment and energy policy is outlined below.

Environment and Energy Policy



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

Environmental Management Systems (EMS) are essential to enable a company to manage its environmental performance and control the impacts of its operations, activities or products. London Underground's EMS is well developed and has been in existence for many years. Due to the changing nature of business, legislation and LU's own operations it is essential that the system is constantly reviewed and improved to ensure sound environmental management of all our activities.

Progress made during 2003/4

This year LU's environmental policy was reviewed and updated to include our commitment to manage energy consumption. Also, our integrated Health Safety and Environmental Management System (HSEMS) suite of documented procedures has undergone an extensive review. The review resulted in a streamlined suite of documents, reducing the total number from 145 to 40. It also eliminated duplication and greatly simplified many of our core processes allowing our staff to better understand their requirements.

LU's ability to manage its potential environmental impacts has continued to progress this year. The infrastructure companies; Metronet BCV, Metronet SSL and Tube Lines are continuing to develop their environmental management systems to meet the requirements of ISO 14001, the international standard for environmental management systems. Under the PPP contract they are obliged to have their environmental management systems certified to ISO 14001 by April 2006.

Metronet have maintained their existing local certifications, undertaken a company-wide gap analysis, identified their environmental risks and developed an implementation plan to mitigate these risks.

Tube Lines have reviewed their existing environmental risk assessments and updated them in line with current operations and work practices, undertaken a detailed assessment of all potential contaminated land, and continued to work towards their deadline to achieve certification of their management system ISO 14001.

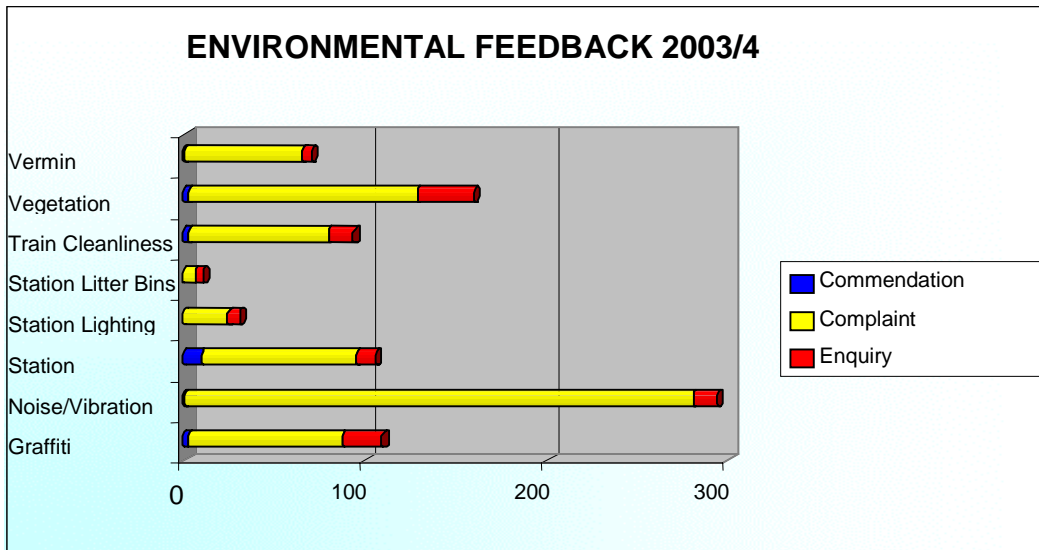
An Environmental Forum Working Group consisting of environmental managers and advisors from Metronet BCV, Metronet SSL, Tube Lines and LU continues to meet on a six weekly basis to ensure consistency of approach and share best practice. Annually, senior managers from the infrastructure companies and LU meet to review environmental progress and set future targets and objectives.

Environmental issues are monitored on an on-going basis. The environmental section of the quarterly Health, Safety and Environment report gives the LU board an indication of the environmental progress and raises awareness of any emerging trends. In addition, ad hoc reports are presented to the joint LU and infrastructure companies Safety and Standards Partnership Group. The group is composed of senior Safety, Quality and Environment managers from LU, Metronet and Tube Lines.

Since April 2003, LU has been part of Transport for London (TfL). As a result, work has been undertaken to ensure commonality of environmental management and reporting across the different modes of transport within TfL. The Environmental Liaison Group (ELG) formed of environmental managers and advisors across the modes meet on an eight-weekly basis. In addition to ensuring a commonality of approach, the group has set targets to implement the Mayor's environmental strategies and shares best practice. The ELG also monitors performance and reviews opportunities for improvement.

Communication is an essential part of a good Environmental Management System. LU's Customer Service Centre is dedicated to ensuring there is ongoing communication between us, customers and other interested parties. The contact we receive from our customers is classified into three categories, complaints, enquiries and commendations. The graph below shows the number of customers contacting LU with regard to environmental issues over the past year.

Noise and vibration is the environmental issue about which LU receives by far the most complaints. The noise and vibration section of this report outlines the work has been undertaken to manage noise and vibration associated with our operations.



No formal action has been taken against LU this year by Environmental Regulators, although there has been increased attention about graffiti and its removal.

Work has commenced with Metronet and Tube Lines to develop more detailed categories for the classification of environmental incidents, complaints and inspections. These categories will be based around our potential environmental impacts and improve our ability to monitor our environmental performance. Further work is required to implement these and provide training and instruction to appropriate staff.

With the commencement of the PPP, LU has undertaken a review of the Quality, Environment, Safety and Health (QUENSH) contract conditions. The purpose of QUENSH is to ensure that all goods and services are procured and contracts managed in a safe and environmentally sensitive manner to an acceptable standard of workmanship. It covers such areas as assessment of environmental impacts, contents of an environmental plan and aims to minimise potential environmental damage e.g. noise and vibration, air and water pollution, land contamination and biodiversity.

Last year we purchased a total of £4.5m of products and services from companies with a recognised management system certified to ISO 14001. This figure does not include spend with low level registered suppliers where such constraints may be damaging to their business.

Objectives for 2004/5:

- Undertake environmental risk assessment of all LU operations.
- LU and Metronet to agree the scope of the Environmental harm assessment.
- Revise classification of environmental incidents, complaints and impacts.
- Strengthen our environmental quarterly report to include a series of Key Performance Indicators.
- Metronet and Tube Lines to progress implementation of ISO14001 such that certification is achieved by April 2006.
- Review company standards to ensure they capture environmental requirements.

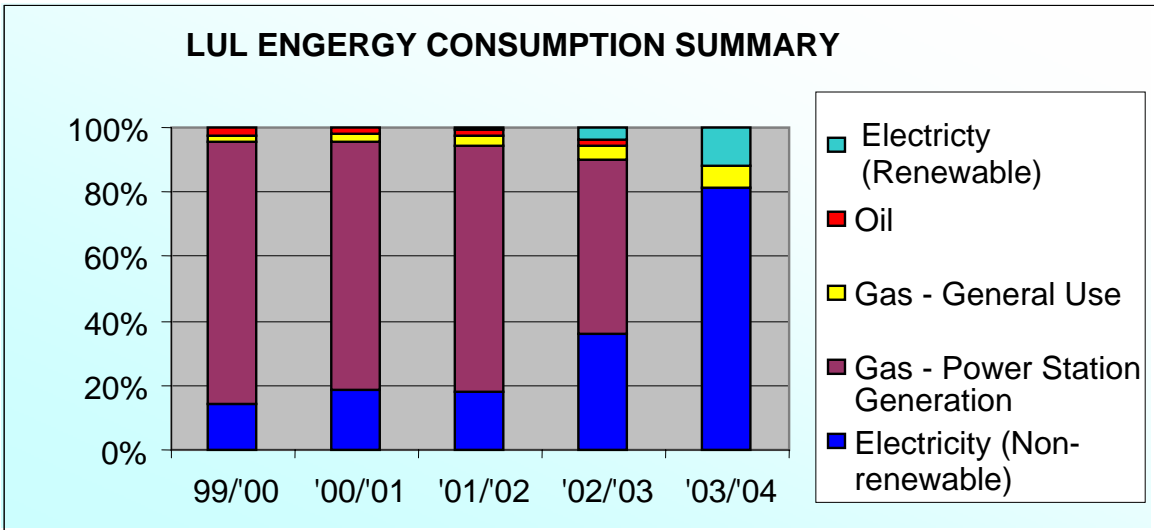
5. Significant Environmental Impacts



5.1 Energy

LU used approximately 3.5% of the total electricity used in London (1087 Gwatts) last year. 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.

Progress made during 2003/4



LU strives to reduce energy consumption by implementing efficiency measures. As part of the refurbishment of three of our major train crew and office facilities, daylight and motion sensitive lighting has been installed. Additionally two of the sites now have energy efficient condensing boilers installed.

We also purchase as much electricity from renewable sources as is economically viable. The LU Environment and Energy Policy gives clear direction for the purchase and use of energy. The graph above illustrates the range of fuel sources utilised by LU.

Being the largest consumer and purchaser of energy within TfL, LU has led a strategic review of energy usage and procurement during 2003. Discussions were held with other modes to understand usage and investigate opportunities for further efficiency.

As a result of the review, non-essential equipment is now switched off when not required, eg: power rectifiers (convert traction current to DC), escalators and lift motors. In addition, greater efficiency has been achieved by upgrading metering to take advantage of lower contract rates. LU now purchases 14.19% of its electricity from renewable sources.

In December 2003 LU's head office, 55 Broadway won inclusion into the Energy Efficiency Accreditation Scheme. The scheme monitors standards of management commitment and investment in energy efficient measures and progressive improvements in standards. Many other LU offices, were among the 35 sites in TfL's portfolio accredited with the prestigious award from the Energy Institute.



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 17.5% against a baseline was surpassed with a record 20.9%.

However, our total electricity consumption has risen again for the 3rd year in a row to a total of 1087 Gigawatts, which also raises our watt-hour per passenger km figure from 152 to 160. This trend is expected to continue in the future, as more electricity will be required to undertake the renewal works required as part of the PPP contract. In addition our new fleet of trains will require additional electricity to operate cooling units and to increase the frequency of the service.

Objectives for 2004/5:

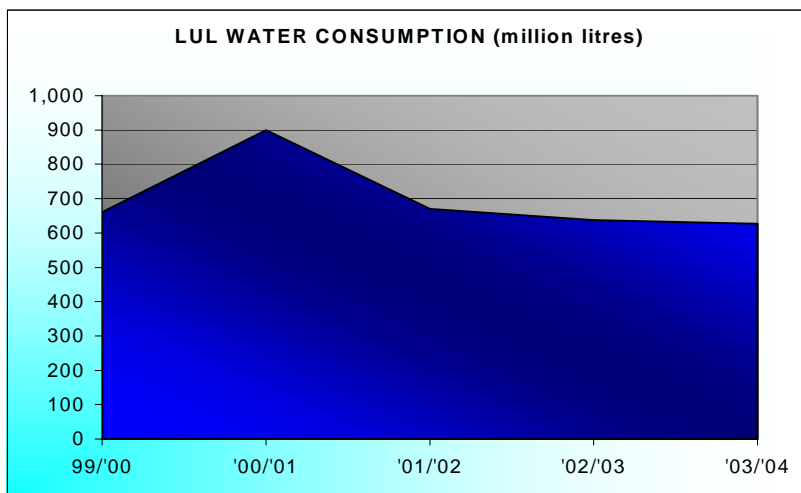
- Maintain our stations energy savings target at or above 20% against the baseline figure.
- Maintain our target of all offices, stations and depots to be powered from 100% renewable energy sources.



5.2 Water

London Underground's primary use of water is for cleaning and catering at our offices, stations and workshops. In our depots, water is used for washing trains and cleaning.

Progress made during 2003/4



The increase in consumption noticeable in 00/01 was due to a major water leak at Hainault Depot. Although this was detected early by our Energy Monitoring Department the leak proved difficult to locate on site.

Over the past year we have reduced our average consumption from 15.7m³ to 13.9m³ per person. This represents a reduction of 22%, however a reduction of 11% in office population may account for some of this reduction. Four of our sites are already exceeding the GLA target of 11m³ used per person within offices by 20%.

At our offices, stations and workshops, we work closely with our staff to reduce unnecessary water usage and have implemented a reporting mechanism whereby all leaks and drips can be promptly repaired. Over 260 of our sites are now monitored on a weekly basis, enabling us to spot erratic usage. We continue our program of installing water saving devices during office refurbishment. At our recent refurbishment of the Premier House Train Crew Facility and Townsend House offices we introduced lower water content cisterns. We continue to investigate emerging technologies that could further reduce our water usage

The London deep aquifer water table is rising, due in part to the reduction in water consumption from bore holes. The effect of the rising water table and leaks from water mains within London causes ingress of water in tunnels throughout the LU network. To deal with this we have a network of 1030 pumps at 630 locations and pump approximately 30 million litres of water per day from our tunnels.

To address the future effect of London's rising water table, LU has continued working with the GARDIT (Ground Aquifer Research & Development Implementation Team) project. The project has continued under the TWU (Thames Water Utilities) 5 year pumping strategy to address control and utilisation of the deep aquifer under London. This has provided LU with a further understanding of the physical impact of rising groundwater and improved relationships and knowledge sharing with other bodies such as Thames Water

Objectives for 2004/5:

- Meet GLA target of less than 11 cubic metres water consumption per employee per year in offices.
- Utilise GARDIT modelling predictions to assess the likely future impacts on our network.



5.3 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 to London's air quality.

Progress made during 2003/4

This year LU asked the Institute of Occupational Medicine (IOM) to investigate the possible long-term health effects on LU employees of airborne tunnel dust. The aim of the study was to characterise workers exposure to dust, the particle size and composition of dust and the effects of it on the human lung. The study also made comparisons between tunnel dust and other known dusts to assess its harmfulness and give guidance on health risks of long term exposure.

The IOM concluded its study in a report to LU entitled "Assessment of health effects of long term occupational exposure to tunnel dust in the London Underground". The report concluded that dust on the Underground is:

- Highly unlikely to cause serious damage to the health of London Underground workers
- Highly unlikely to be damaging to the travelling public; and
- There is no need for more research at the moment but its conclusions should be kept under review.

The report is available in full on the LU Internet site [CLICK HERE](#)

We have developed an internal dust monitoring procedure to ensure that regular monitoring of the levels of dust and any changes can be highlighted.

Tube Lines operate our fleet of support vehicles which includes six refuse collection vehicles and nine emergency response vehicles all of which run on ultra low sulphur diesel. The fleet is comprised of:

Euro I	19
Euro II	10
Euro I+CRT	1
Euro II+CRT	7
Euro II RPC	3
Euro III	1
Euro III+CRT	6
Euro IV	0

Euro engines are low pollution/low noise. Vehicles with Euro IV engines give rise to the least pollution/noise.

CRT – continuous recirculating traps.

RPC – reduced pollution certificate

Objectives for 2004/5:

- Conduct 04/05 programme of dust monitoring.
- Tube Lines to replace 20% of large goods vehicle fleet with ultra low sulphur diesel Euro III or above standard vehicles.
- Tube Lines aim to source and implement use of sulphur free diesel for Acton based large goods vehicles.
- Tube Lines to reduce CO2 emissions from Acton based pool vehicles by 20%.
- Tube Lines to work with TfL to meet objectives set in their EIP regarding trialling alternative fuelled vehicles and selecting the quietest, alternatively fuelled vehicles of TfL managed fleets.



5.4 Contaminated Land

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 due to changes in legislation and social acceptance are no longer permitted, however most land contamination is as a result of historic operations and activities on the site prior to LU ownership. For example, Stonebridge Park depot now occupies the land, which was once the site of a coal fired power station. Although in this instance LU has carried out extensive research into the extent of contamination, at many other sites there is insufficient knowledge of past contamination.

In order to ensure compliance with legislation and minimise risk, LU aims to understand fully the extent of contamination on all property and to take remedial action where it is necessary to do so.

As part of the PPP contract and in accordance with good industry practice Metronet BCV, Metronet SSL are required to carry out an assessment of sources of environmental harm arising from land they manage on behalf of LU. As part of this assessment, any contaminated land will be identified and any remedial action will be recommended.

Progress made during 2003/4

Over the past year, Tube Lines has carried out detailed site investigations to identify the presence and extent of contamination at approximately 30 sites across the LU network that they manage. The locations were varied in nature ranging from complete depot sites to specific locations on the track with an identified higher risk, such as point heaters or track lubricators. Contaminants were found at 16 locations and these findings were assessed for their potential to cause harm to the environment or human health. Only one of these locations was found to require remediation work, although at five other sites an ongoing monitoring programme has been put in place to assess the stability of the current situation.

Objectives for 2004/5:

- Tube Lines to undertake remediation at West Ruislip and continue to monitor 5 sites of potential risk.



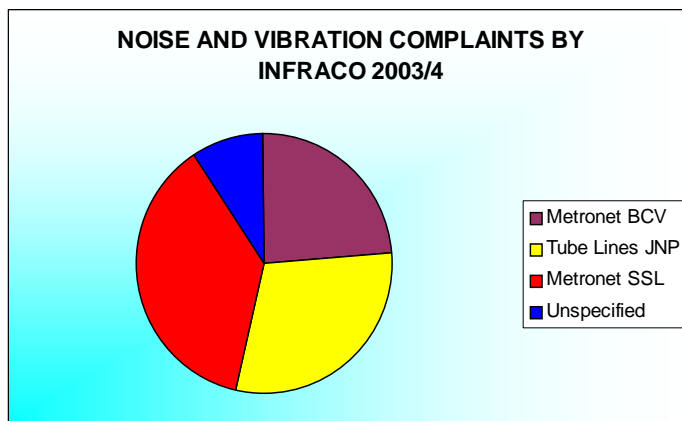
5.5 Noise and Vibration

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, tannoy announcements and distribution vehicles.

LU takes 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, for example the issue of 'wheel squeal' at Bank station.

Progress made during 2003/4

With the introduction of the PPP contract there will be a large increase in engineering and construction works over the coming years. Metronet and Tube Lines have undertaken steps to mitigate the effects of noise and vibration from these works. These steps include; better communication with the public of impending works, better management of contractors to reduce noise and vibration on site, establishing stronger links with Local Authorities by informing them of our works programmes, expected noise levels and mitigation measures, and responding speedily and effectively to any customer complaints. Customer complaints regarding noise totalled 280 from periods 1-13 and commonly over 40% of all complaints received by Metronet and Tube Lines relate to noise and vibration. LU is working to improve categorisation of noise and vibration complaints, to enable us to focus our noise reduction programmes more effectively in the future.



The graph shows how the total noise and vibration complaints were divided between the three infrastructure companies. Metronet SSL received the most complaints during last year.

Over three-quarters of the total complaints about noise and vibration received by LU's Customer Service Centre last year related to trains, or construction maintenance works. Consequently much of the resource LU's spends on mitigating noise and vibration issues are targeted on these two areas.

All three infrastructure companies take the issue of noise and vibration seriously, any noise complaints are investigated and where improvements are identified, appropriate remedial action is taken. Metronet BCV, Metronet SSL & Tube Lines all undertake a programme of works which identifies those sites where operational knowledge indicates are problematic and take actions to mitigate. One of the major sources of operational noise is generated from the contact of wheel and rail on track curves, this is commonly known as wheel squeal. On the Hammersmith & City line, 110 curves have been identified and measurements are undertaken every 10 weeks. These measurements indicate that further action is required. One course of action is track lubrication which is the application of grease onto the track to reduce friction. On the District Line there are 216 fixed lubricators. Tube lines are undertaking an extended trial across a whole line of new lubrication grease. In addition to improved performance the grease is truly bio-degradable and has zero toxicity.

Noise and vibration blankets have been installed in the tunnels between Gloucester Road and High Street Kensington. The acoustic blankets reduce the transmission of wheel noise to adjacent domestic properties. This has contributed to a sustained control of noise to the satisfaction of local residents. 5-10

decibel improvements are being noted at various properties and LU are making every effort to sustain these improvements.

As an ongoing commitment, LU has led the European Union CONVURT (CONTRol Of Vibrations from Underground Rail Traffic) project to achieve a greater understanding of underground rail noise and vibration with the aim of limiting its transmission. The group's findings are due to be published in Autumn 2004. Further information can be obtained from the CONVURT project website www.convurt.com



Objectives for 2004/5:

- Complete the publication of the findings from the CONVURT project.
- Produce a programme of options to implement recommendations arising from the CONVURT project.
- Undertake wheel/rail management e.g. rail grinding and track lubrication at noise problematic locations across the network.

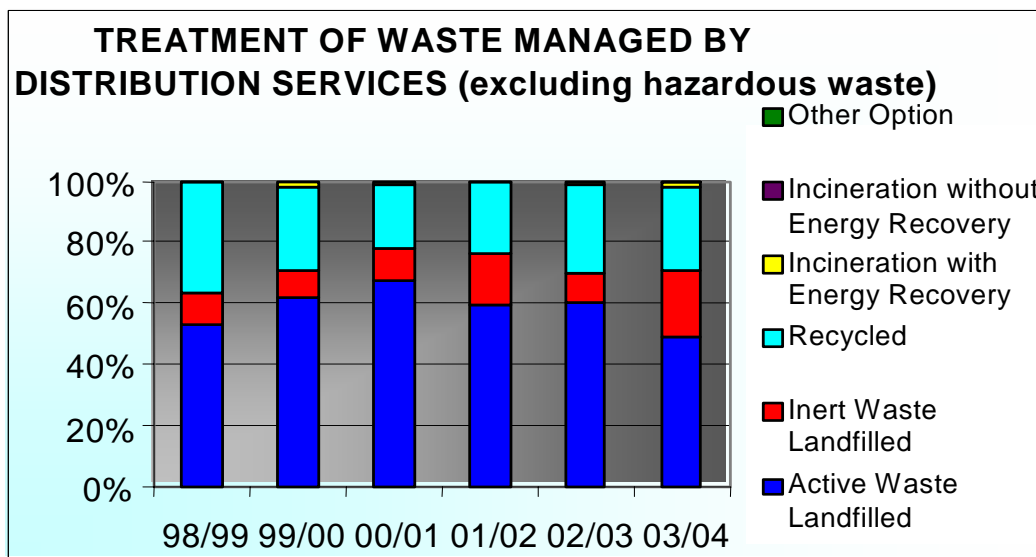


5.6 Waste Management

London Underground is committed to waste minimisation and explores further opportunities for the recycling of waste. Sources of waste generated by LU and the Infraco's includes waste from offices, 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 2003/4

The graph below shows waste collected from across the LU network and its disposal route. We currently recycle 27% of the total solid waste we produce.



A contributing factor in the reduction of paper waste generated by LU came with the introduction of Oyster cards which has reduced the use of paper tickets. Oyster cards are now available not only to LU staff but also to our customers. There are currently 110,000 Oyster staff passes in circulation and 813,000 retail

cards have been issued since the launch in July 2003. In addition 900,000 Oyster Freedom Passes have been enabled. This has cut down the issuing of paper tickets considerably; by July 2004 the issue of magnetic paper tickets had fallen by at least 225,000 per period and continues to fall.

LU have worked jointly with Creatively Recycled Empire Ltd (CRE Ltd) to recycle two tonnes of waste seat covers produced during train refurbishments. 5, 833 tube seats have been recycled into a range of products. Products include sofa cushions, dog jackets and slippers. These products are available from a range of outlets including the Natural History Museum, charity store T.R.A.I.D. and London's Transport Museum.



Following on from this year's radical overhaul of the Health, Safety and Environmental Management System, a total of 300 volumes of the old manuals weighing a third of a tonne have been collected for recycling.

📌 Objectives for 2004/5:

- Implement pilot project to recycle office paper and newspapers at stations.
- Implement a battery recycling scheme at LU office sites by December.
- Establish costs for a cardboard separation scheme at offices.
- Tube Lines Distribution Services to continue to work towards a target of 18% recycling of mixed municipal waste by 2005/6.



5.7 Habitats and biodiversity

Fostering London's bird life



Staff at Metronet's Track Workshop are working with the Royal Society for the Protection of Birds and the London Biodiversity Partnership to provide nestboxes for a variety of birds.

The boxes are being made from plywood and packing offcuts that would otherwise incur a £60 a tonne charge for disposal and are installed at suitable locations across the network.

Over half our network is above ground and the vegetation to either side of the track acts as an essential green corridor allowing plants and animals to migrate into to and out of London. LU owns approximately 4,000 hectares of line side vegetation with a wide range of species including Mature Oak, a variety of grasses and wild flowers, badgers, bats, slow worms, frogs and toads.

The protection of wildlife and biodiversity is of high importance to LU. Since the start of the PPP in 2003 Metronet BCV, Metronet SSL and Tube Lines have been responsible for the maintenance of all trackside vegetation. LU has standards governing how to manage vegetation and also standards governing what species should be encouraged or deterred. In accordance with these standards, planting usually takes place in the spring following completion of engineering works. For every tree that is removed for essential engineering works, two new trees are planted.

Progress made during 2003/4

On completion of works to increase the life expectancy by 40 years of a 110 year old bridge that links West Ham to Bromley By Bow, Metronet partnered with the Lea Rivers Trust to enhance local biodiversity. Metronet has provided resources and financing

to produce willow hurdles and floating reed beds. The willow hurdles improve bank stability and the floating reed beds create habitat for Coots, Moorhens and other waterfowl.

📌 Objectives for 2004/5:

No specific objectives have been set for 2004/5. Established arrangements will continue.



5.8 Climate Change

The term 'climate change' refers to the noticeable warming of the average global temperature. 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. In addition there is evidence that sea levels are rising and world-wide rain and weather patterns are changing. Climate change can be attributed to natural causes and to the activity of man eg: the burning of fossil fuels which emit CO₂ into the atmosphere.

It is predicted that the effect of climate change in London will result in hotter summers and wetter, milder winters. Unless preventative steps are taken, this shift in our climate may impact on our ability to deliver a safe and reliable transport system for London. In future there is likely to be more instances of flash flooding with the potential to flood stations and cause infrastructure damage. Hotter weather could increase the risk of rail buckling and create hotter conditions for customers travelling on our system. The warmer weather could lead to an increase in the length of the growing season for vegetation. This coupled with rainfall and autumn winds could lead to trees being blown down across the track and excessive leaf fall resulting in low adhesion and ineffective braking.

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.

Progress made during 2003/4

LUL is a member of the GLA (Greater London Authority) project examining the effects of climate change on the London transport network. LU has provided historical data to enable the prediction of certain events e.g. how customer choice of transport varies with changing climate or the likelihood and cost of station closures due to flash floods. The possible adverse effects of climate change have also been assessed and have been included in LU's risk register.

With hotter summers come increased temperatures for customers travelling on the network. The fundamental issue is that the vast majority of the Tube network was built long before air-conditioning was invented and consequently no provision was made for its installation. This becomes a particular issue with the deep-level Tubes, as they are old and often insufficiently ventilated. This means on the deep level Tubes, there is very little space for air-conditioning on the trains, outside or inside, where the air conditioning units would take up valuable passenger space. A new fleet of trains with air-cooling have been commissioned for the sub-surface lines (Circle, District, Hammersmith and City, Metropolitan and East London lines), these are due to enter passenger service in 2009.

It should be remembered that air-conditioning units in themselves are often not environmentally friendly, due to the amount of energy they use. Installing a number of these could dramatically increase the Tube's energy consumption.

Consultants have been commissioned to look into options for providing additional ventilation and cooling, and they have submitted their reports to LU for review. Further work will be undertaken this year to assess their recommendations and develop a strategy.

LU has been working on a pioneering project with South Bank University (SBU) on cooling the Tube and has developed a working engineering design. The design would pipe cold ground water through the Tube tunnels, which would act as a reverse radiator, soaking up the heat; this would be then flushed out of the system. We hope to have a trial in place for next summer, subject to approval by both LU's safety experts and Her Majesty's Railway Inspectorate.

LU is also involved in another study by Newcastle University into the effects of climate change on embankments and earth structures. So far, a good correlation of theoretical impacts and actual measurements has been established.

The Mayor initiated a "Cooling The Tube" competition and challenged people to develop an innovative and workable solution to cool the tube with a potential total prize fund of £100,000. LU received 3400

entries from 60 countries posing around 45 different main solutions with many variations on these. Many of the entries were considered impractical, however a few are being taken forward for further consideration. The next stage will be to draw-up a short list for further detailed study in conjunction with the entrants.

Although no long-term solution to cooling the tube will be delivered this year LU are taking a number of actions during the summer to help Tube passengers "Beat the Heat." This includes giving Tube passengers hot weather advice through posters, passenger announcements, the LU website and the Metro page, and also, giving out free bottles of water to passengers as they exit the stations as part of a water promotion.

A contributing factor to climate change is CO₂ emissions from energy use. As outlined in the energy section of this report, LU recognises the need to be proactive in reducing the environmental impact of its energy consumption, by saving energy and procuring less damaging forms of energy. Additionally, trees planted across the LU network as part of our continuing embankment stabilisation works absorb carbon-dioxide.

Objectives for 2004/5:

- Conduct a safety assessment for the cooling scheme resulting from the work with South Bank University.
- Assess reports on the problems with heat on our system and develop an improvement strategy.
- Identify the implications for LU of the GLA London Climate Change Partnership



6. Social Responsibility & Sustainability

Backed by the Government, the GLA want organisations to comply with the principles of sustainable development. Under the guidelines environmental, social and economic criteria are to be considered equally. Sustainability is now a key factor in political and corporate decision making.

This environmental performance report has naturally focused on environmental issues, but in the wider context of sustainable development, there are a range of LU activities of note. These include; managing diversity, accreditation to Investors in People, supporting urban regeneration through new transport infrastructure provision, promoting the Underground, improving accessibility of public transport, and raising funds for charity and local initiatives. This section contains just a few examples of LU's actions over the past year that have either put something back into the community or have contributed to a more sustainable society.



Operation Rhino, set up by the British Transport Police to combat vandalism on the Underground, has continued to prove a major success. Since the initiative's introduction in 2000 it is estimated to have saved LU over £1 million in repair costs and lost fares by reducing vandalism. Measures such as foot and helicopter patrols and plain clothes dog handlers has reduced such crime by 45% on the District Line alone during 2003/04.

Combating Graffiti: This year Metronet removed all non-scratched graffiti from trains on the Circle and Hammersmith & City lines. A team of 19 mobile graffiti removal staff have removed around 30,000 interior graffiti tags in total. On an average day, 276 train carriages are vandalised with 200 tags. This is the first time that graffiti has been wiped out on Sub-Surface line trains. A teenage graffiti vandal who caused more than £22,000 damage to Tube trains and buildings over an eight-month period has been given a two-year prison sentence – one of the stiffest penalties for graffiti ever handed out. He was arrested by British Transport Police (BTP) after being caught on CCTV. Another offender has been fined

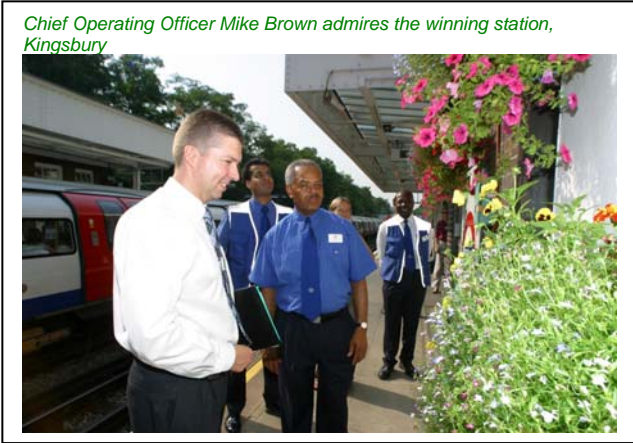
£5,000 for causing criminal damage to trains and stations on the Northern and Victoria lines, and various tube depots; he was also placed under an 18-month Community and Rehabilitation Order.

Fones 4 Safety: Tube Lines has joined Elephant and Castle's fones4safety initiative by contributing 50 mobile phones. The scheme turns reconditioned mobiles into personal safety alarms with instant access to 999 (Emergency Services) at the touch of any button. The phones can also receive incoming calls for reassurance and are provided free of charge to 'at risk' individuals, such as victims of crime and harassment and those living in fear of crime, particularly domestic violence victims. Other vulnerable people who can benefit include the elderly, sick and disabled. Any phones that cannot be re-used are responsibly recycled. The scheme has funding from the Association of London Government for a feasibility study into its expansion to other London boroughs.

Station Garden's Competition: Twenty-one stations are taking part in the competition with many staff often working in their own time and providing their own plants. The splash of colour delights passengers and makes the station environment more pleasant to travel and work in. The 2003/4 winner was Kingsbury station on the Jubilee line and the final of the 2004/5 competition takes place in August.

Preventing suicide: LU has committed to a programme aimed at significantly reducing the occurrences of people on track and people under train. A pilot initiative launched at Mile End has been particularly successful and reduced an average of four suicide attempts a year to zero. The programme identified hotspots and implemented a range of measures including: erecting Samaritan posters, upgrading existing BT phones to include a one button helpline to the Samaritans, installing improved CCTV, working with local mental health units to identify those at risk and listening to staff and encouraging them to take an active role in preventing suicides.

Working with Charities: LU has a Charity Co-ordinator who liaises with approximately 300 separate charities wishing to access our system to collect money. There are approx. 15 -20 collections every day across our network. Some of the bigger charities have 'flag days' when they are out in force at several of our stations and on the streets around the capital collecting for their good cause. LU carries out various checks both on the individual collecting and on the charities to ensure our customers donations are going to the causes intended. Only a registered charity or local schools and churches are permitted to carry out collection activities on LU property. Although these collections are for good causes we recognise that some of our customers would prefer not to be impinged upon on a regular basis. For this reason we allow charity collections no more frequently than one day per week at any station. Collections are only ever permitted in the ticket hall. An example of the generosity of our customers and the dedication of the collectors is that of the collection for Richard House Children's Hospice in Beckton. A total of £18,992 was collected at four separate stations between January and April.



7. Progress On 2003/4 Targets

	TARGET	ACHIEVED	OWNER	PROGRESS SUMMARY
Environmental Management System	<i>Undertake review of Quality, Environment, Safety and Health (QUENSH) contract conditions</i>	✓	LU SQE	Revised version of QUENSH issued Feb 2004.
Energy	<i>Energy efficient stations – consideration of measures such as the use of solar panels on stations to improve our energy efficiency</i>	✗	LU CPO	Due to budget constraints and other business priorities this target was not progressed during 2003/04 for the same reasons it is unlikely that this will progress in 2004/05.
	<i>Increase our stations energy savings target to 17.5% against a baseline figure</i>	✓	LU CPO	Last years target of 17.5% was surpassed with a 20.9% saving against baseline figures.
	<i>Implement recommendations from strategic energy review</i>	✓	LU CPO	Electrical equipment within our power distribution network has been reviewed and non-essential plant switched off.
	<i>Maximise % of energy procured from renewable sources when awarding energy contracts, to work towards all offices, stations and depots, being powered from 100% renewables</i>	✓	LU CPO	LU's contract for traction current was put out for tender and we secured 10% of this electricity from renewable sources. Approximately 99% of all electricity consumed by London Underground Offices, Stations and Depots is procured from renewable sources.



	TARGET	ACHIEVED	OWNER	PROGRESS SUMMARY
	Set a target of 17% for total renewable energy purchased	✗	LU CPO	Due to the timing of the placement of one of our energy contracts this target was not achieved. Our final year actual was 14.19%, however, if calculating a forward date shift to include contract commencement at the start of 2003 our actual would have been 17.17%
Energy cont.	Include all TfL electricity supplies within LU's renewable energy contracts	✓	LU CPO	All known TfL electricity supplies have been included within LU's electricity contract.
	Produce a new LU Energy Policy	✓	LU CPO	A New LU Environment & Energy Policy was published June 03. This forms the foundation of our company energy management and gives LU clear direction in its use and purchase of energy.
Water	Investigate areas of high water demand with our partners, and look to agree consumption reduction targets within depots	✗	LU CPO/ METRONET/ TUBE LINES	A monitoring programme has been established with our partners Metronet and Tubelines to baseline water consumption at 5 of our depots. However targets have not been set for these 5 depots and the remaining 7 have not established baseline consumption figures. This target is unlikely to progress during 2004/05 due to other business priorities of Metronet and Tube Lines.
	Continue to support GARDIT (Ground Aquifer Research & Development Implementation team)	✓	LU CED	The result of the work undertaken as part of the GARDIT project has provided LU with a further understanding of the physical impact of rising groundwater. The project has also improved relationships and knowledge sharing with other bodies such as Thames Water.
	Continue to install water saving devices during refurbishment's	✓	TfL GROUP FACILITIES	Our programme of installing water saving devices during refurbishment's has helped reduce our overall consumption by 22%
Air Quality	Publish & implement the air quality monitoring standard	✓	LU SQE	A Safety, Quality and Environmental air quality monitoring process has been developed and released for implementation.
	Publish the Institute of Occupational Medicine Study	✓	LU SQE	The report is available to the public and can be obtained from the LU's intranet site.
	Infracos to investigate improvements to the tunnel cleaning regime	✓	METRONET/ TUBE LINES	A deep cleaning tunnel programme has been undertaken across the network, which includes Litter picking, turning ballast and the use of back pack drum vacuum cleaners.

	TARGET	ACHIEVED	OWNER	PROGRESS SUMMARY
Contami nated Land	Identify the presence of Land Contamination	✓	TUBE LINES	Tube Lines carried out investigations to identify the presence and extent of contamination at each of the 26 sites across the LU network that they manage.
Noise and Vibration	Improve our wheel/rail lubrication regimes	✓	LU CED	Wheel-railhead management at specific LU sites has achieved a 5-10db improvement in noise and vibration. LU is making every effort to sustain these improvements.
	Consider the feasibility of using new technology on track support to limit vibration transmission from rails to the supporting structures	✓	LU CED	Noise and vibration blankets were installed on the covered ways between Gloucester Road and High Street Kensington to the satisfaction of local residents. The group findings and deliverables have now enabled Supply Chain to produce a new pandrol support with increased capacity for absorption of Noise and Vibration. The product will go to market from the manufacturer in 2004/05 and will be available for future rail head support and acoustic control.
	Work on developing a predictive monitoring tool to forecast impacts arising from wheel/rail induced noise and vibration	✓	LU CED	LU has led the European Union CONVURT (CONtrol Of Vibrations from Underground Rail Traffic) project to achieve a greater understanding of underground rail noise and vibration with the aim of limiting its transmission. The group's findings are due to be published in Autumn 2004. Further information can be obtained from the CONVURT project website www.convurt.com
	Work with government to produce noise maps of the Underground network	✗	LU CED	LU has worked to promote the extent of noise mapping that is required adjacent to our network. Although some noise maps have been produced the project has been shelved due to the reprioritisation of funding.
Waste Manage ment	Introduce a paper recycling service on stations	✗	LU CPO	A feasibility study was undertaken and a paper submitted to LU board for financing of a pilot programme. The proposal was rejected on the grounds of security, as having static bins increases the risk of concealed explosive devices being left on the station. Other alternatives are being examined which will negate a possible risk to station security.

	TARGET	ACHIEVED	OWNER	PROGRESS SUMMARY
	<i>Work with current waste contractors to maximise recycling of waste</i>	✘	LU/ TUBE LINES	Although our waste contractor has undertaken much work to meet this target, the percentage of solid waste recycled this year fell by 2%.
Waste Management cont.	<i>Investigate the possibility of recycling CCTV videotapes as part of the contract</i>	✓	LU CPO	Investigated but the tapes can not be reused as this affects quality.
	<i>Work with London Remade to identify further opportunities for green procurement</i>	✓	LU CPO	LU has identified some opportunities to procure recycled products, unfortunately no products have been purchased during 03/04. LU will continue to develop ideas and opportunities to work with London Remade.
	<i>Introduce Oyster cards across the network to reduce the need for paper based tickets</i>	✓	LU M&P	813,000 retail cards have been issued since the launch of Oyster in July 2003. In addition 900,000 Oyster Freedom Passes have been enabled. The issue of paper tickets has fallen by at least 225,000 per period and continues to fall.
Heritage, habitats and biodiversity	<i>Continue tree-planting regimes</i>	✓	METRONET/ TUBE LINES	LU standards detail which native tree species to plant. This usually takes place in the spring after engineering works have finished. For every tree that is removed for essential engineering works, two new trees are planted.
	<i>Review our current standards to identify further opportunities for the use of FSC certified hardwoods</i>	✓	METRONET	Our hardwood suppliers have been reviewed and we are now in the process of changing to a supplier who can provide the correct quality of product from FSC sources.
	<i>Use waste wood from depots to make bird boxes to be put up over the network</i>	✓	METRONET	Metronet Lillie Bridge Workshops constructed 250 bird boxes in conjunction with an RSPB project using off cuts of wood, (waste from their engineering and manufacturing activities). These were installed at suitable locations across the network.

	TARGET	ACHIEVED	OWNER	PROGRESS SUMMARY
	<i>Fund the Lower Lea Trust in the production of floating reed beds to enhance the biodiversity of the river Lea (District Line)</i>	✓	METRONET	Metronet provided resource and finance to support the Lea River Trust in producing willow hurdles and floating reed beds to promote bank stabilisation and increase scarce habitat for local wildlife.
Climate Change	<i>Work with GLA Climate Change Partnership</i>	✓	LU SQE/ CED	LU is a member of the GLA project to look into the effects of climate change on the London transport network. LU has provide historical data to enable prediction of certain events e.g. how customer choice of transport varies with changing climate or the likelihood and cost of station closures due to flash floods
	<i>Contribute to the Newcastle University study into the effects of climate change on embankments/earth structures</i>	✓	LU CED	Good correlation of theoretical impacts and actual measurements has been established. Knowledge and understanding has been captured for future use.
	<i>Re-evaluate our risk register</i>	✓	LU SQE	The possible adverse effects of Climate Change have been assessed and have been included in LU's risk register
	<i>Work with researchers at London's South Bank University on studies into cooling the underground</i>	✗	LU CED	The project with South Bank university has developed a working engineering design. Some feasibility aspects of the design and evaluation of the safety aspects is yet to be considered. Although significant progress has been made we do not consider this target achieved until a working prototype design has been produced.
	<i>Consider how to solve the problem of heat on our system, through the services of a range of leading consultants and experts, within relevant fields</i>	✗	LU CED	Consultants have been commissioned to look into the problem and their reports have been finalised. Further work will be undertaken this year to assess their recommendations and develop a strategy. This target is not considered fully met until the recommendations have been assessed and a strategy has been developed.

	TARGET	ACHIEVED	OWNER	PROGRESS SUMMARY
	<i>Continue to plant trees on and about our network: these absorb carbon dioxide, one of the principal greenhouse gases</i>	✓	METRONET/ TUBE LINES	Trees have been planted across the LU network as part of our continuing embankment stabilisation works.
Climate Change cont.	<i>Work proactively to purchase increased levels of renewable energy for LU and TfL</i>	✓	LU CPO	14.19 % of LU's energy consumption is procured from renewable sources.
	<i>Strive to reduce our energy consumption levels where possible</i>	✓	LU CPO	The stations energy savings target of 17.5% has been met.



8. Objectives for 2004/5 and beyond

	TARGET	OWNER	DEPT
ENVIRONMENTAL MANAGEMENT SYSTEM	<ul style="list-style-type: none"> Undertake environmental risk assessment of all LU operations. LU and Metronet to agree the scope of the Environmental harm assessment. Revise classification of environmental incidents, complaints and impacts. Strengthen our environmental quarterly report to include a series of Key Performance Indicators. Metronet and Tube Lines to progress implementation of ISO14001 such that certification is achieved by April 2006. Review company standards to ensure they capture environmental requirements 	LU LU / METRONET LU/METRONET/T. L. LU METRONET/TUBE LINES LU	SQE SQE SQE LU
ENERGY	<ul style="list-style-type: none"> Maintain our stations energy savings target at or above 20% against the baseline figure. Maintain our target of all offices, stations and depots to be powered from 100% renewable energy sources. 	LU LU	CPO CPO
WATER	<ul style="list-style-type: none"> Meet GLA target of less than 11 cubic metres water consumption per employee per year in offices. Utilise GARDIT modelling predictions to assess the likely future impacts on our network. 	TfL LU	FACILITIES CED
AIR QUALITY	<ul style="list-style-type: none"> Conduct 04/05 programme of dust monitoring Tube Lines to replace 20% of large goods vehicle fleet with ultra low sulphur diesel Euro III or above standard Vehicles. Tube Lines aim to source and implement use of sulphur free diesel for Acton based large goods vehicles. Tube Lines to reduce CO2 emissions from Acton based pool vehicles by 20%. Tube Lines to work with TfL to meet objectives set in their EIP regarding trialling alternative fuelled vehicles and selecting the quietest, alternatively fuelled vehicles of TfL managed fleets. 	LU TUBE LINES TUBE LINES TUBE LINES TUBE LINES	SQE
CONTAMINATED LAND	<ul style="list-style-type: none"> Tube Lines to undertake remediation at West Ruislip and continue to monitor 5 sites of potential risk 	TUBE LINES	
NOISE AND VIBRATION	<ul style="list-style-type: none"> Complete the publication of the findings from the CONVURT project. Produce a programme of options to implement recommendations arising from the CONVURT project. Undertake wheel/rail management e.g. rail grinding and track lubrication at noise problematic locations across the network. 	LU LU LU / METRONET/ TUBE LINES	CED CED CED

	TARGET	OWNER	DEPT
WASTE MANAGEMENT	<ul style="list-style-type: none"> • Implement pilot project to recycle office paper and newspapers at stations. • Implement a battery recycling scheme at LU office sites by December. • Establish costs for a cardboard separation scheme at offices. • Tube Lines Distribution Services to continue to work towards a target of 18% recycling of mixed municipal waste by 2005/6. 	TUBE LINES / LU TfL TfL TUBE LINES	SQE FACILITIES FACILITIES
CLIMATE CHANGE	<ul style="list-style-type: none"> • Conduct a safety assessment for the cooling scheme resulting from the work with South Bank University. • Assess reports on the problems with heat on our system and develop an improvement strategy. • Identify the implications for LU of the GLA London Climate Change Partnership 	LU LU LU	CED CED CED/SQE